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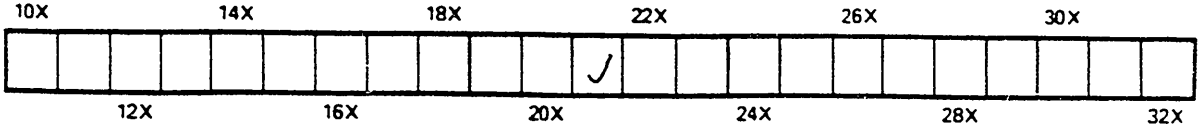

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AND REPLACING

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THE

CANADIAN RECORD

OF SCIENCE.

VOL. VIII. JANUARY, 1899. No. 1.

Editorial Note.

An apology is due to the members of the Natural History Society of Montreal, and to the readers of "The Canadian Record of Science" generally, for the delay of several months which has occurred in issuing the magazine. The responsible editor, appointed at the annual meeting of the Society in 1898, was occupied throughout the summer months in actively prosecuting the practice of his profession, and had no time to devote to the interests of the Natural History Society as bound up in the publication of the "Record of Science." After returning to his academical work in the city, he was taken seriously ill, and was for a long time laid aside from duty, and, when he did recover, he had so much leeway to make up in his professional work proper that work on the Society's journal had to be still further postponed. But the Committee now in charge of the publication will endeavor to overtake lost ground, and hope to present the "Record" regularly each quarter.

It will be conducted for the present on the old lines, laid down when the new series was begun in 1884, and

"will contain, in addition to the Society's proceedings, original papers on scientific subjects of interest to Canadians and reprints of scientific papers published elsewhere which deal with Canadian materials."

All communications and correspondence concerning the "Record" should be addressed,

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ZOOLOGICAL PROBLEMS FOR THE NATURAL HISTORY SOCIETY OF MONTREAL.

By E. W. MACBRIDE.

The subject matter of the study of natural history is of wide, one might almost say, illimitable extent, embracing, as it does, all animated nature in all its infinite variety. Compared to it, the studies of physics and chemistry appear of limited scope. In so vast a field, it is but natural that first one aspect and then another aspect should have rivetted the attention of students. In the early part of the century, the main object of the naturalist was to catalogue the different varieties of living things which he saw around him, distinguishing them from one another by external and easily recognized marks. Later, the celebrated anatomists, Cuvier, Owen and many others, laid the foundation of what has been called transcendental zoology, that is, they recognized that there were deep-seated agreements in the general plan of structure running through whole groups of animals, and that to properly classify them, animals must be thoroughly examined, internal structure as well as external features being taken into account.

The meaning of these deep-seated unities underlying differences puzzled the earlier anatomists very much.

They were wont to speak of animals having a common plan of structure, and to explain that by plan they meant an idea in the mind of the Creator. With the advent of Darwin, all this was changed, and it was recognized that the fundamental agreement in structure of many different animals implied community of descent. This enlightening and fascinating idea gave a tremendous spur to anatomical investigation, and for a time the dissecting room and the laboratory almost monopolized the attention of natural history students, especially when, at the same time, the new mode of interpreting the development or life history of animals, as a recapitulation of the ancestral history of the race, came into the foreground.

Of late years, however, there has been somewhat of a revulsion of feeling in this respect. It has been remembered that an animal is not a mere piece of intricately constructed matter, but a working machine, and in order to properly understand it, it must be studied living amidst its natural surroundings. We ought to beware of repeating the mistake of the older anatomists and over-emphasizing one side of the truth. We cannot, it is true, fully explain the structure of an animal with reference to its present habits and surroundings. If we could, all evidence for the descent of different animals from a common ancestor would disappear. No, an animal is to be compared to a piece of wax which has been passed through many different moulds, each of which has left its impress, and the newer impress has never entirely obliterated the traces of the older. Each form-impressing mould will then represent a set of circumstances and of habits possessed by the ancestors of the animal at one period of its existence, and the present habits and environment represent, so to speak, the last mould into which the piece of wax has been pressed.

In studying the surroundings and habits, then, we are not merely trying to explain some part of an animal's

structure; we are really observing the mode in which evolution, that is modification of structure, has taken place.

Now it is surprising how few accurate observations we have on the relation of animals to their environment. The older naturalists were content, as I have said, to classify, interspersing here and there some remarks as to habits, which were generally erroneous. Yet there are few subjects of study more important to zoology. Some of the most fundamental questions in the science depend for their solution on such studies. Chief among these is the amount of weight to be assigned to the principle which was regarded by Darwin as the driving power of evolution, viz., natural selection.

I need hardly remind you that by natural selection is meant the theory, that the struggle for existence, which inevitably follows from the tendency of every species of animal to produce far more young than can possibly survive, will select survivors with some advantageous peculiarity, which peculiarity will, in this way, become a character of the species.

Now, when stated in these broad, general terms, few would deny the truth of the theory, and certainly when we examine the larger differences which separate families and orders from each other, we can often show their relation to differences in surroundings and habits, but the question at issue is whether the minute differences which separate species from species can be so explained. High authorities have taken opposite sides on this question, and it can only be settled by systematic open air study. If the marks of species are not so to be interpreted, then we want to know what is their explanation, and, above all, what keeps allied species from intermingling.

The first duty of a Natural History Society is to prepare an accurate list of the species of animals from the surrounding country. I am well aware that our Society has done this in several groups of the animal kingdom,

but there are others in which it is yet to be done. The Vertebrata are, of course, all fairly well known. The Entomological Society, which, in my humble judgment, ought to be a section of this Society, has, no doubt, prepared a list of the insects, but I doubt very much whether any list of the Crustacea and Arachnida, to say nothing of the various groups of worms, has been made.

Once such a list has been made, innumerable interesting problems suggest themselves, of which I can select two or three as examples. We have, for instance, at least, four species of frogs in the neighboring country. The great bull-frog, or Canadian nightingale, Rana Catesbiana, attains a considerable size, and has a dull, yellowish, brown skin, sprinkled with minute black dots. Not attaining quite this size is the green frog, Rana clamata, the skin of which is of a uniform dull green, and which has an immensely developed tympanum or ear-drum. The common grass frog, Rana halecena, is much smaller, and has skin varying in color from bright green to golden brown and is diversified by oblong black patches. Finally, we have the wood frog, said to be identical with the common English species, Rana temporaria. This variety has a uniformly brown skin above and yellow beneath. I have not yet come across examples of this species.

Now the question arises, do these species differ from one another in their mode of life or not, and are their specific marks related to their surroundings?

With regard to the grass frog, Rana halecena, I may mention an observation which I myself made. I noticed at Ste. Rose a specimen on the grassy bank of the river. When not moving it was absolutely impossible to see it, the black patches on the green ground harmonized so completely with the color of the blades of grass and the shadows they threw. Now, it is stated that the bull-frog rarely leaves the water, and one might surmise that the muddy color of the skin resembled that of the muddy

ground on which it usually was to be found. Further, if it is true that Rana temporaria, the English grass frog, is only found in woods, its deeper color might very possibly harmonize with the deeper shades in the forest. I do not put this suggestion forward even as a theory. I merely mention it as a working hypothesis to point to a direction promising good results if properly looked into.

It must be clearly borne in mind that a pretty extensive knowledge of the habits of an animal is required before one can hope to find the use of an external feature. On the English coast a small crab of a dark green color is very abundant. It is known as the Partin or shore crab (Carcinus Moenas), and one of its marked features is a series of five sharp notches on either side of the front part of the carapace. When one sees the animal in the course of a shore-collecting expedition, there is nothing in its habits that could suggest any reason for the existence of these notches. But if we keep some specimens in a tank with a gravelly bottom, we shall find that they form burrows, and, when not on the look out for prey, remain hidden in them. Under these circumstances, the limb, which ends in the great claw, is held closely pressed against the front edge of the carapace. The five notches referred to above constitute a grating, through the meshes of which the water streams to the gills, whilst the meshes are fine enough to prevent particles of the gravel in which the animal is buried slipping down. We must know where an animal passes all its time before we give up the idea that a feature is of some use to it.

Now, in the St. Lawrence, we have two well-marked species of Crayfish—Cambarus virilis and Cambarus Bartonii. The first has large eyes, and the predominant color is dark greenish-brown, although red specimens are also met with. It has a prominent rostrum with spines at the sides. The first abdominal legs in the male end in

whip-like lash. This species is most abundant along the north shore as far as Lachine. Cambarus Bartonii, on the other hand, is always of a light red color; it has markedly smaller eyes, a broad, blunt rostrum without spines at the edge, and the first abdominal leg of the male ends in a hook. Cambarus Bartonii is much rarer than the other species, so far as my experience goes. I have found single specimens everywhere, but it appears to be abundant in the late fall on the back river (Ottawa.) It would be a most interesting problem to try to determine the distribution of these two species, and, if possible, their habits. Faxon, who has made a study of the North American Astacidae, places the two species in two different sections of the genus Cambarus, but he has no observations on their habits.

Another most interesting question which inevitably arises when we find two species of one genus living side by side is what prevents them from intermingling. The only proper definition of a species is a group of individuals closely resembling one another and breeding with one another so as to produce fertile offspring. Now when the naturalist separates two varieties as distinct species, he is seldom able to bring proof that they will not interbreed with one another. Hence the vast majority of determinations of species are mere surmises, surmises based on the belief that the only thing which will cause a group of animals to remain similar to one another is constant interbreeding. This is all very well in cases where the species are as distinct as our species of Cambarus, but in very many cases the differences separating allied species are so slight that there is the strongest reasons for doubting whether, in the true and physiological sense, they are distinct.

It would be comparatively easy to cross Cambarus virilis and C. Bartonii in the spring, and the animals experimented on could be kept either in a small pond or in little aquaria.

Some very interesting experiments are at present being carried out on butterflies in Cambridge. Some European species of butterflies are well known to be represented by two varieties—a mountain variety found in the upper meadows of the Alps, and a valley variety. The mountain variety is a dusky form. Now it occurred to Mr. Bateson, a distinguished naturalist in Cambridge, that if one started below in the valley and worked one's way upward, one of two things must happen; either one would find a slow gradation of one variety into the other, or one would arrive at a point where the two varieties are found flying together. Mr. Bateson found, as a matter of fact, that it was the latter alternative which was really the case. He collected a quantity of each variety and crossed them. The result is very interesting; the two varieties are perfectly fertile amongst themselves, but the offspring are not intermediate in character between the two parents; they either "take after" the father or the mother. Now, I feel sure that there are many cases known to the entomologists of Montreal where similar experiments could be made, and only in such ways shall we gradually arrive at an idea how one species may have given rise to two. In passing, it may not be inopportune to remark that there is a great deal of misconception in the way in which many people represent the *modus operandi* of evolution to their minds. They speak as if they believed that evolutionists thought that one species living in one place, of its own internal motion, broke up into two or three species, and hosts of imaginary difficulties have been raised, such as the supposed swamping of varieties by intercrossing, and so on. It must be confessed that these difficulties seem to have taken root in the mind of even so renowned an evolutionist as Alfred Russel Wallace. Now such a view seems to me to be entirely irrational. If we could have been spectators of the history of a species through the lapse of ages,

we should have seen that so long as it inhabited the same area, it remained one, just as the English nation has remained one, although its general character has slowly changed, just as species have become modified in the lapse of time. What has led to the breaking up of a species into several has been the migration of parts into new areas and the isolation of these groups of individuals from the main stock; in a word, the sending out of colonies. The new conditions under which the colonists live make them, to a certain extent, different from the parent stock. Bateson's experiments show that there can be differentiation even where the territories of the mother country and the colony adjoin, and that, when this differentiation has reached a certain pitch, it is preserved from the fact that the characters of the two varieties will not mix in breeding.

The science of conchology is a branch of natural history eminently characteristic of the older period. It was an easy and agreeable task to collect shells; their colors were pretty, and the external characters were well marked. The passion for making new species out of all sorts of chance variations raged unchecked, and the number of species has reached portentous dimensions. Now, the question is, how far have these species determinations any real validity? and this question is only to be settled by systematic study on the spot. Owing to the difficulty of rearing fresh water molluscs, it is hardly possible to apply the test of interbreeding, but it might be at least ascertained how far the so-called species are really distinct and whether they do not grade into each other. Another most important and interesting point is to ascertain how far differences in the structure of the animals are correlated with the external differences in the shell. In the course of my expeditions to collect material for the classes in McGill, I have made some interesting observations on our two common species

of mussel, Unio Complanatus and Unio Ventricosus, both found living together in the St. Lawrence at Verdun. Unio Complanatus has a long, narrow, comparatively flat shell. Unio Ventricosus, a shorter, broader and deeply arched shell. Now the first has a structure similar in all respects to that of Anodonta, which is the typical species described in zoological text books. The inner lobe of the inner gill is attached to the foot only in front and the outer gill is used as a nursery for the young. In Unio Ventricosus, on the other hand, the inner lobe of the inner gill is attached to the foot for the whole of its length and only the hinder part of the outer gill is used for a nursery. Here are two well marked anatomical facts correlated with a difference in the shells of two species of the same genus, and there are numerous other minor differences which I have not mentioned. It is exceedingly important to pursue this line of investigation further.

To sum up, the day is past when a natural history society could be held to justify its existence by the mere collecting and naming of species. Its function certainly is to collect, but that only as a means to an end, namely, to determine the conditions of the problems which it has to attack. From this point of view, whilst there is everything to be said in favor of making collections of total species, there is equally much to be said against spending time in making collections of species from all parts of the world, and especially against mixing species from different localities. Once the local fauna is fairly well known, the object of the naturalist is to study each species in relation to its environment, and leaving to the anatomist the task of elucidating the past history and wider relationships of an animal from its internal structure to determine what effect its present surroundings have had on it; in a word, to study evolution in action.

The Gramineæ, Cyperaceæ and Juncaceæ of Montreal Island.

By Harold B. Cushing, B.A., and Robert Campbell, M.A., D.D.

The following list, prepared jointly by Mr. Harold B. Cushing, B.A., and Rev. Robert Campbell, M.A., D.D., of Montreal, was communicated to the Natural History Society of Montreal on the evening of January, the 31st, 1898, by Dr. Campbell. It is the first time that a serious effort has been made to collect the local species of these three important families. The collections being continued over a period of four years, the list may be regarded as tolerably complete. The number of grasses—species and varieties—is 85, of which only 18 have been previously reported. The Cyperaceæ number 89—species and varieties—and of these only 10 have been previously reported. The Juncaceæ number 14, and none of these have been hitherto reported. In all there are 179 species and 9 varieties given in this paper, of which only 28 have been previously credited to the Island of Montreal. It may surprise some of those under whose eye this catalogue may fall, that in an island only twenty-eight miles long and nine miles wide, so many species of grasses, carices and reeds should be found. In fact, we have in the Counties of Hochelaga and Jacques Cartier an epitome of the flora of all the Eastern Provinces. The reason, doubtless, is that the insular situation of these counties, and especially their geological character—being the combined Provinces of Ontario and Quebec in miniature—peculiarly fit them, owing to the occurrence of mountains, rivers, marshes, swamps and woods close together, for affording a suitable *habitat* to the plants in question.

The nomenclature followed is that given in Britton & Brown's Flora of the United States and Canada. They have embodied in the main the determinations of the

Torrey Club, now regarded as the most eminent authority on the Flora of Eastern America. The *Gramineæ* of their publication were elaborated by Geo. V. Nash; the *Juncaceæ*, by F. V. Coville, while Prof. Bailey's conclusions were generally adopted in regard to the *Cariceæ*. Wherever there has been a departure from the nomenclature of Gray's "Manual," 6th edition, the latter is placed within brackets.

GRAMINEÆ JUSS.

SYNTHERISMA WATT.

1. SYNTHERISMA SANGUINALIS (L.) Nash. (*Panicum sanguinale.*)—Yards and roadsides. Rare.

PANICUM L.

1. PANICUM CRUS-GALLI L.—Very common in yards and waste places. July and August.

2. PANICUM PORTERIANUM Nash. (*P. latifolium.*)—Mount Royal Park and Cemetery. June.

3. PANICUM CLANDESTINUM L.—Bagg's Woods. July, 1896.

4. PANICUM XANTHOPHYSUM A. Gray.—Mount Royal Park. June.

5. PANICUM SCRIBNERIANUM Nash.—Mount Royal Park. July.

6. PANICUM DICHOTOMUM L.—Mount Royal Cemetery. Reported by Dr. Holmes as *P. nitidum.*

7. PANICUM DEPAUPERATUM Muhl.—Top of Mount Royal. 1894.

8. PANICUM MILIACEUM L.—Cote St. Paul. July 17, 1897.

9. PANICUM CAPILLARE L.—Common in yards, roadsides, lanes. August.

IXOPHORUS SCHLECHT (*Setaria.*)

1. IXOPHORUS VERTICILLATUS (L.) Nash. (*Setaria ver-*

ticillatus.)—Common. Reported by Holmes and Fletcher.

2. IXOPHORUS VIRIDIS (L.) Nash. (*Setaria viridis.*) Common. Reported by Holmes.

3. IXOPHORUS GLAUCUS (L.) Nash. (*Setaria glauca.*)—Common everywhere. July and August.

4. IXOPHORUS ITALICUS (L.) Nash. (*Setaria Italica.*) Cote St. Antoine. 1896.

ZIZANIA L.

1. ZIZANIA AQUATICA L.—Mouth of St. Pierre River. August, 1895.

HOMALOCENCHRUS MIEG (*Leersia.*)

1. HOMACLOCENCHRUS ORYZOIDES (L.) Poll. (*Leersia oryzoides.*)—St. Pierre River. August. Reported by Holmes.

PHALARIS L.

1. PHALARIS ARUNDINACEA L.—Mouth of St. Pierre River. June and July.

2. PHALARIS ARUNDINACEA PICTA L.—Cote St. Paul. August.

3. PHALARIS CANARIENSIS L.—Cote St. Antoine and city lanes. August.

SAVASTANA SCHRANK.

1. SAVASTANA ODORATA (L) Scribn.—Savanne. June, 1897.

STIPA L.

1. STIPA MACOUNII Scribn. (*S. Richardsonii.*) Mount Royal Park, near riding course. August.

ORYZOPSIS MICHX.

1. ORYZOPSIS JUNCEA (Michx) B. S. P.—Mount Royal Park. June, 1896.

2. ORYZOPSIS ASPERIFOLIA Michx.—Cemetery woods and north mountain. May.

3. ORYZOPSIS MELANOCARPA Muhl.—Woods north of riding course. August.

MILIUM L.

1. MILIUM EFFUSUM L.—Hill west of Mount Royal Cemetery gate. August.

MUHLENBERGIA SCHREB.

1. MUHLENBERGIA MEXICANA (L.) Trin.—Common on Mount Royal. August.

2. MUHLENBERGIA RACEMOSA (Michx) B.S.P.—Savanne, St. Michel. August, 1897.

3. MUHLENBERGIA SYLVATICA Torr. — Pointe-aux-Trembles and Mount Royal Park. August.

4. MUHLENBERGIA TENUIFLORA (Willd) B. S. P.—Bagg's woods. August. Reported by Holmes as *agrostis tenuiflora.*

BRACHYELYTRUM BEAUV.

1. BRACHYELYTRUM ERECTUM (Schreb) Beauv.—Hochelaga woods. June. Reported by Holmes as *B. aristatum.*

PHLEUM L.

1. PHLEUM PRATENSE L.—Common. June and July.

ALOPECURUS L.

1. ALOPECURUS GENICULATUS L.—Swamps on Mount Royal and Annex. July. Reported by Holmes.

CINNA L.

1. CINNA LATIFOLIA (Trev.) Griseb. (*C. pendula.*)—Swamp on Mount Royal. July and August.

AGROSTIS L.

1. AGROSTIS ALBA L.—Common. June and July.

2. AGROSTIS ALBA VULGARIS Thurber.—Common. June and July

3. AGROSTIS PERANNENS (Watt) Tuckerm.—Swamp on Mount Royal. August.

4. AGROSTIS HYEMALIS (Watt), B S. P. (*A. scabra.*)—South mountain. August.

CALAMAGROSTIS ADAMS.

1. CALAMAGROSTIS CANADENSIS (Michx) Beauv. (*Arundo Canadensis.*)—Mount Royal. August.

2. CALAMAGROSTIS LANGSDORFII (Link) Trin. (*Arundo Langsdorfii.*)—Woods west of riding course. August.

3. CALAMAGROSTIS NEGLECTA (Ehrh.) Gaertn. (*Arundo neglecta.*)—Hochelaga woods. August.

HOLCUS L.

1. HOLCUS LANATUS L.—Montreal Junction. August. Reported by Holmes as *Hierochloa borealis.*

DESCHAMPSIA BEAUV.

1. DESCHAMPSIA FLEXUOSA (L.) Trin.—In Cemeteries and on Mount Royal. June and July.

ARRHENATHERUM BEAUV.

1. ARRHENATHERUM ELATIUS (L.) Beauv.—Between Pointe-aux-Trembles and Sault au Recollet. June, 1894.

DANTHONIA DC.

1. DANTHONIA SPICATA (L.) Beauv.—Abundant top of Mount Royal and Cemeteries. June.

SPARTINA SCHREB.

1. SPARTINA CYNOSUROIDES (L.) Willd.—Pointe-aux-Trembles. August. Reported by Holmes.

EATONIA RAF.

1. EATONIA PENNSYLVANICA (DC.) A. Gray.—Montreal Junction. August.

Dactylis L.

1. Dactylis glomerata L.—Common.

Cynosurus L.

1. Cynosurus cristatus L.—Rare. August. Reported by Holmes.

Poa L.

1. Poa annua L.—Common on roadsides, lawns. June and July.

2. Poa compressa L.—Common. June and July.

3. Poa pratensis L.—Common. July and August. Reported by Holmes.

4. Poa trivialis L.—Hochelaga bank and Bagg's woods. August.

5. Poa nemoralis L.—Mount Royal Park and Lachine. August.

6. Poa flava L. (*P. serotina.*)—Common in many places. Reported by Holmes as *P. serotina.*

7. Poa debilis Torr.—Bagg's woods. August.

8. Poa alsodes A. Gray.—Swamp north of riding course. August.

Graphephorum Desv.

1. Graphephorum melicoideum (Michx) Beauv.—Hochelaga woods. August, 1897.

Panicularia Fabr. (*Glyceria.*)

1. Panicularia Canadensis (Michx) Kuntze. (*Glyceria Canadensis.*)—Common. Reported by Holmes as *Poa Canadensis.*

2. Panicularia elongata (Torr.) Kuntze. (*Glyceria elongata.*)—Common in woods. June and July.

3. Panicularia nervata (Willd) Kuntze. (*Glyceria nervata.*)—Common. Reported by Holmes as *Poa nervata.*

4. Panicularia Americana (Torr.) MacM. (*Glyceria*

grandis.)—In wet places. Common. Reported by Holmes as *Poa aquatica.*

5. PANICULARIA PALLIDA (Torr.) Kuntze. (*Glyceria pallida.*)—South mountain. August.

6. PANICULARIA FLUITANS (L.) Kuntze. (*Glyceria fluitans.*)—Marsh, Logan's Park. August.

FESTUCA L.

1. FESTUCA OCTOFLORA Watt. — South mountain. August.

2. FESTUCA OVINA L.—Common.

3. FESTUCA OVINA DURIUSCULA (L.) Hack.— Cemetery path. July.

4. FESTUCA SCABRELLA Torr.—South mountain. August.

5. FESTUCA ELATIOR L.—Bagg's woods. August.

BROMUS L.

1. BROMUS CILIATUS L.—Mount Royal Park, near upper reservoir. August.

2. BROMUS ASPER Murr.—Mount Royal Park, near riding course. August.

3. BROMUS STERILIS L.—Cote des Neiges road. August, 1897.

4. BROMUS KALMII A. Gray.—Mount Royal Park, near upper reservoir. August.

5. BROMUS SECALINUS L.—Cemetery and Mount Royal. August, 1897.

LOLIUM L.

1. LOLIUM PERENNE L. — Mount Royal Cemetery. August. Reported by Holmes.

AGROPYRON J. GAERTN.

1. AGROPYRON REPENS (L.) Beauv.—Too common.

2. AGROPYRON VIOLACEUM (Hornem) Vasey. — South mountain. August.

3. AGROPYRON CANINUM (L.) R. & S. — Mount Royal Park. August.

HORDEUM L.

1. HORDEUM JUBATUM L.—Westmount, Pointe-aux-Trembles. July. Reported by Holmes.

ELYMUS L.

1. ELYMUS STRIATUS Willd.—Mount Royal Park. August.

2. ELYMUS VIRGINICUS L.—Mount Royal Park, near upper reservoir. August.

3. ELYMUS CANADENSIS L.—Sault au Recollet. September, 1897.

4. ELYMUS GLAUCUS Buckl.—South mountain. August.

5. ELYMUS ARENARIUS L.—Shore of St. Lawrence, Point St. Charles. July, 1896.

HYSTRIX MOENCH. (*Asprella.*)

1. HYSTRIX HYSTRIX (L.) Millsp. (*Asprella Hystrix.*) Common. Reported by Holmes as *Elymus hystrix.*

CYPERACEÆ J. ST. HIL.

I. CYPERUS TOURN.

1. CYPERUS DIANDRUS Torr.—Point St. Charles. August, 1897.

2. CYPERUS ESCULENTUS L.—Cote St. Paul. August, 1897.

3. CYPERUS STRIGOSUS L.—Lachine. September, 1897.

DULICHIUM L.C. RICHARD.

1. DULICHIUM ARUNDINACEUM (L.) Britton.—River St. Pierre. August, 1896.

ELEOCHARIS R. BR.

1. ELEOCHARIS OVATA (Roth.) R. & S.—Hochelaga, Cote St. Paul and Annex.

2. ELEOCHARIS PALUSTRIS (L.) R. & S.—Common everywhere.

3. ELEOCHARIS ACICULARIS (L.) R. & S.—Common in swamps.

4. ELEOCHARIS TENUIS (Willd) Schultes.—Hochelaga woods, Point St. Charles. June, 1896.

5. ELEOCHARIS ACUMINATA (Muhl.) Nees.—Mount Royal Park. August, 1897.

STENOPHYLLUS RAF.

1. STENOPHYLLUS CAPILLARIS (L.) Britton. (*Fimbristylis capillaris.*)—Point St. Charles. August, 1897.

SCIRPUS L.

1. SCIRPUS AMERICANUS Pers.—Point St. Charles. July, 1896. (Dr. Holmes.)

2. SCIRPUS LACUSTRIS L.—Hochelaga bank and St. Pierre River. June, 1895.

3. SCIRPUS FLUVIATILIS (Torr.) A. Gray.—Hochelaga woods. July, 1897.

4. SCIRPUS ATROVIRENS Muhl.—Common everywhere.

5. SCIRPUS MICROCARPUS Presl.—Swamp above riding course. August, 1896.

6. SCIRPUS CYPERINUS (L.) Kunth.—Swamp above riding course. September, 1897.

7. SCIRPUS CYPERINUS ERIOPHORUM (Michx) Britton.—Swamp, Pointe-aux-Trembles. September, 1896.

ERIOPHORUM L.

1. ERIOPHORUM VAGINATUM L.—Hochelaga woods. August, 1897.

2. ERIOPHORUM POLYSTACHYON L.—Pointe-aux-Trembles. August, 1896.

CAREX L.

1. CAREX INTUMESCENS Rudge.—Mount Royal, Mile End, St. Michel. May.

2. CAREX LUPULINA Muhl.—Montreal Annex, Cote St. Paul, Hochelaga bank.

3. CAREX UTRICULATA Boott.—Marsh in Hochelaga woods and Bagg's woods. August, 1896.

4. CAREX MONILE Tuckerm.—Marsh at Pointe-aux-Trembles, August, 1897.

5. CAREX TUCKERMANI Dewey.—Mountain swamp. June. 1894.

6. CAREX RETRORSA Schwein.—Mountain swamps and Annex.

7. CAREX LURIDA PARVULA (Paine) Bailey. (*C. tentaculata*, var. *parvula.*)—Lachine. July, 1896.

8. CAREX HYSTRICINA Muhl.—Mount Royal, Hochelaga woods. June, 1894.

9. CAREX PSEUDO-CYPERUS L.—Mount Royal and Mile End. June, 1894.

10. CAREX COMOSA Boott. (*C. Pseudo-Cyperus*, var. *Americana.*)—Pointe-aux-Trembles. September, 1897.

11. CAREX ARISTATA R. Br. (*C. trichocarpa*, var. *aristata.*)—Savanne, St. Michel. July, 1896.

12. CAREX RIPARIA Curtis.—Shore of St. Lawrence, Verdun. August, 1897.

13. CAREX LANUGINOSA Michx. (*Filiformis*, var. *latifolia.*)—Mount Royal, Annex, Hochelaga.

14. CAREX STRICTA Lam.—Aqueduct, Cote St. Paul, Lachine. June, 1895.

15. CAREX STRICTA ANGUSTATA (Boott) Bailey.—Hochelaga woods. August, 1896.

16. CAREX STRICTA XEROCARPA (S. H. Wright) Britton. —Bagg's woods. September, 1897.

17. CAREX HAYDENI Dewey. (*C. stricta*, var. *decora.*) —Hochelaga swamp. July, 1896.

18. CAREX AQUATILIS Wahl.—Swamp near Back River. August, 1897.

19. CAREX GOODENOVII J. Gay. (*C. vulgaris.*)—Lachine. July. Reported by Dr. Holmes as *C. vulgaris.*

20. CAREX PRASINA Wahl.—Hochelaga bank. June, 1897.

21. CAREX CRINITA Lam.—Mount Royal, St. Anne's, Hochelaga.

22. CAREX GYNANDRA Schwein.—Woods at St. Michel. July, 1897.

23. CAREX GRACILLIMA Schwein.—Common.

24. CAREX DAVISII Schwein.—Mount Royal. July. Reported by C. F. McCrea.

25. CAREX ARCTATA Boott.—Mount Royal, Hochelaga, Westmount, St. Anne's.

26. CAREX ARCTATA FAXONI Bailey.—Hochelaga woods. June, 1897.

27. CAREX TENUIS Rudge. (*C. debilis*, var. *Rudgei.*)—Bagg's woods. July, 1896.

28. CAREX GRANULARIS Muhl.—Common in many places.

29. CAREX FLAVA L.—Mile End and Montreal Annex. June, 1895.

30. CAREX PALLESCENS L.—Mount Royal. May and June, 1895.

31. CAREX HITCHCOCKIANA Dewey.—Near riding course, June, 1895.

32. CAREX LAXIFLORA Lam.—Mount Royal and Mile End. Reported by Dr. Holmes.

33. CAREX LAXIFLORA BLANDA (Dewey) Boott.—Mount Royal and Hochelaga. May, 1895.

34. CAREX ALBURSINA Sheldon. (*C. laxiflora*, var. *latifolia.*)—Mount Royal. May, 1895.

35. CAREX PLANTAGINEA Lam.—Sides of Mount Royal. May, 1895.

36. CAREX PLATYPHYLLA Carey.—North mountain. Reported by Holmes and McCrea.

37. CAREX AUREA Nutt.—Mount Royal and Cote St. Paul. May and June, 1895.

38. CAREX PEDUNCULATA Muhl.—Mount Royal and Westmount, 1894. Reported by McCrea.

39. CAREX PEDICELLATA (Dewey) Britton. (*C. communis.*)—Mount Royal, Westmount, St. Anne's.

40. CAREX PEDICELLATA WHEELERI (Bailey) Britton. (*C. communis*, var. *Wheeleri.*)

41. CAREX PENNSYLVANICA Lam.—Common in Mount Royal Park. May.

42. CAREX VARIA Muhl.—Common on Mount Royal. Reported by Dr. Holmes.

43. CAREX NOVÆ ANGLIÆ Schwein.—Hochelaga bank. June, 1897.

44. CAREX UMBELLATA Schk.—Mount Royal Park and Cemetery. May, 1895.

45. CAREX PUBESCENS Muhl.—Mount Royal. Rare. 1894.

46. CAREX LEPTALEA Wahl. (*C. polytrichoides.*)—Swamp on Mount Royal. May, 1894.

47. CAREX CHORDORHIZA L.—Bog, Hochelaga woods. August, 1896.

48. CAREX STIPATA Muhl.—Cote St. Paul and Mount Royal. Fairly common. June.

49. CAREX TERETIUSCULA Gooden.—Lachine. July, 1897.

50. CAREX VULPINOIDEA Michx.—Common. Reported by Holmes and McCrea.

51. CAREX TENELLA Schk.—Swamps on Mount Royal.

52. CAREX ROSEA Schk.—Common Mount Royal.

53. CAREX SPARGANIOIDES Muhl.—Near riding course. June, 1895.

54. CAREX CEPHALOPHORA Muhl.—Mount Royal, Mile End and Westmount.

55. CAREX STERILIS Willd. (*C. echinata*, var. *microstachys.*)—Common. Reported by Holmes as *C. scirpoides.*

56. CAREX CANESCENS L.—Swamps on Mount Royal. June, 1894.

57. CAREX ŒNEA Willd.— Mountain swamp. July, 1897.

58. CAREX TENUIFLORA Wahl.—Lachine swamp. July, 1897.

59. CAREX DEWEYANA Schwein.—Mount Royal. Fairly abundant. Reported by Holmes and McCrea.

60. CAREX BROMOIDES Schk.—Hochelaga bank swamp. June, 1896.

61. CAREX TRIBULOIDES Wahl.—Cote St. Paul, Lachine, Bagg's woods. July.

62. CAREX SCOPARIA Schk.—Mount Royal, Hochelaga. Lachine. August.

63. CAREX CRISTATELLA Britton. (*C. tribuloides,* var. *cristata.*) Cote St. Paul. August, 1896.

64. CAREX ADUSTA Boott.— Montreal Annex. July, 1897.

65. CAREX STRAMINEA Willd.— Hochelaga, Lachine. June, 1896.

66. CAREX TENERA Dewey. (*C. straminea,* var. *aperta.*) —Hochelaga bank. June, 1897.

67. CAREX FESTUCACEA Willd. (*C. straminea,* var. *brevior*).—Mount Royal. June, 1897.

(The following were omitted in their proper places in the list.)

68. CAREX HARTII Dewey.— Mount Royal, Montreal. July, 1897.

69. CAREX REDOWSKYANA C. A. Meyer.

JUNCACEÆ VENT.

I. JUNCUS L.

1. JUNCUS EFFUSUS L.—Mount Royal and Point St. Charles. July, 1895.

2. JUNCUS BALTICUS Willd. — Point St. Charles August, 1897.

3. JUNCUS BUFONIUS L.—Not rare.

4. JUNCUS TENUIS Willd.—Common.

5. JUNCUS DICHOTOMUS Ell.—Lachine. August, 1897.

6. JUNCUS MARGINATUS Rostk.—Lachine. September, 1897.

7. JUNCUS STYGIUS L.—St. Michel, Savanne, 1897.

8. JUNCUS ARTICULATUS L—Rockfield. July, 1897.

9. JUNCUS RICHARDSONIANUS Schultes.—(*Alpinus*, var. *insignis.*)—Mount Royal. 1896.

10. JUNCUS NODOSUS L. (Var. *genuinus.*)—Mount Royal, 1894.

11. JUNCUS CANADENSIS J. Gay.—Pointe-aux-Trembles.

12. JUNCUS CANADENSIS BREVICAUDATUS Engelm. (Var. *coarctatus.*)—Hochelaga bank, 1897.

II. JUNCOIDES ADANS. (*Luzula, D C.*)

1. JUNCOIDES PILOSUM (L.) Kuntze. (*Luzula vernalis.*) —Mount Royal Cemetery. 1896.

2. JUNCOIDES CAMPESTRE (L.) Kuntze. (*Luzula campestris.*)—Mount Royal Cemetery, 1895.

DIMORPHISM AND POLYMORPHISM IN BUTTERFLIES.[1]

By HENRY H. LYMAN, M.A.

The subject which I have chosen for my address to-night is one of very great interest and is capable of excellent illustration among the butterflies of this continent, some of which furnish remarkable examples of diverse forms.

I shall confine my remarks strictly to the North American species, as these are the only ones which I have

[1] Read before the Natural History Society, 25th Feb., 1895.

studied, and the facts which I shall set forth are the common property of lepidopterists.

Under the title dimorphism, I have included sexual diversity, although this is frequently treated of separately under the term antigeny.

You are all aware that many animals exhibit striking differences between the sexes, and this is true of many butterflies, some of which differ much more between the sexes than do those of the same sex of different species, and some differ so greatly that you would suppose them to belong to different genera, while others differ so little that it takes an entomologist of some experience to separate them. Not only is there great range of degrees of difference, but also the variety of ways in which they differ seems almost endless.

And not only do the different genera vary greatly in this way, but even within the limits of a single genus you may have species in which the sexes are practically identical, species in which they differ slightly, others, differing more strongly, and so on till we reach a species where the sexes are so unlike that they might easily be taken for different species or even different genera. Such a group is the genus Argynnis, a genus very typical of the Palearctic and Nearctic fauna.

The smaller species, such as Myrina, Montinus, &c., which Dr. Scudder separates under the generic name Brenthis, are practically identical in the sexes, though there is a slight difference in the point of origin of one of the nervules of the hind wing.

In the majority of the species the males may be said to have the ground color fulvous, while in the females it inclines to luteous, but in a few there is a very striking diversity between the sexes.

Argynnis Cybele, which is quite common in this locality, is a very good example of the majority, though the contrast is, perhaps, greater than in the average, while

Argynnis Nokomis is a splendid species, in which the male is of a fiery fulvous, while the female is of a dark brown tone, and Argynnis Leto is a similar though less marked example in the same class. But the most striking case in this genus is that of Argynnis Diana, the most superb species of the genus. In this the male, while fairly preserving the usual colors of the genus, departs widely from the normal type of ornamentation, as instead of the ground color being fulvous, marked with bars and spots of black, it is for two-thirds of the distance from the base of a dark brown color, with a bright tawny border, but the female not only departs widely from the usual type of ornamentation, but also loses every trace of tawny or fulvous coloring, becoming a dark blue butterfly with a striking resemblance to the genus Limenitis.

This is an example of the fact that where there is marked dimorphism between the sexes it is almost invariably the female which departs from the usual type, but whether this is to be accounted for by the general desire of that sex for striking and varied costumes, I am unable to say.

The genus Colias, one of the most puzzling and, therefore, most interesting, of genera, furnishes some striking cases of sexual dimorphism.

This genus is composed of the so-called Sulphur Butterflies, the yellow or orange butterflies which are found everywhere, flitting about the clover fields especially, and which Dr. Scudder thinks were probably the first to be called butterflies, as the yellow Ranunculus is called the buttercup. The most striking case of sexual dimorphism in this genus is Colias Eurydice, which some authors separate from that genus under the generic name Meganostoma.

It is a most beautiful species in the male sex, but the female is of a uniform pale sulphur yellow, only resembling the male in the shape of the wings and in the discal spot of the primaries.

So great is the contrast that it was described as Rhodocera Lorquini by the celebrated Dr. Boisduval, who had previously named the male, and it was also described as Meganostoma Helena ♂ by Mr. Reakirt.

In Colias Pelidne, which occurs in Labrador, the male is of a sulphur yellow, while the female is of a rather dingy white, thickly sprinkled below on the secondaries with greenish brown, and similar examples occur elsewhere, especially among the alpine and sub-arctic species of the genus.

Among those species which do not appreciably vary in the sexes are some of the most strongly marked species, species, moreover, which are either cosmopolitan or have a very extended range over a great part of the earth's surface, and upon which the differing climatic conditions of their various habitats seem to have been powerless to effect any change. Of these the most marked are Vanessa Antiopa, called in England, where it is a great rarity, the Camberwell Beauty, Pyrameis Atalanta, or Red Admiral Butterfly, and the species to which Mr. Kirby in his catalogue gives the locality as "Mundus," Pyrameis Cardui, the so-called Painted Lady, an opprobrious name in my estimation.

On the other hand, the species which varies the most in the sexes is the beautiful species named Diadema Missipus, from Indian River, Florida, which differs so greatly that no one unacquainted with it would suppose that the two sexes were of the same genus, still less of the same species. This species forms a sort of link between the genus Limenitis, in which the colors are largely purple brown and white, and the genus Danais, which is tawny, with black and white markings. Indeed, the female of Missipus may be classed with the mimetic or mimicking forms, "but that," as Rudyard Kipling would say, "is another story."

Between these two conditions—of no variation and

very great variation—there is every possible gradation. Pyrameis Huntera, very closely allied to the cosmopolitan Cardui, only differs perceptibly in the color of the transverse bar near the apex of primaries which is white in the male, but tawny in the female. In Danais Archippus the sexual mark is a slight black swelling close to the lowest median nervule of the hind wings, which is really a pouch enclosing the androconia or scales peculiar to the male sex. These androconia are thought by some to be scent organs for the purpose of rendering the male pleasing to the female, the male being thought to have the power of opening at will the pouches or folds in which they are contained. They are of very various forms and are placed in different parts of the wing in different species.

In the larger species of the genus Argynnis they occur along the branches of the median and along the submedian vein of the fore wings. They are covered up and protected by other scales, which gives the appearance of a thickening of the veins, and these species also have a row of hairs in the males above the subcostal vein of the hind wings.

In the Theclas or Hair Streaks, these scales are often crowded together in a peculiar patch near the front of the fore wing, and in some species of Satyrs, especially in the genus Chionobas, they cluster together in a peculiar dash on the front wings running towards the apex, and when the species, as is frequently the case, are ornamented with ocelli, these are generally larger and more conspicuous in the females. In other genera the sexes are distinguished by a considerable difference in the shape of the wings, a very striking example of this being found in the genus Apatura, as in Apatura Clyton, where the wings of the female are much fuller and more rounded than in the male, and similarly in Thecla Titus the fore wings of the male have a pointed tip and the hind wings have the inner angle sharply defined, while in the female

both these parts are broadly rounded, but in most of the species of this genus no such striking distinction in shape occurs.

Another curious point is found in connection with the atrophy or partial atrophy of some of the legs. In the Hesperidæ or Skippers, the little brownies of the butterfly world, which are universally admitted to be the lowest family of butterflies, there are six fully developed legs, while in the Nymphalidæ, which is certainly a higher family, there are only four legs used in walking, the front pair having become aborted into furry lappets, folded down on the breast, whence the English name sometimes given to this group, Brush Footed Butterflies.

But the most curious point in this connection is that between the six-footed butterflies and four-footed butterflies stands an intermediate family, the Lycænidæ, which are among the gems of the butterfly world, in which the fore legs are perfectly formed in the females, but more or less atrophied in the males, so that if the doctrine which assigns the higher plane to the four-footed butterflies is sound, it must be admitted that the ladies of this intermediate family are upon a lower level of creation than their lords and masters, a most deplorable conclusion.

In this family there are often great differences between the sexes in color and ornamentation in addition to the structural difference just referred to.

In the Theclidi the differences are generally not great, though one beautiful species, Læta, differs so much that the sexes were described as different species by Mr. Wm. H. Edwards, one of the very foremost American lepidopterists.

In Chrysophanus the males are frequently brown with a purplish reflection, and the females of a fiery coppery hue, whence their name "Coppers," as in Chrysophanus Thoë, which occurs here, though rarely, but in some of the species, such as Hypophleas, which is abundant all through this eastern part of the continent, no such distinction exists.

In Lycæna, or the "Blues," the females are generally more heavily bordered with dark brown than the males, and sometimes are almost entirely brown, with a border of orange spots.

Among the skippers the differences are generally well marked in the Pamphilidi, in which the males are generally more tawny than the females, and frequently have a peculiar discal dash on the front wings where the androconia are placed, but are not well marked in the other tribe, the Hesperidi, though in some genera the male has a peculiar fold on the costal or front margin of the fore wings in which the androconia are concealed. But though I have not nearly exhausted the subject of sexual dimorphism, I must hasten on to treat of the more general subject of dimorphism and polymorphism other than sexual.

It is a very remarkable fact that certain species of butterflies exist in two or more distinct forms which in many cases have been described as distinct species.

This kind of dimorphism may be partial or complete, that is, it may exist in one sex or both. Further, it may occur in part of a butterfly's habitat, but not in all parts. Again, it may be seasonal or occur regardless of season, or it may be partly seasonal and partly not.

To take a few instances of partial dimorphism, one of the most striking is the case of our common yellow swallowtail, Papilio Turnus.

In the north both sexes are yellow, but south of a line which may be roughly described as starting at a point a little south of New York and curving northwesterly to a little north of the international boundary north of Montana, a black form of female, to which the name Glaucus was given, begins to take the place of the yellow form and rapidly replaces it to total exclusion as we go south to the Gulf States.

Another somewhat similar case, but in the reverse sex,

is the black male of Lycæna Violacea, one of the polymorphic forms of Lycæna Pseudargiolus, which is found in this spring brood in Virginia and the South.

This case is especially remarkable in being the only example so far known of partial dimorphism in which the male instead of the female departs from the type.

I have already referred to the fact in treating of sexual dimorphism that in some species of the germs Colias, the male is yellow and the female white, but in quite a number of other species and among them our common Sulphur Butterfly, Philodice, there are two forms of female, one yellow like the male, and the other albino, though the albino specimens are rare, but no case of an albino male is known.

Partial dimorphism is not by any means common, and the only other instance in our butterfly fauna which is familiar to me is that of Pamphila Hobomok which has two forms of female, and was therefore nicknamed the Mormon by Dr. Scudder, one being largely tawny like the male, and the other very dark in colour, and formerly supposed to be distinct, was named Pocahontas.

Among the species in which complete dimorphism occurs may be mentioned several species of Graptas, popularly called Comma Butterflies from the silvery mark resembling a comma on the underside of the hind wings.

These are Grapta Interrogationis with its two forms, Fabricii and Umbrosa, Grapta Comma with its two seasonal forms, Harisii the autumnal and spring form, and Dryas the summer form.

Grapta Satyrus, a most interesting species, having its home or metropolis in the far west where it is dimorphic with a second form named Marsyas, but occurring extremely rarely in the east where the form Marsyas has never been found, and Grapta Silenus another western species with a dimorphic form, Oreas.

All these butterflies have at least two broods in the season, otherwise dimorphism could never develop, and in the allied species, such as Gracilis and Faunus, which are single brooded or monogoneutic, it does not occur.

These forms were all formerly thought to be distinct species and were so named, and it was only by careful observations and breeding from the egg that their interesting relationship was discovered.

Among this group, the most curious case is that of Grapta Interrogationis, as it not only differs in colour but also in the shape of the wings, and even in certain structural features.

In most of these cases the dimorphism is largely seasonal, one form being the autumnal form, which hibernates and appears again in the spring, and the other the summer form produced from the hibernators, but the separation is not complete, as a few of the summer brood are of the autumnal type.

But by far the most startling instance of dimorphism, on this continent at least, if not in the world, is that which has been recently worked out by Mr. David Bruce and Mr. W. H. Edwards, to the latter of whom we owe most of our knowledge not only of the dimorphism and polymorphism of our butterflies but also of their preparatory stages, and who stands at the head of North American Lepidopterists.

The case to which I refer, is the discovery that Papilio Oregonia, a form of yellow swallowtail, and Papilio Bairdii, a form of black swallowtail, are merely dimorphic forms of one species, in spite of belonging to two distinct subgroups of the genus Papilio.

So incredible did this seem that some of us found fault with Mr. Edwards for his first announcement, as we thought the evidence not perfectly conclusive, so Mr. Edwards, though a man of 72 years of age, went out to

Colorado last summer to work out on the spot the life history of these most interesting forms.

So far I have spoken only of dimorphism, but polymorphism also exists among our North American butterflies.

The most striking instance so far known among butterflies occurring commonly in Eastern Canada is the case of the beautiful little blue butterfly which may frequently be seen in its favourite haunts early in May. Dr. Scudder calls it the Spring Azure and its scientific name is Lycæna Pseudargiolus.

This species occurs in many forms, most of which have been regarded as distinct species. In the north there first appears the variety Lucia with an occasional Violacea and sometimes an intermediate form which Mr. Edwards named Marginata. Then in the summer there is the form Neglecta. To the South, say in Virginia, the forms Lucia and Marginata do not occur, Violacea being the regular earliest Spring form, but it has a dimorphic black male to which reference has already been made, and there is an additional and later Spring form, the largest in the series and the one first described under the name Pseudargiolus, while the later broods are few in numbers and of the form Neglecta.

In Arizona another variety occurs which Mr. Edwards calls Cinerea, and there is also the Pacific Coast form Piasus, with its variety, Echo, which occurs in California and Arizona.

A wonderful example of polymorphism is the case of Colias Eurytheme the bright orange butterfly of the West, though on two occasions single individuals have been taken in this Province.

Its typical form is of fiery orange with a heavy black border, but there are also albino females; then it runs through various degrees of less orange until we get the winter form Ariadne, small and with hardly any orange at all, and then there is the form which Mr. Edwards named

Hagenii after Dr. Hagen, supposing it to be distinct, but which was found by breeding to be merely a yellow polymorphic form of this species.

Another fine example of polymorphism is the case of Papilio Ajax with its forms Walshii, Telamonides and Marcellus. Of these forms the first two are Spring forms both coming from chrysalides of the previous year, Walshii appearing first and Telamonides shortly afterwards, and Marcellus being the summer form, but the relations of these forms to each other are very curious and could only be made clear by an extended notice, but Mr. Edwards sums up the results thus:—

Walshii produces Walshii, Telamonides and Marcellus, the same season: Telamonides produces Marcellus the same season and its own type in the following Spring; Marcellus produces successive broods of Marcellus the same season and occasionally Telamonides, and the last brood produces Walshii and Telamonides in the Spring.

In conclusion, we may consider the possible causes of dimorphism and polymorphism and the results which are likely to follow.

Some cases of dimorphism, especially the strongly marked cases of sexual dimorphism and the cases of partial dimorphism are extremely obscure, as it is impossible to assign a reason as yet why Turnus male should not be affected by the climatic changes in the southern range of its habitat except to become larger and finer, while the female is turned into a nigger.

But in some cases such as the cases of complete and seasonal dimorphism, it doubtless results from the greater or less heat at the time the different broods are maturing, while in the case of Lycæna Pseudargiolus it probably results in part from climatic conditions and in part from the difference, and abundance or scarcity of the food of the different broods. This species is of such a dainty appetite that it does not feed on the leaves of its food

plants, but only upon the flowers, and as the flowering time of most plants is limited to a comparatively short period of the summer the successive broods have to seek different food plants. In West Virginia, according to Mr. Edwards, they feed in the Spring on the flowers of the Dogwood (Cornus). In June and July the larvæ feed on the flower buds of the Rattle-weed (Cimicifuga Racemosa), and later in the season on Actinomeris Squarrosa.

Mr. Edwards noticed that the caterpillars varied somewhat in colour according to the food plant and this might doubtless affect the shade of colour of the resulting butterfly.

In regard to the results of these variations it seems probable that we have here species actually forming before our eyes.

In the case of the Spring Azure, Mr. Edwards found that there was only the very slightest connection between the large typical Pseudargiolus and the form Violacea, and that if the few straggling specimens of the form Neglecta which emerge late in the summer, instead of hibernating in the chrysalis stage and producing Pseudargiolus in the following May, were suppressed, the separation would be complete and we should have two species instead of one.

In the case of Grapta Interrogationis, the separation has gone so far that were the males of each form to mate only with females of like form, the species would be permanently divided into two.

Species forming, however, is slow work and none of us can see but a very short way along the path, but to those who have the eyes to see, even the slight glimpse which we can get is most interesting, and we know at least that the great creative process is still going on according to the natural laws laid down by the great Architect of the Universe.

Royal Society of Canada.

Meeting at Ottawa.

It was an important step, in the interest of the Science and Literature of the Dominion, which was taken by the Marquis of Lorne, then Governor-General of Canada, when he inaugurated, in 1882, the Royal Society of Canada. It has since increasingly formed a rallying centre for those engaged in scientific and literary research in Canada. As all local societies in the country, including the Natural History Society of Montreal, report their proceedings to the Royal Society, and individual workers in original research are encouraged to send their papers to the Society, if we wish to keep track of the progress made in either the Science or Literature of Canada, we shall find the best record of it in the journal of that Society. We believe, therefore, we are doing the readers of the "Record of Science" real service in presenting the following abstracts of papers read before Sections III. and IV. of the Royal Society, at its recent meeting, kindly furnished by Sir John Bourinot, Honorary Secretary of the Society, as containing a summary of what was accomplished during 1898 in connection with the Physical, Chemical, Geological and Biological Sciences, those subjects in which, it may be assumed, the readers of the "Record of Science" are specially interested.

The proceedings of the Royal Society were opened by an address by the President, T. C. Keefer, Esq., C.M.G., C.E., on "Canadian Water Power and its Electrical Product in Relation to the Undeveloped Resources of the Dominion," a subject of exceptionable importance to Canada at the present time. The evening of May 25th was given up to Popular Science, when Professor Rutherford, of McGill, who has taken the place of Professor Callendar, delivered the admirable lecture, with which the patrons of the Natural History were

favored, in the Somerville Course, last spring, on "Wireless Telegraphy," with experiments.

SECTION III.—MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES.

1.—"The Need for a Hydrographic Survey Department for Canada" (Present state of the question.) By Professor Alexander Johnson, LL.D.

2.—"The Synchronism of Terrestrial Magnetic Disturbances and Unusual Excitation in the Trails of Comets." By Arthur Harvey, President of the Astronomical and Physical Society of Toronto.

The author communicated his discovery that the sudden increase occasionally observed in the brightness of comets, sometimes accompanied by changes in the form of their tails, and by their apparent disintegration, are synchronisms with terrestrial magnetic disturbances. He considers this to furnish proof that the cause of these phenomena is electrical, has its origin in the sun, and is probably related to auroral displays.

3.—"Illustrations of Remarkable Secondary Tidal Undulations on January 1st, 1899." (From Recording Tide Gauges in the region of Nova Scotia.) (With 2 plates.) By W. Bell Dawson, M.A., Ma.E., Asst. M. Inst. C.E.

4.—"La Vie, l'Evolution le Materialisme." By C. Baillargé, M.A., C.E.

5.—"An Investigation of the Physiology of the Brain of the Bird." By Professor T. Wesley Mills, of McGill University.

This is a preliminary communication, based on experimental investigation of the brain of the Pigeon, now in progress, and is in part a continuation of work already reported to the Society, and in part a research in a new field of brain physiology, involving the application of a variety of methods of investigation.

6.—"An Examination of Some Points in the Psychology of the Bird, based in part on the above." By the same author.

SECTION IV.—GEOLOGICAL AND BIOLOGICAL SCIENCES.

1.—President's Address. "Canadian Geological Nomenclature." By R. W. Ells, LL.D.

The paper comprised a short sketch of the origin and introduction into Canadian geological literature of most of the terms now employed in the description of the several rock formations, found in the older or eastern provinces of Canada. A brief outline is also given of some of the changes of opinion which have been published from time to time, by the several workers in the geological field, regarding the interpretation of certain difficult problems which have arisen in this connection, and of the reasons which have led thereto, with a statement of some of the most recent conclusions reached from the systematic study of the rocks, both in the field and laboratory.

2.—"Recent Additions to the List of Injurious Insects of Canada." By James Fletcher, LL.D., F.L.S.

In 1883, Saunders's important work upon the "Insects Injurious to Fruit" was published. Since that time a great deal has been done in economic entomology, both as to working out the life histories of crop-pests and as to means of controlling many of these. The above paper treats of several injurious species which have attracted public attention by their ravages upon crops of all kinds for the last twenty years.

3.—"Catalogue of Canadian Proctotrypidæ." By W. Hague Harrington.

This contribution toward a more adequate knowledge of the Canadian insect faunas, consists of a list of all the species in the family Proctotrypidæ, which are known to occur therein, but, owing to the absence of systematic collecting in other localities, it is virtually limited to the species obtained at Ottawa. Of the two hundred species

enumerated, fully nine-tenths are recorded from Ottawa or its immediate vicinity. The insects are parasitic in their habits, either in the eggs or upon the larvæ of other insects. They are all small, and the majority are so minute as to be difficult of identification without careful microscopical study. They, however, exhibit a considerable and interesting diversity of structure, and a large proportion of the genera are readily recognizable. Descriptions of several apparently new species are included in the paper, as well as some remarks on previous records, and on the habits of certain species.

4.—"The Geology of the More Important Cities of Eastern Canada." By Henry M. Ami, M.A., D.Sc. Communicated by R. W. Ells, LL.D.

The paper discusses the geological formations as seen around the cities of Ottawa, Montreal, Quebec, St. John, Toronto, Hamilton and London. In the last named place the information has been largely obtained by means of borings which have been made in the vicinity, since rock-formations do not appear at the surface in that locality.

5.—"Origin and History of Some New Varieties of Wheat Produced at the Dominion Experimental Farms." By Wm. Saunders, LL.D., F.R.S.C., F.L.S., Director of Experimental Farms.

In this paper the author traces the history of some of the most promising of the cross-bred varieties of wheat which have been produced during the past ten years at the Experimental Farms. The objects in view in undertaking this work are referred to and some of the more striking instances of success given.

Particulars as to how these varieties compare with the standard sorts in cultivation are also given, together with facts indicating their adaptability to the different climates of the Dominion.

6.—"The Scientific Work of Prof. Charles Fred. Hartt." By G. U. Hay, M.A., Ph.B.

The scientific career of Prof. Chas. Fred. Hartt, teacher and geologist, although extending over a period of less than a score of years, was one of brilliant achievement. The work of his riper years was confined to the States and Brazil, yet he was a Canadian by birth and education. Born at Fredericton, N.B., he was graduated from Acadia College in 1860, and pursued a course under Prof. Agassiz at Cambridge, Mass., extending over four years. He accompanied Agassiz in his expedition to Brazil; and after he was appointed to the chair of geology in Cornell University, he made several journeys thither accompanied by some of his students. The results were embodied in a comprehensive work entitled "The Geology and Physical Geography of Brazil," published in 1870. He was afterwards appointed Chief of the Geological Commission, to make a survey of the vast empire of Brazil. With a corps of talented assistants he pursued this work in the face of great difficulties until he fell a victim to yellow fever, in 1878, at Rio Janeiro.

Hartt found time amid the absorbing labors of the Commission to study the language and traditions of the early Indians of Brazil, and had prepared a grammar and dictionary of their language. His genius, coupled with an extraordinary aptitude for linguistic studies, would have made him one of the foremost ethnologists of the age; and there is little doubt that inclination and sympathy had long been leading him to this broader and more fascinating field of research.

7.—"Studies on Cambrian Faunas, No. 3. The Upper Cambrian Fauna of Mount Stephen, B.C. The Trilobites and Worms." By G. F. Matthew, D.Sc, LL.D.

This paper deals with the fauna of Mt. Stephen, British Columbia, Canada, which fauna is remarkable for the excellent preservation of the organic remains composing it. The author is able to correlate its genera more closely with European forms than has hitherto been done, and

comes to the conclusion that the fauna is Upper Cambrian.

Some new genera and species are described, and others already described are more fully shown.

An attempt is made to rate the chronological standing of the fauna, by considering the relative length of the thorax and pygidium of the several genera contained in it. The presence of Ogygia gives it an Ordovician aspect, but many of the genera are related to those of the Upper Cambrian, and some to rare genera of the Upper Paradoxides beds of Sweden. Several plates of figures accompany the article.

8.—"Studies on Cambrian Faunas, No. 4. Fragments of the Cambrian Faunas of Newfoundland." By the same author.

In this article are reviewed several species already published by other authors, and some new species of the Cambrian terrane in Newfoundland are described.

The species referred to in this article range from the Protolenus to the Dictyonema fauna. A Raphistoma is found in the Upper Cambrian. A number of genera of the Protolenus fauna are found beneath the Paradoxides beds of this island, showing that that fauna is present. A genus of the Sardinian Cambrian, Metadoxides, not heretofore found in America, is recognized; and one species described in the Bulletin of the Natural History Society of New Brunswick is given with further details of structure.

Several plates of figures accompany this article.

9.—"The Etcheminian Fauna of Smith Sound, Newfoundland." By the same author.

This article gives the result of the author's visit to Newfoundland in the summer of 1898, for the purpose of comparing the Etcheminian system of that colony with that of New Brunswick in Canada.

The first part of the article is given to a description of the stratigraphical and lithological conditions of the sedi-

ments that contain this fauna. These were found similar in most respects to those of the New Brunswick sediments of this age. A surprising similarity can be observed in the deposits of this age for a long distance along the Atlantic border.

The fauna consists chiefly of species of the family Hyolithidæ, mostly of the genera Hyolithes and Orthotheca; the latter showing the greater variety of species, the former the larger forms. Next in importance come the conical gasteropods. The spiral gasteropods and the lamellibranchs are each represented by minute species. One species of Aptychopsis represents the Crustaceans, there being no trilobites in the fauna, so far as the collections show.

The zoological position of the Hyolithidæ is discussed in this paper and the conclusion reached that they should be classed with the Tubicolous Worms.

The new and the characteristic species of the fauna are figured.

10.—"Notes on Some Additions to the Molluscan Fauna of the Pacific Coast of Canada." By Geo. W. Taylor, of Nanaimo, B.C.

Notes on forty species of Marine Mollusca added to the list since the publication of the "Preliminary Catalogue," in 1895; also some corrections in the nomenclature employed in that catalogue, and additional information as to the distribution, &c., of many of the species. The paper was not ready for last year's transactions.

11.—"L'Antiquité de la Terre et de l'Homme." By C. Baillargé, M.A., C.E.

12.—"On the Origin of the Silvery Appearance in the Integument of Fishes." By Prof. E. E. Prince, Commissioner of Fisheries. Communicated by R. W. Ells, LL.D.

13.—"Some Chitinous Elements in the Larval Skeleton of Fishes which appear to be Primitive." By the same author. Communicated by R. W. Ells, LL.D.

Proceedings of the Natural History Society.

Session 1897–98.

Montreal, Oct. 25th, 1897.

The first monthly meeting of the Society for the Session of 1897–98 was held in the Library this evening at eight o'clock. Edgar Judge acted as Chairman. There were also present Dr. Fr. D. Adams, the President; Major Latour, J. B. Williams, Rev. Robt. Campbell, D.D., E. T. Chambers, Albt. Holden, A. F. Winn, Hon. J. K. Ward, J. Stevenson Brown, Geo. Sumner, Mrs. A. F. Gault, Miss Jessie Brown, and a number of other ladies.

Minutes of meeting of April 26th last were read and approved.

The Report of Council (October 18th) was read. On motion of Edgar Judge, seconded by Major Latour, it was received and adopted.

The Hon. Curator's report was also read, together with his very full report to the Council, which reported work done in the Museum from June till September of the present year. On motion the report was adopted.

E. T. Chambers, the Hon. Librarian, presented the report of the Library Committee, which, on motion of Edgar Judge, seconded by J. B. Williams, was received.

On motion, the following were elected as members of the Society:—

Mrs. H. H. Austin as Associate member.

Mrs. C. E. E. Ussher as an ordinary member.

The Hon. Curator, J. C. Williams, read a long list of donations to the Museum since May last. On motion of J. Stevenson Brown, seconded by E. T. Chambers, the acceptance and thanks of the Society were tendered to the various donors The list is on file with the reports.

The President, Frank D. Adams, Ph.D., F.R.S.C., then delivered his special communication on "Some Recent

Discoveries Concerning the Older Rocks of Canada," which was listened to with very great interest. On motion of Rev. Robt. Campbell, D.D., seconded by Edgar Judge, a very hearty vote of thanks was tendered to Dr. Adams for his very excellent lecture, and unanimously carried.

The Recording Secretary being absent, Mr. F. W. Richards acted as Secretary.

MONTREAL, Nov. 29th, 1897.

The second monthly meeting of the Society was held this evening at eight o'clock, the President, Dr. F. D. Adams, in the chair. There were also present J. Stevenson Brown, J. A. U. Beaudry, A. F. Winn, Prof. Cox, Albert Holden, F. W. Richards, E. T. Chambers, Miss Derick, Capt. W. Ross, H. McLaren, Dr. C. W. Wilson, Harold B. Cushing, B.A., and seventeen others, among whom were Mrs. Cox, Mrs. Dr. Blackader and Mrs. Cowans.

The minutes of previous meeting were read and confirmed.

The resignation of Mr. John S. Shearer as First Vice-President of this Society was read.

It was then resolved, on motion of J. Stevenson Brown, seconded by Albert Holden, "That in view of the statements made by those who have interviewed Mr. Shearer with the object to have him withdraw his resignation as 1st Vice-President of the Natural History Society, in which they had not been successful, the Society is now obliged, with much regret, to record the resignation of Mr. Shearer as 1st Vice-President."

The following resolution was then put to the meeting and unanimously carried :—

Moved by J. Stevenson Brown, seconded by Chas. S. J. Phillips,

"That in recording the resignation of Mr. John S.

Shearer as 1st Vice-President of the Natural History Society, the Society wishes to place on record its deep regret that he is unable to continue longer an active worker in the administration of its affairs, and at the same time takes this opportunity to express its high appreciation of the many valuable services rendered by Mr. Shearer and to testify of his untiring energy and zeal for the welfare of the Society, extending over a period of nearly 30 years.

And furthermore the Society feeling assured of Mr. Shearer's loyalty to its best interests, hopes and trusts that he will continue to advance its interests from time to time as occasion may arise.

"And further that it is the instructions of this Society that a copy of this resolution be sent to Mr. Shearer."

DONATIONS.—The following additions have been made since last meeting:—Eleven eggs of Canadian birds, presented by Master R. Allan Phillips; a Horned Lizard, Centipede, Tarantula and Tarantula Fly by purchase; a Jewish Phylactery, by Alfred Griffin; a piece of Mexican Pottery, donor, E. D. Wintle; two images of Pottery from the Astec City of Caletipec, donor, D. A. Ansell; two Meadow Browns (Chinonobras Jutta), one of the rarest butterflies in Canada, donor, A. F. Winn.

It was resolved that the thanks of the Society be tendered to the different donors.

Professor McBride, Professor of Zoology in McGill University, then gave his communication on "Studies in Development," which was listened to with intense interest and delight.

After questions and remarks by Prof. Cox and other members, the thanks of the meeting were, on resolution, tendered to Prof. McBride.

The meeting then adjourned.

MONTREAL, Jan. 31st, 1898.

The third monthly meeting of the Society was held in the Library this evening at the usual hour. Rev. Robert Campbell, one of the Vice-Presidents, occupied the chair. There were also present A. F. Winn, J. B. Williams, H. B. Cushing, Capt. W. Ross, James Gardner, Rev. G. Colborne Heine, Prof. J. T. Donald, Miss Radford, Miss Ethel Radford, and the Recording Secretary.

The minutes of the last meeting were read and confirmed.

DONATIONS.—The following were given as additions to the Museum and Library:—1 live Muskrat, by Dr. J. A. Springle; 1 White-footed Mouse, by A. Joyce; 1 Hippopotamus Tusk, by Dr. J. A. Springle in exchange; 1 Emu's Egg, by Mrs. J. A. Springle; 2 Swimming Crabs, by J. B. Williams; 4 Eggs, long-billed Marsh Wren, by C. N. Sonné; 1 Egg of Crested Flycatcher, by D. N. Stewart; "Comstock's Manual," by Entomological Society.

It was moved by J. B. Williams, seconded by James Gardner, that the thanks of the Society be tendered to the donors for the above contributions. Carried.

The suspension of the rules was moved by James Gardner, seconded by A. F. Winn, and the following gentlemen were then balloted for as an ordinary and Associate member respectively: Hugh Watson and C. N. Sonne.

Dr. Campbell having vacated the chair, Mr. James Gardiner, at his request, presided, while Dr. Campbell and H. B. Cushing, B.A., gave their very excellent communication on the "Reeds, Grasses and Sedges of the Island of Montreal," with specimens of over 170 varieties. The paper was listened to with great interest, and at the conclusion a hearty vote of thanks was tendered these gentlemen, being moved by J. B. Williams, seconded by A. F. Winn.

Notice of motion, by A. Holden, *re* change of night for Council meeting, was referred back to Council to act as they think best.

There being nothing further before the Council, the meeting adjourned.

MONTREAL, Feb. 28th, 1898.

The fourth monthly meeting of the Society was held this evening at the usual hour, Geo. Sumner, Vice-President, in the chair. There were also present E. T. Chambers, H. McLaren, A. Holden, J. B. Williams, C. T. Williams, Dr. Wilson and J. A. U. Beaudry and others.

In the absence of the Secretary, Mr. J. A. U. Beaudry consented to take the minutes.

The minutes of last meeting were read and confirmed.

The following addition was made to the Museum:—One Snowy Owl (adult male) from Manitoba, received in exchange from G. E. Atkinson.

The notice of motion of Mr. A. Holden, *re* changing of night for holding Council meetings was then discussed at some length, and, having been duly seconded by E. T. Chambers, was carried unanimously.

Mr. A. B. Macfarlane was proposed as an ordinary member by A. F. Winn, seconded by J. B. Williams; the rules of the Society being suspended, Mr. Macfarlane was duly elected.

Mr. J. B. Williams, F.Z.S., then gave a very interesting paper on "Canadian Reptiles," which was evidently very much enjoyed.

A vote of thanks having been proposed by E. T. Chambers, seconded by H. McLaren, and carried unanimously, the meeting then adjourned.

MONTREAL, March 28th, 1898.

The fifth monthly meeting of the Society was held this evening at 8.20.

The President, Dr. F. D. Adams, in the chair. There were also present; A. F. Winn, J. A. U. Beaudry, J. S. Brown, Geo. Sumner, C. T. Williams, Rev. R. Campbell, E. T. Chambers, F. W. Richards, and others.

In the absence of the Secretary, Mr. A. Holden acted as same.

The minutes of last meeting were read and confirmed.

The following addition to the Library was reported by the Librarian: Report of the Maryland Geological Survey.

The following additions to the Museum were reported by J. B. Williams: 1 Musk Rat (alive), Dr. J. A. Springle; 1 Meadow Mouse (alive), Henry Jackson; 140 North American Butterflies and moths, T. Dwight Brainerd; 30 Canadian Butterflies and Moths, A. F. Winn; 2 European Butterflies, J. B. Williams; 12 Canadian Birds, in exchange, J. Manghan, Jr., Toronto.

A vote of thanks was duly passed to the above donors.

Moved by Geo. Sumner, seconded by J. A. U. Beaudry, that the thanks of the Society be tendered to the Lecturers of the Saturday Afternoon Lectures to young people. Carried.

Moved by Geo. Sumner, seconded by A. F. Winn, that the rules be suspended and Mr. J. B. Picken be elected a member. Carried.

Mr. A. F. Winn read a very interesting paper, "A Trip to the Gomin Swamps:" also exhibited many butterflies captured in the vicinity.

Mr. C. T. Williams read his paper, "Through a Pocket Lens," which he illustrated with many beautiful and interesting objects with the lime light lantern.

J. Stevenson Brown, seconded by F. W. Richards, moved a very cordial vote of thanks to Mr. A. F. Winn and Mr. C. T. Williams for their very interesting papers. Carried.

MONTREAL, May 30th, 1898.

The annual meeting of the Society was held this even-

ing in the large hall. The President: Prof. Frank D. Adams in the chair. There was also present J. H. Joseph, A. Holden, Wm. Ross, J. A. U. Beaudry, J. B. Williams, Rev. Dr. Campbell, J. Stevenson Brown, F. W. Richard, E. T. Chambers, H. McLaren, R. W. McLachlan, Hon. J. K. Ward, Walter Drake, Judge Wurtele and Chas. S. J. Phillips.

The minutes of the last annual meeting were read and confirmed. Donations to the Museum :—

The following donations have been received since last meeting :—1 young Alligator, sent by W. Whitaker; 1 young Garter Snake from Rigaud Mountain, donor, J. B. Williams; 2 Brown Snakes, 1 Red Bellied Snake, C. S. Lemesurier; 6 Brown Snakes, 3 Red Bellied Snakes, and 2 Grass Snakes, donated by T. Lomer; 2 samples of Magnetic Iron Sand from the Moisei River, donor J. R. Miller; 1 Menobranchus or Mud Puppy, given by Dr. J. A. Springle, also by the same gentleman the following, all from the South Pacific :—12 Crabs, 2 Prawns, 1 Shrimp, 1 Fishy Louse, 2 Centipedes, 3 Starfish, 2 Brittle Stars, 2 Sea-Urchins, 2 Sea-Cucumbers, 4 Sea-Slugs, 1 Sea-Horse, 3 Midibranchus.

The following Annual Reports were read and are now on fyle :—

Chairman of Council.

Treasurer, showing bal. in hand of $49.57.

House Committee, Curators.

Librarian. No report from Editing Committee.

PRESIDENT'S REMARKS.

The President then made his annual address in which he made an apology for the small amount of time given to the Society, owing to his labors in the College and other Societies that made their demands upon his time, but was glad to say that the Rev. Dr. Campbell did the work, and everything had gone forward satisfactorily.

The papers at the monthly meetings had been good, especially those of Prof. McBride, Dr. Campbell, and Dr. Cushing.

The Somerville Course of Lectures were exceptionally good and had been well attended, as were also the Saturday afternoon talks to the young people. The President made mention also of the very excellent lectures on the Wild Flowers of the Rocky Mountains, delivered to a large and delighted audience in the High School Hall during the winter. Reference was also made to the "Record of Science" and the amount of time taken in the editing of it, also that the last number closed a volume and that it should be kept up sharply and promptly.

It was then moved by Dr. Campbell and seconded by J. H. Joseph, that the above reports be received and adopted and be published in the "Record of Science." Carried.

The election of officers for the ensuing year was then proceeded with.

Sir J. Wm. Dawson was by acclamation elected Hon. President.

For President, Frank D. Adams, Ph.D., F.R.S.C. Moved by Judge Wurtele and seconded by J. Stevenson Brown, that the Recording Secretary be instructed to cast the ballot. Carried.

Prof. Adams elected.

The following Scrutineers were appointed by the Chair, F. W. Richards and Albert Holden.

On vote the following were elected as Vice-Presidents:—

Rev. Dr. Campbell, Lord Strathcona, Judge Wurtele, Dr. Wesley Mills, J. H. Joseph, Walter Drake, Hon. J. K. Ward, Dr. Harrington and Geo. Sumner.

On motion of Judge Wurtele, seconded by Walter Drake, it was instructed that the ballot be cast by the Scrutineers for C. S. J. Phillips as Recording Secretary. Elected.

On a similar motion Dr. W. E. Deeks was elected Corresponding Secretary.

It was moved by J. Stevenson Brown, and seconded by Judge Wurtele, that Mr. J. B. Williams be appointed Hon. Curator. Carried.

It was moved by Rev. Dr. Campbell and seconded by Judge Wurtele, that Mr. F. W. Richards be appointed Hon. Treasurer. Carried unanimously.

On motion the following were nominated and elected as Members of Council. Albert Holden, G. P., Girdwood, M. D., C. T. Williams, Prof. McBride, A. F. Winn, Rev. E. I. Rexford, J. A. U. Beaudry, Alex. Brodie, H. McLaren.

On motion of J. Stevenson Brown, seconded by J. B. Williams, Mr. E. T. Chambers was elected Librarian.

On motion the following were appointed, Editing and Exchange Committee.

Alex. Brodie, B.A. Sc., Chairman, G. F. Matthew, St. John, N. B., Rev. Robt. Campbell, M.A., D.D., J. F. Whiteaves, Ottawa, Ont., N. N. Evans, M.A. Sc., Prof. Goodwin, Carrie M. Derick, M.A., Frank D. Adams, Ph.D., F. R. S. C., O. E. Leroy, B.A.

There being no further business the meeting adjourned.

REPORT OF THE CHAIRMAN OF COUNCIL FOR THE YEAR ENDING MAY 30TH, 1898.

The Chairman of the Council begs to report that nine meetings of the Council, for the transaction of the Society's business, have been held during the year.

There have been seven meetings of the Society for the reading and discussion of papers.

The titles of the papers have been as follows:

Oct. 25. "Some recent discoveries concerning the older Rocks of Canada," by Frank D. Adams, Ph. D.

Nov. 29. "Studies in Development," by Prof. W. McBride.

Jan. 31. "Reeds, grasses and sedges of the Island of Montreal," by Rev. Robt. Campbell, D.D., and H. B. Cushing.

Feb. 28. "Canadian Reptiles," by J. B. Williams, F.Z.S.

Mar. 28. "A trip to the Gomin Swamp," by A. F. Winn, and "Through a Pocket Lens," by C. T. Williams.

April 21. "The Corundum Deposits of Shooting Creek, North Carolina," by A. McKenzie and Prof. J. T. Donald.

The Annual Field Day last year took place on June 5th, when the members and their friends visited the River Rouge, where they were hospitably entertained by the Hon. J. K. Ward.

The weather was all that could be desired, and the outing proved, altogether, a very enjoyable one.

The Somerville Lectures for the present year provided an interesting, and varied series of topics. They were given on the Thursday evenings from February 24th to April 7th. The attendance was very good; on several occasions the hall and adjoining rooms were quite crowded.

The Museum was, as usual, open to the public for an hour before the commencement of each lecture, and a considerable number visited it on these evenings.

The lectures were as follows:

"Butterflies," by Prof. Fletcher, F.R.S.C.

"Bees," by Percy Selwyn.

"Curious Protective Features in Animals." by Prof. Prince, B.A.

"The Marine Mammals of Canada," by Prof. Robert Bell, LL.D.

"The Modern Steamship," by Prof. A. J. Durley, B.Sc.

"Precious Metals," by Prof. Frank D. Adams, Ph.D.

"Coal and Iron," by Osmond E. LeRoy, B.A.

The Saturday Half-hour Lectures to Young People proved very attractive, and several times the attendance was so large that the doors had to be closed soon after the lecture began.

The lectures were as follows:

Feb. 12. "Dick's Dive in a Duck Pond," by C. T. Williams.

Feb. 19. "Life among the Esquimaux," by A. W. Buckland.

Feb. 26. "Frogs and Snakes," by J. A. Williams, F.Z.S.

Mar. 5. "Humanity to Animals," by Rowley James.

" 12. "Fossils," by E. T. Chambers.

" 19. "Volcanoes," by T. Denis.

" 26. "The Ferns of Montreal," by Rev. Robert Campbell, D.D.

The attendance at the Museum has increased considerably during the year. On the pay days the total admissions have been 429, nearly a hundred more than last year; on Saturdays, the free day, the attendance has varied from about 50 to 150, though it was much larger on the Saturday-Lecture afternoons. Since the beginning of this year the Museum has also been open free on Wednesday afternoons, and the number of visitors is increasing very much on that day. Altogether there must have been about 4,000 visitors to the Museum during the past year.

The "Canadian Record of Science" has been issued, as usual, though we have failed to obtain a renewal of the grant from the Quebec Government, which in former days used to defray the cost of publication.

An appeal has been issued to members and friends asking for financial aid. The sum of about $10,000 is required as an endowment fund to replace the loss of the Government grant.

It is impossible to provide for the publication of the "Record of Science," the care and maintenance of the Library and Museum, and the annual courses of public Lectures, without some such addition to our income.

In each of these departments the Society is doing useful and valuable work, and it would be a great pity for any of it to be curtailed or abolished for lack of means to properly carry it on.

Eight new members have been added this year, and we have lost four by death, viz.: H. Lyman, one of our oldest Life Members, Robert Mitchell, R. R. Grindley, and W. Kennedy.

The number of members, at present, is only about 170; this includes the life, ordinary, and associate members.

Respectfully submitted,

J. Stevenson Brown,
Chairman of Council.

Museum Report for 1897–98.

During the past year I have to report that our collection of Hummingbirds has been named and labelled, and this has completed the renaming of our entire bird collection.

The Birds' Eggs have been cleaned and re-arranged, and quite a number of additional specimens have been named and placed on exhibition, so that these cases of eggs form quite an attractive feature of the Museum.

Mr. Winn has re-arranged several drawers in the insect cabinet, and both he and Mr. Brainerd have made valuable additions to our collection of Canadian Lepidoptera.

The two cases of Lepidoptera on the Landing have also been cleaned and labelled. We hope to exhibit in the Museum this summer live specimens of the larva of some of our large Moths and Butterflies, so that visitors may see them in the various stages of their developement.

The collection of Crabs, Lobsters and other Crustacea has been re-arranged in the gallery cases and the different families grouped together and labelled, and the Corals, Sponges and other low forms of life have also been cleaned and re-arranged and placed all together in the gallery cases.

The Fish Collection has been re-arranged and a large

part of the specimens have been cleaned, named and labelled, according to recent classifications.

The Esquimaux tools and relics have all been re-arranged, cleaned, and labelled.

The Roman Antiquities from Pompeii have been cleaned and re-arranged in a more conspicuous position than they had previously occupied.

The collection of Indian pipes, stone weapons, etc., has been cleaned and re-arranged, and the relics from Hochelaga, which have a special local interest, have been placed in a case by themselves.

The Botanical specimens which were scattered in various places have been grouped together in cases near to the Botanical Cabinet, and our collection of Montreal Ferns, which, by Dr. Campbell's generosity, has been made nearly a complete series, was arranged, and placed on view for several months in one of the Mineral cases.

If we had some proper cases for this purpose, different groups from the Botanical Cabinet might be placed, alternately, on exhibition; and such a series would do something towards informing and interesting visitors in the riches and peculiarities of our local flora.

Part of the Society's collection of Coins which has hitherto been stored away, has been cleaned, arranged, labelled and placed on exhibition in one of the Mineral cases in the gallery.

The Roman, Italian, English, and Canadian are the series thus exhibited.

We have, besides, a number of French American, East Indian, Turkish, Chinese, Grecian, Russian, German, Danish, Norwegian, and Belgian coins.

The whole, if exhibited, would form a very interesting collection, and would require some new cases for their proper display. Though they cannot be classed, either as Botany or Zoology they illustrate the natural history of man, and form, as it were, the fossils of human civilisation.

Complete lists of additions and donations to the Museum have been given at our Monthly Meetings, and need not, therefore, be repeated here in detail. We have received twenty-five additional specimens of Canadian Birds in exchange for some of our duplicate specimens, and shall be able to make further additions in this way in the near future.

I have just commenced cleaning and re-arranging the Shells, of which we have about 4,000 specimens. It is several years since anything has been done to them, and dust and disorder have to some extent marred their beauty.

If, however, they are put into good order, and have *English names* placed upon the different groups, the collection will be much improved in appearance, and they will become interesting and intelligible to the ordinary as well as to the scientific visitor.

For, at present, the name (Meleagrina radiata) conveys to very few the fact that they are looking at a Pearl Oyster; the name (Archatina perdix), does not vividly impress on the mind that this is the shell of one of the largest Land Snails in the world; and our specimens of the beautiful Pearly Nautilus are not labelled at all, so that visitors pass them without paying any homage to this queen of all the Sea-Shells, and are hardly aware that they are looking at the only surviving representatives of one of the most ancient and highly distinguished families of the Mollusca.

Respectfully submitted,

J. B. WILLIAMS,
Curator.

NATURAL HISTORY SOCIETY OF MONTREAL,

IN ACCOUNT WITH

F. W. RICHARDS, *Treasurer*,

RECEIPTS AND EXPENDITURE FROM JUNE 1ST, 1897, TO MAY 27TH, 1898.

Dr.

To Balance cash on hand, June 1st, 1897	$ 39 16
" Rents	778 50
" Members' Subscriptions	479 00
" Donations	565 00
" Loan, Merchants Bank	398 36
" Entrance fees to Museum	32 75
" Interest as per bank book	85
" Surplus Field Day, 1897	67
	$2302 09

Cr.

By Superintendent's Salary and Commission	$482 50
" "Record of Science"	436 78
" Museum account	283 68
" Lecture "	149 82
" Sundry Expense "	143 69
" Fuel "	139 63
" Lighting "	133 53
" Repairs and Renovations "	126 99
" Printing "	71 94
" City Water Tax "	33 95
" Merchants Bank account loan	250 00
" Cash on hand	49 57
	$2302 09

Audited and found correct,

C. T. WILLIAMS,
A. HOLDEN,
Auditors.

F. W. RICHARDS, *Treasurer.*

MONTREAL, May 27th, 1898.

REPORT OF THE LIBRARY COMMITTEE.

The Librarian has little to report for the work of the past year. The Library Committee has not been called together as there was no business they could do. No funds being available either for binding or for adding to

the shelf-room; the shelves being so crowded that work in the improvement of the library is at a standstill.

The usual exchanges have been received, entered and acknowledged. I have also to report the receipt of "Comstock's Manual of the Study of Insects," presented to the Society by the Montreal Branch of the Canadian Entomological Society. This is a very useful work and a valuable addition to the library as we have but few modern works on that branch of Science. Another valuable gift to the library is "Lydekker's Royal Natural History," in six volumes, generously purchased and presented to the library by a few of the members.

In consideration of the large number of valuable works still unarranged, it is hoped that the Society will soon be in a position to assign a sufficient sum to enable the Committee to complete the work of arrangement and cataloguing, which has been so long in hand.

E. T. CHAMBERS,
Hon. Librarian.

May 30th, 1898.

FIELD DAY TO MONTFORT.

The annual field day of the Natural History Society of Montreal is an event which is pleasurably anticipated by the members of the Society and their friends, and which seems to be growing more and more popular an excursion with the public generally as the years pass on. At least, so one would judge from the crowds that were present on Saturday morning at the Windsor street Station, all on pleasure intent, whether it consisted in fishing, exploring, or the collection of specimens. So large, indeed, was the number of the excursionists, that it was found necessary to add another car to the train, making six cars in all,

which at 8.30 pulled out, each car being well filled with people.

The organizers of the excursion, in selecting Montfort as the place for the field day, no doubt had in mind the idea that a picturesque railway journey would be appreciated, nor were they wrong in so judging. Montfort is hidden far away amid the Laurentian Mountains, or perhaps it would be better to say "was," as the Montfort & Gatineau Colonization Railway, has brought it within a few hours' journey of this city. The village is some thirteen miles from the junction of the above-mentioned road with the C.P.R., and is situated on Lake St. Francois-Xavier, a small body of water pent in by lofty fir-clad hills.

Although the railway had begun to rise soon after St. Jerome had been left, it was on leaving Montfort Junction that the real climbing commenced. The railway is comparatively new. The grades are very steep, and it was at first a matter of doubt to the officials of the line whether such a heavy train could be taken up to Montfort at all. However, with the aid of two locomotives, one being of the old picturesque wood-burning type, the train proceeded, and for the whole of the distance to Montfort the car windows on each side presented a panorama of as magnificent scenery as anyone could wish to see. There were some of the party who, deeming it too tame to admire the surroundings from the windows, preferred to stand on the steps of the platforms, and really, in the pure, fresh mountain air, it seemed preferable to do so to staying in the cars. Up, up, went the train, ever upward, winding round tortuous curves, passing over high embankments, plunging into deep and narrow valleys, between lofty hills, running through dense woods where the tree branches almost touched the car-windows, till at length the train stopped opposite the Montfort Industrial School, about half a mile from the Montfort station, where the

boys of the institution greeted the excursionists with loud cheers. The Rev. Father Bouchet, who is in charge of the school, came up and addressing Professor Wesley Mills, M.D., the president of the Natural History Society, welcomed him and the officers and members of the Society to Montfort. A number of the boys came forward and sang a pretty chanson, after which, Dr. Wesley Mills and the officers of the society having thanked the rev. father for his kind greeting, the train continued its way to Montfort, which was reached in a few minutes.

Having arrived, the members of the party immediately scattered, each on his own or her particular pleasure bent. There was no system of separate sections for natural history and other work upon this occasion, every one who chose being left to collect specimens independently. The results were, on the whole, very gratifying, several persons returning to the cars well loaded with specimens. For the first forty minutes after arrival the members of the party engaged themselves in attending to the wants of the inner man, some going to the hotel for that purpose, while others preferred to take their lunch baskets and refresh themselves while enjoying the shade of the woods that stretched down to the lakeside. There was an abundance to see and to admire, and, indeed, it was as great a pleasure as any to rest one's self and drink in the beauties of the scene around and to reflect that what one saw was only one very small corner of the Province of Quebec. Owing to the length of time taken up with the railway journey going and returning, the stay was necessarily a brief one, but during what time there was, about five hours, all managed to enjoy themselves. Entomologists, botanists and geologists were hard at it, and there was a plentiful field for their operations. Others went on board the train and journeyed a few miles further, to the terminus of the line, for the purpose of viewing more of the beautiful scenery. Enthusiastic

anglers were also at work on the lakeside but if truth must be told, with very little success, for, from some reason or other, the fish, and there were many in the lake, refused to bite. Had there been time, there is no doubt that some members of the party would have climbed the hills on either side of the lake, but neither was climbing nor, indeed, walking in the woods, found to be an easy matter, for nature has been left to herself in these districts, and the woods have not been spoilt by the hand of man.

Towards five o'clock a move was made for the cars, and a few minutes after that hour the return journey commenced.

The run was this time down hill to the junction with the Canadian Pacific Railway, and was of a quite exciting character.

By the kindness of Sir William Van Horne refreshments were served on board the train, which were much appreciated, and which helped to pass the time.

Montreal was reached at 8.20 p.m., every one agreeing that the field day had been both most enjoyable and successful. While en route it was announced that the following prizes had been won for collections :—

Botany (unnamed specimens), Sidney Lyman and Fred Brown, equal, first, and Miss E. G. Watson, second; entomology, H. N. Cowan, first, and E. Norris, second; geology, (unnamed specimens), H. Cone first. The judges in the sections were: Botany, the Misses Van Horne; entomology, Messrs. H. H. Lyman and A. F. Winn; geology, Mr. E. T. Chambers.

Book Notices.

Elementary Botany.—By George F. Atkinson, Ph.B., Professor of Botany, Cornell University. 444 pages; illustrated. Publishers, Holt & Co., New York.

The "elementary botany" of to-day is vastly different from the elementary botany of ten or fifteen years ago. This is largely due to the changed method of presenting to the student the rudiments of botany. The old method introduced the pupil to the technicalities of systematic botany by way of the arbitrary rulings of the manual. If he enjoyed puzzles of that kind, he specialized in botany and the natural sciences, and eventually obtained his reward by seeing relationships in a broad and comprehensive way, but if these analogies had been first observed, it is probable that the "analysis" of the flower would not have appeared so tiresome. This work, presented to the public generally, but to teachers particularly, marks an important step in the new direction. This newer method is, in the words of the author, "to study first some of the life processes of plants, especially those which illustrate the fundamental principles of nutrition, assimilation, growth and irritability. In studying each one of these topics plants are chosen so far as possible from several of the great groups. Numbers of the lower as well as of the higher plants are employed in order to show that the process is fundamentally the same in all plants. . . . In this way, the mind is centred on this process and the discovery to the pupil that it is fundamentally the same in such widely different plants arouses a keen interest not only in the plants themselves, but in the method which attends the discovery of this general principle."

This volume is divided into three parts, Part I. being devoted to the life processes of the plant, absorption, transpiration, respiration, nutrition and the like. Part II. discusses the morphology of the plant and the relationships of different families. Part III., perhaps the most interesting section of the book, is devoted to ecology or the study of plants in their mutual and environmental relationships. The author fitly points out that by a study of the life histories of plants, their habits of behavior under different conditions of environment, we shall broaden our concept of nature and cultivate our æsthetic, observational and reasoning faculties. How much more important this is to the student than to be possessed of a few stray and disconnected facts of natural history! Ecology means study in the field, and is the kind of valuable nature-study-work so heartily and ably encouraged and fostered by the Natural History Society of Montreal and the Field Naturalists' Club of Ottawa. Atkinson's Elementary Botany will be of great value to High School teachers and to teachers in

Collegiate Institutes. It inspires the student by presenting the attractive features first, and trains his mind in logical methods of induction, which, as the author observes, is of vast importance in its influence upon the character of the pupil.

The book is well printed, beautifully illustrated, and substantially bound.

JOHN CRAIG.

ABSTRACT FOR THE MONTH OF JULY, 1898.

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

DAY	THERMOMETER.				BAROMETER.				†Mean pressure of vapor.	‡Mean relative humidity.	Dew Point.	WIND.		SKY CLOUDED IN TENTHS.			Per cent. possible Sunshine.	Rainfall in inches.	Snowfall in inches.	Rain and snow melted.	DAY.
	Mean.	Max.	Min.	Range.	Mean.	§Max.	§Min.	Range.				General direction.	Mean velocity in miles per hour	Mean.	Max.	Min.					
1	69.80	78.0	63.6	14.4	30.0392	30.162	29.876	.286	.4912	67.8	43.8	N.	14.54	3.3	7	0	80	....	....	.....	1
2	73.00	81.8	59.5	22.3	30.0468	30.177	29.887	.290	.6000	73 0	63.8	S.E.	12.33	2.5	8	0	79	....	....	....	2
SUNDAY.....3	.....	90.4	73.5	16.9	.....	.....	.....	....	.....	....	....	S.	21.87	....	..	..	92	0.03	....	0 03	3.....SUNDAY
4	69.63	77.1	58.5	18.6	29.8987	30 067	29 808	.259	.5397	72 8	60.2	N.W.	12.33	8.3	10	2	50	....	....	....	4
5	57.87	66.4	48.8	17.6	30.2210	30.267	30.067	.200	.3020	62 5	45.0	N W.	10.29	0.0	0	0	99	....	....	....	5
6	63.88	73.8	50.3	23.5	30.2017	30.18(	30.118	.163	.3757	64 7	50.8	S.W.	8.08	0.3	2	0	93	....	....	....	6
7	73.75	83.6	61.0	22.6	30.0080	30.118	29.881	.237	.5052	60 5	59.2	S W.	16.71	0 3	2	0	100	....	....		7
8	71.48	80.7	67.0	13.7	29.7362	29 881	29.629	.252	.6175	80.8	64.7	S.W.	18.25	4.2	10	1	57	0.12	....	0.12	8
9	64.02	70.8	54.6	16.2	29.6802	29.822	29 601	.221	.4258	70 5	53.5	S. W.	14.00	4.0	10	0	63	0.12	....	0.12	9
SUNDAY.....10	.....	62.6	48.8	13 8	.....	.....	.....	.....	.....	....	....	W.	12 54	....	..	..	87	....	....	....	10.....SUNDAY
11	56.57	64.8	48.0	16.8	30.2350	30 360	30.091	.269	.2925	64.0	44 2	S.	11.00	3.5	10	0	95	....	....	....	11
12	63.58	71.4	50.5	20.9	30.4277	30 469	30.360	.109	.4072	69 2	53.3	S.	6.92	0.8	3	0	100	....	....	...	12
13	66.38	75.8	55.3	20.5	30.3043	30.403	30 214	.189	.5080	78.8	59.2	S.E.	6.44	3.5	10	0	71	.....	....	....	13
14	71.30	80.8	57.7	23.1	30.0230	30.214	29.810	.404	.6327	82.2	65.3	S.	17.92	7.0	10	0	58	0.00	....	0.00	14
15	72.30	79.7	66.0	13.7	29.8503	29 896	29.800	.096	.4938	63 2	54.3	N.W.	17.75	3.3	10	0	95	0.01	....	0.01	15
16	70.93	79.6	63.6	16.0	29 9520	30 003	29.896	.107	.3985	52.8	52.7	N.W.	13 04	1.0	4	0	100	....	....	....	16
SUNDAY.....17	.....	76.4	59.0	17.4	.....	.....	.....	.....	.....	...	....	N.	7 25	....	..	..	8	0 00	....	0 00	17... .....SUNDAY
18	73.05	84.3	64.1	20.2	29 9288	29.990	29 874	.116	.6022	74.8	64.0	S.W.	11.29	8 0	10	3	37	0.09	....	0.09	18
19	77.53	87.8	69.6	18.2	29.8435	29.874	29 786	.088	.7761	82 8	71.7	S.W.	11.67	6.0	10	2	53	0.00	....	0.00	19
20	79.63	89.3	71.0	18.3	29.8237	29.851	29.793	.058	.7827	78 2	72 2	S.W.	11.83	3.8	10	0	92	0.59	....	0.59	20
21	73.30	82.2	65.3	16.9	30 0218	30.161	29.834	327	.5618	68.3	62 0	N.	13.42	1.7	6	0	79	0.12	....	0.12	21
22	67.97	77.7	56.9	20.8	30.2017	30.250	30.161	.089	.4140	61.0	53.5	N.	12.79	0.7	2	0	100	....	....	....	22
23	71.05	80.7	59.7	21.0	30 1307	30.188	30.079	.109	.6158	79.8	64.2	S.	7.42	6.0	10	0	62	0.00	....	0 00	23
SUNDAY..... 24	.....	83.5	66.8	16.7	.....	.....	.....	.....	.....	....	....	N.W.	8.25	...	..	..	85	....	....	....	24.....SUNDAY
25	74.62	86.2	68.2	18.0	29 8897	29 975	29.828	.147	.7023	82.5	68.7	S.	15.17	7.8	10	5	31	1.01	....	1.01	25
26	69.78	77.8	62.1	15.7	29.9215	30.031	29.839	.162	.5283	73 2	60.5	N.	7.83	2.3	10	0	87	....	....	....	26
27	75.70	86.8	63.5	23.3	29.8477	29.921	29.783	.138	.6507	73 7	66.3	S.E.	5.71	1.7	10	0	92	0.02	....	0.02	27
28	79.20	88.8	68.6	20.2	29.7712	29.826	29.726	.100	.7425	75.0	70 2	S.	12.58	1 2	2	0	90	....	....	....	28
29	77.93	86.4	73.2	13.2	29.7487	29 774	29 720	.054	.7312	77.0	70.0	S	12 54	6.0	10	0	53	....	....	....	29
30	71.03	77.2	67.8	9.4	29.8643	29.923	29.773	.150	.5877	77.0	63.5	S.	12.83	8.2	10	4	19	....	....	....	30
SUNDAY.....31	....	77 2	62.9	14.3	.....	.....	.....	.....	.....	....	....	N.	11.17	....	..	..	58	....	....	....	31.....SUNDAY
Means.....	70.58	79.34	61.46	17.88	29.9853	30.0713	29.8936	.1777	.5494	71.77	60 03	S. 39¾° W.	12.14	3.08	6.3	0.6	73.1	2.11	....	2.11	.....Sums.
24 Years means for and including this month.....	68.91	77.41	60.79	16.63	29.8986	.....	.....	.142	.5053	71.46	....	....	s 12.81	5.33	.	..	¶59.36	3 93	....	3 98	24 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	2066	89	116	356	3231	2015	567	590	
Duration in hrs..	172	19	20	40	236	153	47	44	13
Mean velocity..t..	12.01	4.68	5.80	8.90	13 69	13.17	12.06	13.41	

Greatest mileage in one hour was 31, on the 3rd.

Greatest velocity in gusts 48 miles per hour on the 25th.

Resultant mileage, 3,080.
Resultant direction, S. 39¾° W.
Total mileage, 9,080.
Average velocity 12.14 m. p. h.

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

§ Observed.

† Pressure of vapour in inches of mercury.

‡ Humidity relative, saturation being 100.

¶ 17 years only. s 12 years only.

The greatest heat was 90.°4 on the 3rd; the greatest cold was 48.°0 on the 11th, giving a range of temperature of 42.4 degrees.

Warmest day was the 3rd. Coldest day was the 10th. Highest barometer reading was 30.469 on the 12th. Lowest barometer was 29.601 on the 9th, giving a range of 0·868 inches. Maximum relative humidity was 96 on the 25th. Minimum relative humidity was 41 on the 6th.

Rain fell on 13 days.

Aurora was observed on 1 night.

Lunar coronas on 4 nights.

Fog on 2 days. Thunder storms on 2rd, 8th, 18th, 19th, 20th, 23rd and 25th.

ABSTRACT FOR THE MONTH OF AUGUST, 1898.

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 pressure of vapor.	‡Mean relative humidity.	Dew Point.	WIND. General direction.	Mean velocity in miles per hour	SKY CLOUDED IN TENTHS. Mean.	Max.	Min.	Per cent. possible Sunshine.	Rainfall in inches.	Snowfall in inches.	Rain and snow melted.	DAY
1	67.37	74.3	59.4	14.9	29.9793	30.046	29.886	.160	.5825	85.8	62.8	N.	9.04	7 2	10	0	26	0.42	....	0 42	1
2	70.12	77.9	63.1	14.8	30.0042	30.032	29.959	.073	.5713	78.7	62.7	S.	6.92	6.3	10	2	72	0.00	....	0.00	2
3	72.52	81.8	62.4	19.4	29.9240	30 043	29 790	.253	. 363	77 5	65.0	S.E.	9.92	6.7	10	0	26	0.01	....	0.01	3
4	72.82	79.8	67.3	12.5	29.8015	29 837	29.774	.063	.6568	82 3	67.2	S.	14.12	9.0	10	3	14	0.03	....	0.03	4
5	67.97	79.4	61.1	18.3	29.8983	29.926	29.857	.069	.5048	75.2	59.5	S.W.	17.67	7.2	10	3	52	0.03	....	0.03	5
6	69.22	78.5	59.6	18.9	29.8907	29 942	29.858	.084	.4700	67 3	57.2	S W.	19.29	2.7	10	0	96	...	....	.....	6
SUNDAY..... 7	.....	79.8	63.3	16.5	.....	.....	.....	....	.....	....	...	S.E.	13.08	....	..	..	56	...	....	....	7. .....SUNDAY
8	73.68	80.9	68.0	12.9	29 7577	29.778	29.728	.050	.6987	84.5	68.5	S.	15.71	8.8	10	7	25	0.01	....	0.01	8
9	72.33	80.6	66.0	14.6	29.8492	29.925	29.763	.162	.5815	72.5	62.7	N.	12.21	4.3	7	0	81	0.00	....	0.00	9
10	66.50	74.4	59.2	15 2	29.9297	29.952	29.901	.051	.5022	78 0	59.2	N.	7.42	10.0	10	10	06	0.00	....	0 00	10
11	69.58	80.1	57.8	22.3	29.9675	30.003	29.938	.065	.5427	76.5	61.2	S.	9.00	2.5	10	0	80	0.00	....	0.00	11
12	70.22	79.2	62.8	16 4	29.9285	30.001	29 864	.137	.5895	80.5	63.7	S.	14.46	7.3	10	4	60	0.10	...	0.10	12
13	67.53	75.5	62.6	12.9	29.9928	30.137	29.895	.242	.5615	83.5	62.3	S.	15.87	6.3	10	0	47	0.11	....	0.11	13
SUNDAY. 14	....	77.5	59.5	18.0	.....	.....	.....	.....	.....	....	....	S.	8.29	....	..	..	89	....	....	....	14 .....SUNDAY
15	70.05	79.8	57.4	22.4	30.0997	30.223	29.919	.304	.4977	68.7	58.7	S.	9.79	6.7	..	0	67	0.00	....	0.00	15
16	73.23	81.9	66.0	15.9	29.8498	29 900	29.804	.096	.6420	78.3	66.0	S.	17.96	6.0	10	0	42	0.04	....	0.04	16
17	68.62	78.0	62.3	15.7	29 8265	29.919	29.766	.153	.5692	82.2	62.5	S.	12.71	5 5	10	0	43	0.53	....	0.53	17
18	62 12	69.7	55.7	14.0	30.0015	30.050	29.964	.086	.4042	72 7	52 8	N.	8.29	4.3	10	0	64	....	....	....	18
19	59.90	64.9	55.2	9.7	30 0167	30 035	30.000	.035	.2925	76 5	52.3	N.	8.71	6.7	10	0	00	....	....	....	19
20	66.60	74.9	55.2	19.7	29.9748	30.069	29.881	188	.4632	71.7	56.8	S.	12.42	2.0	10	0	87	....	....	..	20
SUNDAY.. 21	....	77.0	62.5	14.5	.....	.....	.....	.....	.....	...	....	S.	14.04	....	..	.	43	0.02	....	0.02	21..... ...SUNDAY
22	70.25	78.8	61.2	17.6	29.7852	29.834	29.742	092	.5793	78.5	63.2	S.	7.46	2.5	10	0	58	....	....	....	22
23	64 25	68.0	61.4	6.6	29.7982	29 863	29.739	.124	.5275	87.5	60.5	N.	7.92	7.8	0	0	0	0 04	....	0.04	23
24	63.68	66.8	60.6	6.2	29.8082	29.838	29.776	.062	.5490	93.0	61.5	N.	7.68	10 0	10	10	0	0.17	....	0 17	24
25	64 77	71.6	60.6	11.0	29.6822	29.760	29 609	.151	.5563	90 2	61.8	N.	9.68	9.7	10	8	5	0.21	....	0.21	25
26	58.75	66.3	55 3	11.0	29.7635	29.848	29.656	.192	.4115	83.2	53.5	S.W.	18.79	7.7	10	0	14	0.02	....	0.02	26
27	60.20	67.0	51.2	15 8	30.0215	30.154	29 890	.264	.3368	65.2	48.2	S.W.	14.42	2.0	6	0	93	....	....	....	27
SUNDAY .. 23	.....	69.8	49.0	20.8	.....	....	.....	.....	.....	....	....	S.	7.54	....	..		84	....	....	....	28.....SUNDAY
29	63.97	73.2	57.3	15.9	29.8730	29.997	29.793	.204	.5395	89.2	60.7	S.	17.88	6 3	10	0	4	0 81	....	0.81	29
30	66.40	71 6	60.8	10.8	29.8982	29.959	29.837	.122	.4902	75.7	58.5	S.W.	12 13	5.2	10	0	69	0.01	....	0.01	30
31	68.95	75.2	63.7	11.5	29.9540	29.997	29 861	.136	.5487	77.7	61.7	S.W.	13.79	3.0	10	3	29	0.00	....	0.00	31
Means..... ...	64 47	75.30	60.24	15.06	29.8991	29 9655	29.8315	.1340	.5298	78.99	60.39	S. 24° W.	12.07	6.21	9 7	1.9	46.2	2.56	....	2.56	....Sums.
24 Years means for and including this month	66.62	74.92	58.65	16.25	29.9373	.....	....	.134	.4821	73.38	....	....	....	5.76		..	¶57.78	3.56	....	3.56	24 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	1911	18	131	148	4429	1561	472	308	
Duration in hrs..	212	2	21	11	331	96	50	16	5
Mean velocity....	9 01	9.00	6.24	13.45	13 38	16.26	9.44	19.25	

Greatest mileage in one hour was 27, on the 5th.

Greatest velocity in gusts 36 miles per hour on the 5th and 31st.

Resultant mileage, 3,825.

Resultant direction, S. 24° W.

Total mileage, 8,978.

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

§ Observed.

† Pressure of vapour in inches of mercury.

‡ Humidity relative, saturation being 100.

¶ 17 years only. *s* 12 years only.

The greatest heat was 81.°9 on the 16th; the greatest cold was 49.°0 on the 28th, giving a range of temperature of 32.9 degrees.

Warmest day was the 8th. Coldest day was the 26th. Highest barometer reading was 30.262 on the 28th. Lowest barometer was 29.609 on the 25th, giving a range of 0·653 inches. Maximum relative humidity was 99 on the 24th. Minimum relative humidity was 43 on the 14th.

Rain fell on 22 days.

Fog on 8 days.

Thunder storms on 5th, 12th, 16th, 17th, and 29th.

ABSTRACT FOR THE MONTH OF SEPTEMBER, 1898.

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 pressure of vapor.	‡Mean relative humidity.	Dew Point.	WIND. General direction.	Mean velocity in miles per hour	SKY CLOUDED IN TENTHS. Mean.	Max.	Min.	Per cent. possible Sunshine.	Rainfall in inches.	Snowfall in inches.	Rain and snow melted.	DAY.
1	65 92	70.8	63.1	7.7	30.0312	30.070	29.997	.073	.5427	84.8	61.3	N.	7.17	8 7	10	2	20	0.23	....	0 23	1
2	69 15	78.8	60.8	18.0	29.8038	30.007	29 651	356	6587	91 8	66.5	S.	10.29	5.3	10	0	29	0 66	....	0.66	2
3	74.88	81.3	70 0	11.3	29.7487	29 788	29 651	.137	.7062	82 5	63.8	S.	11.29	4.7	7	2	84	....	....	.....	3
SUNDAY..... 4	.....	90.3	70 8	19.5	.....	.....	.....	....	.....	....	..	S.	20.17	...	..	..	69	0.10	....	0.10	4.....SUNDAY
5	67.75	76.0	63.5	12.5	29.8290	29.847	29.786	.061	.4970	73.0	58.7	S.	10.21	4.7	10	0	39	0.00	....	0.00	5
6	69.75	76.8	62.4	14.4	29 8402	29.931	29.719	.212	.5940	81 3	63.7	S.	9.04	7.0	10	4	41	0.06	....	0.06	6
7	64.23	72.4	57.3	15 1	29.7200	29 833	29 672	. 61	.5620	92.0	61.8	S.	15.17	8.2	10	0	2	0.55	....	0.55	7
8	61.07	68.8	52.0	16.8	30 0350	30 146	29 833	.313	.3865	71 8	51.5	S.	18.21	3 2	10	0	98	0.04	....	0 04	8
9	60.83	66 3	56.6	9.7	30 2687	30. 327	30 146	.1 1	.3960	74 3	52.5	N.	7.13	6.3	10	0	83	0.00	....	0 00	9
10	51.43	58.4	47.8	10.6	30 3922	30.452	30.242	.210	.2913	77 5	44.5	N.	11.04	5.3	10	0	61	0.16	....	0.16	10
SUNDAY. 11	... .	63 8	44 5	19.3	.....	.....	.....	.....	.....	....	....	W.	18.29	. ..	..	..	80	0.00	....	0.00	11 .....SUNDAY
12	49.58	55.6	42.8	12.8	30 3635	30.410	30.260	.150	2547	72.2	40.7	N W.	9 54	0.0	0	0	96	0.00	...	0.00	12
13	55.25	64.8	42.6	22.2	30 2948	30 392	30 240	.152	.3357	77 2	47.7	S.W.	6.17	1.5	5	0	81	....	....	....	13
14	60.03	68.4	51.6	16 8	30.1458	30.240	30 090	.150	.4495	86.7	55.8	S.W.	5.92	7.7	10	0	19	...	....	....	14
15	63 67	72.7	54.3	18.4	30.0015	30 090	29 941	.149	.4747	81 0	57.3	S.	11.21	1.2	3	0	77	....	..	....	15
16	65.20	72.7	61.0	11.7	29 8602	29 941	29 816	.125	.5637	90 8	62 2	S.	13.25	6.8	10	0	4	0.03	....	0.03	16
17	64 35	71.6	57.0	14.6	29.9058	29.933	29 816	.117	.4725	79 0	57 3	S.W.	15.71	3.0	10	0	86	....	....	....	17
SUNDAY.....18	..	72.5	56.4	16.1	.....	.....	....	...	.....	....	....	S.W.	17.50	....	..	.	25	1.45	....	1.45	18.....SUNDAY
19	55.25	60.7	50.4	10.3	29 7515	29.871	29 639	232	.3395	75 0	47.3	S.W.	24.71	5.0	10	0	18	0.11	....	0.11	19
20	47.13	51.2	43 2	S.0	30 0330	30 233	29 871	.362	.2218	68.7	37.2	W.	17.50	3.8	10	0	83	....	....	..	20
21	51.20	60.7	40.5	20.2	30 2543	30.293	30.190	103	.2757	72.3	42.3	S.W.	15 03	4.7	10	0	63	0.01	...	0.01	21
22	60.40	70.6	49 2	21 4	29 9978	30 190	29.894	.296	.4257	78.7	53.5	S.W.	10 50	4.2	10	0	56	0 05	....	0.05	22
23	55 93	62 2	47.6	14.6	29.7153	29 894	29 649	.245	.4423	97.3	55.2	N.	15.88	10 0	10	10	0	1.90	....	1.90	23
24	48.43	56.4	42.0	14.4	30 0032	30 051	29.764	.317	.2818	82 7	43.3	N.W.	21.83	8.5	10	6	51	0.12	...	0.12	24
SUNDAY..... 25	.....	56.7	46.4	10 3	.....	.....	.....	.....	.....	....	....	S.E.	16 04	...	..	..	0	0.36	....	0.36	25.....SUNDAY
26	56.87	65.6	51.9	13.7	29.7582	29.843	29.664	.179	.4063	88.3	53.3	S.E.	13.67	6.3	10	0	4	0.22	....	0.22	26
27	52.88	57.7	46.9	10.8	29 8707	29.926	29.664	.262	.2970	74 0	44 7	W.	16.74	4.5	10	0	56	0 03	....	0.03	27
28	57.08	63.2	49.2	14 0	29.9840	30 016	29 922	.094	.3457	74.2	48.7	S.W.	11.71	0.8	5	0	90	....	....	....	28
29	62.73	71.4	52.5	18.9	30.0345	30.086	29.932	.094	.4192	74.5	54.0	S.W.	17.67	0.0	0	0	93	....	....	....	29
30	66.22	74 7	54.0	20 7	30 0663	30 128	30.015	.113	.5380	83 2	60.8	S.W.	9 50	1.8	10	0	89	0.00	....	0.00	30
Means.....	59 89	67.77	52.94	14.83	29.9892	30.0759	29.8894	.1365	.4298	80.13	53 48	S. 43° W.	13 62	4.74	8.5	0.9	54.5	6.08	....	6.08	.....Sums.
24 Years means for and including this month	58.55	66.61	50.79	15 83	30.0167	.....	.....	.180	.3768	.....	....	....	S 12 72	5.71	.	.	¶54 33	3 18	....	3.18	24 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	718	18		649	2847	3142	1460	961	
Duration in hrs..	80	2		217	217	222	96	49	6
Mean velocity....	89.75	9.00		13.52	13 12	14.15	15.21	19.61	

Greatest mileage in one hour was 40, on the 23rd and 24th.

Greatest velocity in gusts 60 miles per hour on the 18th.

Resultant mileage, 5,665.
Resultant direction, S. 43° W.
Total mileage, 9,795.
Average velocity 13.62 m. p. h.

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

§ Observed.

† Pressure of vapour in inches of mercury.

‡ Humidity relative, saturation being 100.

¶ 17 years only. s 12 years only.

The greatest heat was 90.°3 on the 4th: the greatest cold was 40.°5 on the 21st, giving a range of temperature of 49.8 degrees.

Warmest day was the 4th. Coldest day was the 20th. Highest barometer reading was 30.452 on the 10th. Lowest barometer was 29.532 on the 18th, giving a range of 0 920 inches. Maximum relative humidity was 99 on the 18th, 23rd and 25th. Minimum relative humidity was 56 on the 13th and 20th.

Rain fell on 22 days.

Hail fell on 18th.

Auroras were observed on 2 nights. Lunar halos on 1 night. Lunar coronas on 3 nights.

Fog on 4 days.

Thunder storms on 1st, 2nd, 4th, 9th, 10th, 18th and 19th.

ABSTRACT FOR THE MONTH OF OCTOBER, 1898.

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 pressure of vapor.	‡Mean relative humidity.	Dew Point.	WIND. General direction.	Mean velocity in miles per hour	SKY CLOUDED IN TENTHS. Mean.	Max.	Min.	Per cent. possible Sunshine.	Rainfall in inches.	Snowfall in inches.	Rain and snow melted.	DAY.
1	66.27	72.8	60.7	12.1	30.3300	30.387	30.128	.259	.4682	72.5	57.2	N.	13.29	2.7	8	0	80	....		....	1
SUNDAY..... 2	.....	73.8	56.3	17.5	.....	.....	.....	....	.....	....	....	N.W.	10.29	....	..	..	4	...	....	....	2.....SUNDAY
3	67.10	71.7	62.9	8.8	30.1152	30.209	30.015	.194	.6022	90.3	64.2	S.E.	12.75	8.0	10	0	3	0.99	....	0.99	3
4	66.48	73.9	55.2	18.7	30.0948	30.167	30.013	.154	.5022	74.8	57.7	S.W.	14.17	6.0	10	0	64	0.03	....	0 03	4
5	51.80	58.6	49.7	8.9	29.8850	30.137	29.769	.368	.3410	88 2	48.3	N.	16.71	7.2	10	0	1	0.23	....	0.23	5
6	45.23	50.7	40.3	10.4	30.3292	30.389	29.905	.484	.2030	67 2	35.0	N.W.	12.88	1.3	3	0	96	....	....	.....	6
7	49.08	56.6	38.5	18.1	30.3143	30.418	30.208	.210	.2618	75.5	41.3	S.W.	6.04	4.2	10	0	66	....	....	....	7
8	51.85	59.6	47.5	12.1	30.0122	30.208	29 931	.277	.2912	76.3	44.0	S.	10.25	4.3	10	0	54	....	....	....	8
SUNDAY..... 9	....	52.8	34.5	18.3	.....	.....	.....	.....	.....	....	....	N.	14.42	....	..	..	82	....	....	....	9.....SUNDAY
10	38.68	45.6	30.6	15.0	30.3327	30.450	30 190	.260	.1458	62.0	26.5	N.E.	6.71	2.5	8	0	82	....	....	....	10
11	57.23	64.5	40 0	24.5	29.7177	30.190	29.500	.690	.4212	88.7	53.8	S.	21.17	10.0	10	10	0	0.17	....	0.17	11
12	50.77	57.7	41.0	16.7	29.7388	29.937	29.603	.334	.3012	78.7	44.0	S.W.	18.46	7.2	10	0	45	0 03	...	0.03	12
13	39.38	42.5	33.5	9.0	30.0593	30.124	29.937	.187	.1777	73.3	31.5	N.	8.88	7.0	10	0	19	....	....	...	13
14	39.57	43.7	36.8	6.9	30.0127	30.124	29.908	.216	.2165	88.7	36.5	N.	14.75	10.0	10	10	0	0.32	....	0 32	14
15	36.88	40.0	35.1	4 9	29 8117	29.908	29.758	.150	.1963	89.7	34.0	N.	16.71	10.0	10	10	0	0.67	0.0	0.67	15
SUNDAY.....16	....	49.6	36.5	13.1	.....	.....	.....	.....	.....	...	....	N.	17.08	....	..	..	74	....	....	....	16.....SUNDAY
17	36.93	42.7	32.5	10.2	30 3668	30.409	30.295	.114	.1783	81.3	31.8	N.E.	12.38	2.5	8	0	81	....	....	....	17
18	39.60	49.8	30.0	19.8	30 3130	30 430	30.229	.201	.1865	77 2	32.7	N.E.	11.42	1.2	8	0	73	....	....	....	18
19	40.05	44 0	34.7	9.3	30.1732	30.254	30.106	.148	.2333	92.7	38.0	N.E.	10.04	8.3	10	0	0	0.95	....	0.95	19
20	45.27	51.2	41.5	9.7	30.2312	30.266	30.106	.160	.2742	90.8	42.5	W.	6.79	3.3	10	0	49	0.01	....	0.01	20
21	45 38	51.4	38.5	12.9	30 0865	30 257	29.835	.422	.2822	92.5	43.3	E.	11.33	10.0	10	10	0	0.11	....	0.11	21
22	52.87	59.8	47.8	12.0	29.4213	29.835	29 219	.616	.3643	90.0	50.0	N.E.	15.67	8.3	10	0	0	0.48	....	0.48	22
SUNDAY..... 23	.....	55.0	44.2	10.8	.....	.....	.....	.....	.....	....	....	S.W.	18.88	...	..	..	25	0.05	....	0.05	23..... SUNDAY
24	49.38	55.7	45.0	10.7	30.1747	30 233	30.080	.153	.2810	79.5	43.3	S.	12.33	8.8	10	5	27	....	....	....	24
25	50.65	56.5	44.0	12.5	30.1163	30.205	29.998	.207	.3022	81.5	45.2	S.	14.46	6.2	10	0	21	....	....	....	25
26	54.27	58.9	49.2	9.7	29.6993	29.998	29.429	.569	.3993	94.0	52.7	S.	15.75	10.0	10	10	0	0.32	....	0.32	26
27	37.37	51.4	32.3	19.1	29 8397	30.253	29.440	.813	.1917	83.2	32.7	S.	30.67	9 5	10	7	16	0.19	0.0	0.19	27
28	32.25	35.8	29.0	6.8	30.4327	30.485	30.253	.232	.1523	83.7	27.8	N.	7.75	6.5	10	3	44	....	....	....	28
29	37.03	46.7	28.3	18.4	30 3340	30.436	30.217	.219	.1853	82.0	32.2	N.	6.79	1 2	7	0	83	....	....	....	29
SUNDAY.....30	.....	42 0	32.0	10 0	.....	.....	.....	.....	.....	...	....	N.	8 67	....	..	..	0	0.02	....	0.02	30.....SUNDAY
31	39.30	44.9	34.7	10.2	29.9693	30.156	29 859	.297	.1978	82.5	34.3	W.	10.63	8.8	10	3	33	0.00	....	0.00	31
Means.....	46 95	53.55	40.74	12.81	30.0735	30.2256	29.9204	.3052	.2829	82.18	41.56	S. 83° W.	13.23	6.34	9.3	2.5	36.4	4.57	0.0	4.57	.....Sums.
24 Years means for and including this month	45.49	52.50	38.64	13.86	30.0017	.....	.....	.218	.2454	76.65	....	....	S 13 52	6.33	.	..	¶41 05	3.02	....	3.14	24 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	2673	1085	168	1048	2616	965	447	840	
Duration in hrs..	218	108	19	81	146	52	49	65	6
Mean velocity....	12.26	10.05	8.84	12.94	17.92	18 56	9.01	12.92	

Greatest mileage in one hour was 48, on the 27th.

Greatest velocity in gusts 54 miles per hour on the 27th.

Resultant mileage, 48.
Resultant direction, S. 83° W.
Total mileage, 9,842.
Average velocity 13.23 m. p. h.

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

§ Observed.

† Pressure of vapour in inches of mercury.

‡ Humidity relative, saturation being 100.

¶ 17 years only. *s* 12 years only.

The greatest heat was 73.°9 on the 4th; the greatest cold was 28.°3 on the 28th, giving a range of temperature of 45.6 degrees.

Warmest day was the 3rd. Coldest day was the 28th. Highest barometer reading was 30.465 on the 28th. Lowest barometer was 29.219 on the 22nd, giving a range of 1·266 inches. Maximum relative humidity was 99 on the 3rd, 19th, 20th and 26th. Minimum relative humidity was 46 on the 9th and 10th.

Rain fell on 16 days.

Snow fell on 2 days.

Rain or snow fell on 16 days.

Lunar corona on 1 night. Lunar halos on 4 nights.

Hour frost on 4 days. Fog on 10 days.

ABSTRACT FOR THE MONTH OF NOVEMBER, 1898.

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 pressure of vapor.	‡Mean relative humidity.	Dew Point.	WIND. General direction.	Mean velocity in miles per hour	SKY CLOUDED IN TENTHS. Mean	Max.	Min.	Per cent. possible Sunshine.	Rainfall in inches.	Snowfall in inches.	Rain and snow melted.	DAY.
1	35.82	41.2	27.8	13.4	30.2248	30.301	30.072	.229	.1673	78.8	29.8	S. W.	11.75	6.8	10	0	53	..	....	....	1
2	42.65	52.5	37.0	15.5	30.0457	30.337	29.894	.439	.2108	76 7	35 8	S.	23.71	5 7	10	0	22	0.08	....	0 08	2
3	44.30	52.6	32.2	20.4	30 3780	30 422	30.309	.113	.2165	74 5	36.3	S.	20.83	0.7	3	0	96	....	....	....	3
4	46 90	56.2	36.1	20.1	30.3263	30.446	30.174	.272	.2377	74 3	39.0	S.	16.83	1 0	4	0	92	....	....	....	4
5	51.02	55.7	44.4	11.3	29.8490	30.174	29.527	.647	.2778	73 5	42.8	S.	24.92	4.7	10	0	51	0 02	....	0 02	5
SUNDAY.....6	.....	56.8	39.3	17.5	.....	.....	.....	....	.....	....	...	S.	28.17	.	..	..	81	....	....	....	6.....SUNDAY
7	33.57	39.3	29.8	9.5	30 0377	30.197	29 760	.437	.1490	77 5	27.2	S.	19.38	2.8	10	0	60	....	0.0	0.00	7
8	45.12	55.5	29.0	26.5	30.0578	30 197	29.930	.247	.2188	72 5	36 3	S.	21.29	1.2	9	0	83	....	....	....	8
9	34.68	46.2	32.3	13.9	30.4217	30.403	30 179	.284	.1427	70.5	26.0	N.	15.63	3 3	10	0	24	....	....	....	9
10	29.70	32.3	28.6	3.7	30.0818	30 444	29.697	.745	.1433	87 2	26 5	N.	23.75	10 0	10	10	0	....	....	....	10
11	29.75	34.7	23 7	11 0	29.9090	30 218	29 499	.719	.1455	87 8	26.7	N.	24.00	5.3	10	0	9	....	6 0	0.64	11
12	28.33	34.8	16.7	18.1	30.2342	30.300	30 195	.105	.1358	84 8	24.3	S.E.	19 33	2.0	8	0	57	....	....	....	12
SUNDAY.....13	... .	38.7	28.6	10.1	.....	.....	.....	.....	.....	....	....	S.	5.50	.	..	..	20	...	0.2		13 .....SUNDAY
14	33.23	37.3	28.5	8 8	29.8103	29 975	29.746	.229	.1765	92 5	31.2	S.W.	8.67	9 8	10	9	0	0.22	.	0 24	14
15	28.77	37.8	19.0	18.8	30 0848	30.137	29.975	.162	.1407	86 5	25.3	S.W	13.25	10.0	10	10	0	....	0.1	0.01	15
16	37.02	39.8	34.8	5.0	30 2327	30 255	30.121	.134	.1952	88 3	34 0	S.W.	7.50	10 0	10	10	0	....	....	....	16
17	36.00	39.8	30 9	8.9	30.1742	30 244	30.112	.130	.1937	91 5	33 7	N.E.	5.54	8.3	10	3	1	....	...	....	17
18	42.88	47.4	36.2	11.2	29 8380	30.112	29.657	455	.2500	90.2	40.2	S.E.	9.92	10 0	10	10	1	....	....	0.01	18
19	39.52	45.4	36.8	8 6	29.5380	29.657	29 464	193	.2272	93 3	37.5	N.	13.58	10.0	10	10	0	0.02	....	0.02	19
SUNDAY.....20	..	42.3	37.0	5.3	.....	.....	.....	.....	.....	...	....	W.	22.13	....	.	.	0	....	....	....	20..... ...SUNDAY
21	36 10	40.3	33.2	7.1	30 2235	30 278	30.064	.214	.1605	75 5	29 0	W.	8 33	1.3	6	0	87	...	....	....	21
22	35.33	45.0	26 3	17.6	30 0855	30 261	29.932	329	.1735	83.8	31 0	N.	13.40	1 7	10	0	90	....	....	....	22
23	34.40	41.6	31.3	10.3	30 1085	30.199	29.932	.267	.1648	81.7	29.7	S.W	17.54	9.7	10	8	3	0 03	0.0	0.03	23
24	29.95	32.3	26.5	5.8	30.1442	30.220	30 024	.196	.1373	82.3	25.3	W	10.04	7.5	10	0	5	....	0.7	0.07	24
25	18 32	28.1	13.2	14.9	30.0480	30.162	29 963	.199	.0837	80 8	13.5	S W.	28.00	5.0	10	0	33	....	3.1	0.31	25
26	13.62	16.8	9.0	7.8	30.1378	30.177	30.097	.080	.0678	83.5	9.8	N.	14.33	6.8	10	0	0	....	....	....	26
SUNDAY.....27	.....	22 0	12.0	10 0	.....	..	.....	.....	.....	....	....	N.W.	22.92	..	..	.	36	....	....	....	27..... SUNDAY
28	25.90	31.3	17.2	14.1	29.9470	30.059	29 837	.222	.1010	70.5	18.0	W.	17.21	0.2	1	0	91	....	....	....	28
29	25 08	26.8	17.5	9.3	29 6365	29.837	29.400	.437	.1017	81.8	18.5	N.	6.13	3.8	10	0	44	....	....	....	29
30	27.38	31.4	20.2	11.2	29.4647	29.526	29.400	.126	.1335	89.0	24.3	S.W.	9.79	10 0	10	10	00	0.03	....	0.03	30
31																					31
Means.....	33 97	40.09	27 90	12.19	30 0400	30.1767	29.8840	.2927	.1674	81.89	28 92	S. 40½° W.	16 11	5.87	8.9	3.1	34.6	0.51	15.7	2.15	....Sums.
24 Years means for and including this month	32.51	38.95	26.56	12 40	30.0170	.....	.....	.269	.1605	79.98	....	.....	S 16.03	7.29		.	¶28 94	2.33	12.87	3 64	24 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	2328	86	235	1216	3478	1834	1711	714	
Duration in hrs..	144	9	34	65	184	114	118	44	8
Mean velocity....	16.17	9.56	6.91	18.71	18.90	16.09	14.50	16.23	

Greatest mileage in one hour was 46, on the 6th.

Greatest velocity in gusts 54 miles per hour on the 6th.

Resultant mileage, 3630.
Resultant direction, S. 40½° W.
Total mileage, 11,602.
Average velocity 16.11 m. p. h.

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

§ Observed.

† Pressure of vapour in inches of mercury.

‡ Humidity relative, saturation being 100.

¶ 17 years only. s 12 years only.

The greatest heat was 56.°8 on the 6th; the greatest cold was 9.°0 on the 26th, giving a range of temperature of 47.8 degrees.

Warmest day was the 5th Coldest day was the 26th. Highest barometer reading was 30.463 on the 9th. Lowest barometer was 29.400 on the 29th, giving a range of 1·063 inches. Maximum relative humidity was 99 on the 11th and 19th. Minimum relative humidity was 56 on the 8th.

Rain fell on 8 days.

Snow fell on 8 days.

Rain or snow fell on 14 days.

Lunar halos on 2 nights. Lunar coronas on 5 nights.

Hoar frost on 2 days. Fog on 5 days.

ABSTRACT FOR THE MONTH OF DECEMBER, 1898.

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

DAY	THERMOMETER.				BAROMETER.				†Mean pressure of vapor.	‡Mean relative humidity.	Dew Point.	WIND.		SKY CLOUDED IN TENTHS.			Per cent. possible Sunshine.	Rainfall in inches.	Snowfall in inches.	Rain and snow melted.	DAY.
	Mean.	Max.	Min.	Range.	Mean.	§Max.	§Min.	Range.				General direction.	Mean velocity in miles per hour	Mean.	Max.	Min.					
1	30.37	32.9	26.3	6.6	29.6432	29.771	29.514	.257	.1420	83.8	26.2	S.W.	21.04	7.7	10	4	1	....	0.4	0.04	1
2	31.13	34.6	26.7	7.9	29.9885	30.157	29.771	.386	.1512	86.0	27 7	S.	16.87	4.8	10	0	51	....	0.1	0.01	2
3	28.08	32.1	25.0	7.1	30.2570	30.274	30.157	.117	.1400	90.8	25.7	N.	10.04	3.7	10	0	28	....	....	....	3
SUNDAY.....4	.....	31.8	21.7	10.1	.....	.....	.....	....	.....	....	....	N.	13.75	....	..	..	0	....	1.6	0.18	4 .....SUNDAY
5	29.83	32.2	26.4	5.8	29.3093	29.461	29 178	.283	.1545	93.0	28.0	N.	27.71	9.8	10	9	0	....	6.3	0.71	5
6	23.60	29.6	21.7	7.9	29.7432	29.820	29.394	.426	.1078	84.7	19.8	S.W.	21.87	7.2	10	0	68	....	1.0	0.10	6
7	26.77	30.6	22.8	7.8	29.7343	29.815	29.659	.156	.1228	83 8	22.7	S.W.	23.46	4.8	10	0	59	....	1.3	0 13	7
8	19.13	24.1	10.5	13.6	30.0173	30.222	29.815	.407	.0877	81.7	14.5	S.W.	19.54	4.7	10	0	5	....	1.6	0.16	8
9	15.65	21.1	8.9	12.2	30.1772	30.286	29.977	.309	.0683	77.0	9.8	S.W.	23.25	8 3	10	0	5	....	0.0	0.00	9
10	25.42	29.5	16.5	13.0	29.5960	29.977	29.364	.613	.1207	87.3	22.3	S.W.	26.33	9.5	10	7	4	....	0.7	0.07	10
SUNDAY.....11	.....	29.0	3 0	26.0	.....	.....	.....	.....	.....	....	....	W.	26.54	....	..	..	1	....	2.5	0.25	11.....SUNDAY
12	—2.17	3.0	—4.8	7.8	29.7698	29.804	29.713	.091	.0327	82.7	—5.8	N.	8.79	3.5	10	0	9	....	....	....	12
13	—6.08	—3.3	—10.1	6.8	30.0523	30.246	29.786	.460	.0285	87.7	—3.8	S.W.	19.25	1.2	7	0	79	....	....	....	13
14	4.98	13.6	—11.9	24 6	30.2142	30.292	30.151	.141	.0468	83.3	1.2	S.W.	18.13	8.3	10	0	0	....	0.9	0.09	14
15	1.12	10.4	—1.1	11.5	30 4938	30 531	30.292	.239	.0378	83.8	—2.8	N.	13.54	8.3	10	0	39	....	0.2	0.02	15
16	14.00	28.3	2.5	25.8	30.3545	30.480	30 208	.272	.0778	89.2	11.3	S.	12.42	10.0	10	10	0	...	0.2	0.02	16
17	33.50	36.3	28.3	8.0	29 9992	30.208	29.843	.365	.1563	80.8	28.5	S.	19.29	10.0	10	10	0	....	0.3	0.03	17
SUNDAY.....18	.....	35.9	9.3	26.6	.....	.....	.....	.....	.....	...	....	W.	21.17	....	..	..	4	....	0.2	0.02	18.....SUNDAY
19	4.95	9.3	0.8	8.5	30.3650	30 456	30.219	.237	.0450	82.5	1.0	N.	11.33	3.3	10	0	64	....	....	....	19
20	17.68	24.8	7.3	17.5	29.9330	30 219	29 829	.390	.0952	93 7	16.0	N.E.	14.00	10.0	10	10	0	0.30	1.8	0.50	20
21	30 02	37.6	21.3	16.3	29.8213	29.863	29.742	.118	.1582	94 0	28.3	E.	14 25	10.0	10	10	0	0.24	....	0.24	21
22	36.68	38.9	34.4	4.5	29.8245	29.934	29.589	.345	.1893	86.7	33.0	S.	16.46	10 0	10	10	0	0.21	....	0.21	22
23	36.55	40 9	33.6	7.3	29.6390	29.897	29.429	.468	.1682	77.3	29.8	S.	34.00	4.3	10	0	77	0.10	....	0.10	23
24	30.50	35.5	24.4	11.1	29.9632	30.079	29.853	.196	.1268	73.7	23.2	S.W.	24.17	5.2	10	0	28	....	0.0	0.00	24
SUNDAY.....25	.....	24.4	9.7	14.7	.....	.....	.....	.....	.....	....	....	S.W.	12.46	....	..	..	60	....	0.1	0.01	25..... SUNDAY
26	13.03	24.2	2.8	21.4	30.0877	30.319	29 780	.539	.0700	86.7	10.0	S.E.	8.58	6.7	10	0	51	....	0.0	0.00	26
27	27.88	33 6	23.4	10.2	29.4195	29.780	29.328	.452	.1290	83.7	23.8	S.	21.00	10.0	10	10	0	....	0.8	0.08	27
28	—3.68	27.6	—10.0	37.6	29 9067	30.087	29.393	.694	.0332	88.7	—6.3	S.W.	25.13	3.7	10	0	91	....	0.3	0.03	28
29	0.42	7.3	—10.4	17.7	29.8720	30.074	29.718	.356	.0402	89.3	—2.2	N.	10.38	7.3	10	0	0	....	0.6	0.06	29
30	30.43	41.9	7.3	34.6	29.7723	30.077	29.626	.451	.1560	86.5	26.8	S.W.	21.75	9.2	10	5	0	0.14	....	0.14	30
31	3.68	26.1	—2.8	28.9	30.4622	30.579	30.077	.502	.0447	83.0	—0.3	N.W.	14.04	9.0	10	4	7	....	....	...	31
Means.....	18.65	26.57	11.75	14.82	29.9406	30.1002	29.7569	.3433	.1011	85.24	14 94	S. 54¼° W.	18.41	7.06	9.9	3.3	23.6	0.99	20.9	3.20	.....Sums.
24 Years means for and including this month	18.94	26.09	11.76	14.33	30.0313	.....	.....	.2967	.1001	32.97	....	....	s 16.68	6.89	..	..	¶29.12	1.32	23.43	3.59	24 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	2278	121	345	527	1218	7552	1232	421	
Duration in hrs..	170	11	32	37	70	325	69	30	
Mean velocity....	13.40	11.00	10.78	14.24	17.40	23.24	17.85	14.03	

Greatest mileage in one hour was 51, on the 5th.

Greatest velocity in gusts 60 miles per hour on the 5th and 23rd.

Resultant mileage, 7420.
Resultant direction, S. 54¼° W.
Total mileage, 13,694.

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

§ Observed.

† Pressure of vapour in inches of mercury.

‡ Humidity relative, saturation being 100.

¶ 17 years only. *s* 12 years only.

The greatest heat was 41.°9 on the 30th; the greatest cold was —11.°0 on the 14th, giving a range of temperature of 52.9 degrees.

Warmest day was the 22nd. Coldest day was the 13th. Highest barometer reading was 30.579 on the 31st. Lowest barometer was 29.178 on the 5th, giving a range of 1·401 inches. Maximum relative humidity was 99 on the 6th, 20th and 21st. Minimum relative humidity was 61 on the 24th.

Rain fell on 5 days.

Snow fell on 22 days.

Rain or snow fell on 26 days.

Lunar halo on 1 night. Lunar corona on 3 nights.

Fog on 5 days.

Meteorological Abstract for the Year 1898.

Observations made at McGill College Observatory, Montreal, Canada. — Height above sea level 187 ft. Latitude N. 45° 30′ 17″. Longitude $4^h\ 54^m\ 18{\cdot}67^s$ W.

C. H. McLEOD, *Superintendent.*

Month.	Thermometer. Mean.	¶ Deviation from 24 years, means.	Max.	Min.	Mean daily range.	* Barometer. Mean.	Max.	Min.	Mean daily range.	†Mean pressure of vapour.	‡Mean relative humidity.	Mean dew point.	Wind. Resultant direction.	Mean velocity in miles per hour.	Sky clouded per cent.	Per cent. possible bright sunshine	Inches of rain.	Number of days on which rain fell.	Inches of snow.	Number of days on which snow fell.	Inches of rain and snow melted.	No. of days on which rain and snow fell.	No. of days on which rain or snow fell.	Month.
January	12.94	+ 0.88	37.3	— 20.9	15.73	29.9978	30.513	29.246	.358	.0796	89.7	10.5	S. 76½° W.	15.1	57	44.0	0.57	4	62.7	21	6.17	3	22	January
February	19.81	+ 4.17	40.7	— 15.3	12.27	30.0447	30.496	29.338	.183	.1063	88.4	17.0	S. 64° W.	16.9	72	30.7	0.55	3	46.3	21	5.65	1	23	February
March	33.95	+ 9.36	58.3	12.9	14.04	30.1492	30.648	29.391	.204	.1536	75.4	26.9	S. 18° W.	17.3	38	61 5	2.55	10	0.9	2	2.64	1	11	March
April	42 84	+ 2.59	66.6	14.1	18.17	29.9554	30.370	29.552	.164	.1740	62.4	30.0	N. 44° W.	13.9	47	58.6	1.60	6	1.7	4	1.15	..	10	April
May	55.77	+ 1.05	79.5	34.5	15.65	29.9048	30.266	29.590	.138	.3363	74.0	46.9	S. 87½° W.	11.4	61	45.3	2.62	16	....	..	2.62	..	16	May
June	64.80	— 0.04	82.3	46 0	16.31	29.9388	30.336	29.271	.209	.4694	75.3	56.4	S. 65½° W.	11.8	58	49.2	5.57	19	....	..	5.57	..	19	June
July	70.56	+ 1.65	90.4	48.0	17.88	29.9853	30.469	29.601	.178	.5494	71.8	60.0	S. 39½° W.	12.1	31	73.1	2.11	13	....	..	2.11	..	13	July
August	67.47	+ 0.85	81.9	49.0	15.06	29.8991	30.262	29.609	.134	.5298	79.0	60.4	S. 24° W.	12.1	62	46.2	2.56	22	....	..	2.56	..	22	August
September	59.89	+ 1.34	90.3	40.5	14.83	29.9892	30.452	29.532	.187	.4298	80.2	53.5	S. 43° W.	13.6	47	54 5	6.08	22	....	..	6.08	..	22	September
October	46.95	+ 1.46	73.9	28 3	12.81	30.0735	30.485	29.219	.305	.2829	82.2	41.6	S. 83° W.	13.2	63	36.4	4.57	16	0.0	2	4.57	2	16	October
November	33.97	+ 1.46	56.8	9.0	12.19	30.0400	30.463	29.400	.293	.1674	81.9	28.9	S. 40½° W.	16.1	59	34.6	0.51	8	15.7	8	2.15	2	14	November
December	18.65	— 0.29	41.9	— 11.0	14.82	29.9406	30.579	29.178	.343	.1011	85.2	14.9	S. 51½° W.	13.4	71	23 6	0.99	5	20.9	22	3.20	1	26	December
Sums for 1898	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	29.68	144	148.2	80	44.47	10	214	Sums for 1898
Means for 1898	43.97	+ 2.040	....	....	14.98	29.9932	....	....	.2247	.2816	78.79	37.25	S. 38° W.	14.25	55.5	46.48	....	....	....	..	3.71	..	..	Means for 1898
Means for 24 years ending Dec. 31, 1898.	41.93	....	....	....	...	29.9808	....	....	....	.2537	75.18	....	....	*a* 15.04	60.2	§45.81	28.23	135	119.2	78	39.93	16	202	Means for 24 years ending Dec. 31, 1898.

* Barometer readings reduced to 32° Fah. and to sea level. † Inches of mercury. ‡ Saturation 100. § For 17 years only. *a* For 12 years only. ¶ "+" indicates that the temperature has been *higher*: "—" that it has been *lower* than the average for 24 years inclusive of 1898. The monthly means are derived from readings taken every 4th hour, beginning with 3 h. 0 m. Eastern Standard time. The anemometer and wind vane are on the summit of Mount Royal, 57 feet above the ground and 810 feet above the sea level.

The greatest heat was 90.4° on July 3; the greatest cold was 20.9° below zero on January 30. The extreme range of temperature was therefore 111.°3. Greatest range of the thermometer in one day was 37.°6 on December 28; least range was 3.°7 on November 10. The warmest day was July 3, when the mean temperature was 82.°0. The coldest day was January 30, when the mean temperature was 14.°7 below zero. The highest barometer reading was 30.648 on March 26, lowest barometer reading was 29.178 on December 5, giving a range of 1.470 inches for the year. The lowest relative humidity was 30 on April 28 and May 8. The greatest mileage of wind recorded in one hour was 55 miles on March 13, and the greatest velocity in gusts was at the rate of 60 miles per hour on February 1, March 13, September 13 and December 5. The total mileage of wind was 125,378. The resultant direction of the wind for the year was S. 38° W., and the resultant mileage 40,020. Auroras were observed on 8 nights; fog on 49 days; thunder storms on 30 days; lunar halos on 24 nights; lunar coronas 40 nights; solar halos on 2 days. The sleighing of the winter commenced in the city on November 11. The first appreciable snowfallof the autumn was on November 10.

NOTE.—The yearly means of the above are the averages of the monthly means, except for the velocity of the wind.

ABSTRACT FOR THE MONTH OF MAY, 1898.

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 pressure of vapor.	‡Mean relative humidity.	Dew Point.	WIND. General direction.	Mean velocity in miles per hour	SKY CLOUDED IN TENTHS. Mean.	Max.	Min.	Per cent. possible Sunshine.	Rainfall in inches.	Snowfall in inches.	Rain and snow melted.	DAY.
SUNDAY.....1	.....	64.6	43.0	21.6	.....	....		.....	.....	....	..	N.W.	12.13	....	..	..	95	....	....	.....	1.....SUNDAY
2	51.28	63.7	41.6	22.1	30.0127	30.050	29.961	.089	.2717	71.7	42.2	N.	16.96	3 5	8	0	73	....	....	....	2
3	49.95	54.3	43.5	10.8	30.0428	30.068	29.994	.074	.2977	82 8	44.7	N.	7.96	10.0	10	10	..	0.02	....	0.02	3
4	46.55	52.7	43.0	9.7	30.0245	30 051	29.975	.076	.2848	89 8	43 7	N.E.	10.13	10.0	10	10	..	0.11	....	0.11	4
5	45.95	51.4	40.2	11.2	29.93?2	29 985	29.879	.106	.2140	69.2	35.2	W.	12.67	6.5	10	0	29	....	....	....	5
6	47.28	58.8	34.5	24.3	29.8433	29.925	29.764	.161	.1820	56 7	32.0	N W.	12.00	0.0	0	0	94	....	....	....	6
7	54.32	64.6	47.2	17.4	29.7417	29 867	29.683	.179	.1815	41.8	31 7	N.	13.67	0.0	0	0	97	....	....	....	7
SUNDAY.....8	.....	57.0	36.8	20.2	.....	.....	.....	....	.....	...	..	N.	20.04	...	..	..	89	....	....	...	8.....SUNDAY
9	51.33	61.9	38.8	23.1	29.9793	30.036	29 935	.101	.1883	49 5	32 5	N.	9.17	0.0	0	0	91	....	....	....	9
10	50.18	60.9	40.8	20.1	29.9383	29 991	29.832	.112	.2240	61 7	37.2	N.	11.83	8.2	10	3	41	0.00	....	0.00	10
11	49.35	52.6	44.1	8.5	29.8398	29.868	29 831	.037	.3252	91 8	47 0	S.E	12.25	9.2	10	5	..	0.30	....	0.30	11
12	51.85	56.8	48.5	8 3	29.8257	29.874	29 734	.090	.3503	90.3	49.0	S.	13.42	8.5	10	5	7	0.64	..	0.64	12
13	52.40	58.4	43.0	15 4	29.9580	29.986	29 891	.095	.2385	73.2	44.0	S.W.	13.88	4.8	10	0	53	....	....	....	13
14	53.53	60.9	48.2	12.7	29.9873	30.003	29 962	.046	.3265	80.5	47 2	W.	10.71	7.3	10	0	37	0.09	...	0.09	14
SUNDAY.....15	....	68.4	45.6	22.8	.....	.....	.....	.....	.....	....	....	W.	9.00			..	76	...	..	....	15.....SUNDAY
16	56.00	63.4	50.6	12.8	29.9027	30.018	29 804	.214	.3452	77.2	43.8	S.W.	12.04	7.8	10	0	14	0.07	....	0.07	16
17	49.30	55.0	46.0	9.0	29 8720	29.967	29.838	.129	.2603	73.8	41.3	W.	15.25	7.7	10	0	22	0.03	....	0.03	17
18	55.55	65.9	43.3	22.6	29 9867	30 086	29 835	.201	.3208	72 8	46.5	S.	11.08	4.3	10	0	72	....	....		18
19	61.80	69.8	53.0	16.8	29 6813	29.801	29.590	.211	.4475	80 2	55.3	S.W.	16.04	6.8	10	0	3	0.01	....	0.01	19
20	61.68	67.8	56.3	11.5	29.9435	30.135	29.590	.545	.3867	71.2	51.8	N.	10.92	5.0	10	0	68	0.09	....	0.09	20
21	62.97	73.2	48.7	24.5	30.2102	30 266	30 173	.093	.3435	60.3	48.5	N.	2.33	2.5	5	0	92	....	....	....	21
SUNDAY.....22	.....	73.4	58.6	14.8	.....	.....	.....	.....	.....	....	....	S.	9 13	....	..	.	36	0.00	....	0 00	22.....SUNDAY
23	58.20	64.6	55.0	9.6	29 9452	30 038	29 827	.211	.3938	81.3	52.3	S.	13.21	8.8	10	4	7	0.25	....	0.25	23
24	61.30	70.9	57.0	13.9	29.7833	29.814	29.750	.064	.4970	92 3	58 8	S.	1 17	9.0	10	6	27	0.57	....	0 57	24
25	60.77	65.2	57.3	7.9	29 8632	29.936	29.817	.119	.4707	88.3	57.2	S.E.	8.58	10.0	10	10	.	0.09	....	0.09	25
26	61.10	68.7	54.6	14.1	29 9403	29.985	29.911	.074	.4270	79.3	54.3	E	9.58	6.8	10	0	29	....	....	....	26
27	62.88	71.3	51.4	19 9	29 8242	29.903	29.747	.156	.4218	74.3	54.3	N E.	9 46	5.5	10	0	71	....	....	....	27
28	66.80	74.8	59.0	15 8	29.7305	29.770	29.698	.072	.4983	76.2	58.7	S. E.	7.75	8.3	10	5	46	0 03	....	0.03	28
SUNDAY..... 29	.....	68.6	60.8	7.8	.....	...	.....	.....	.....	....	....	S.	17.21	....	..	.	10	0.32	....	0.32	29.....SUNDAY
30	59.65	64 6	55.6	9.0	29.7418	29 837	29.656	.181	.3957	77.2	52.5	S.	14.54	7.8	10	4	31	....	....	....	30
31	67.98	79.5	52.5	27.0	29.9493	29.976	29.837	.139	.4020	59.8	52.7	S.	8.33	0.0	0	0	96	...	....	....	31
Means.....	55.77	63.99	48.34	15.65	29 9048	29.9709	29.8334	.1375	.3363	73.97	46.94	S. 87½° W.	11.38	6.09	8.2	4.4	45.3	2.62	....	2.62	.....Sums.
24 Years means for and including this month	54.72	64.02	45.84	18.18	29.9314	.....	.....	.163	.2912	66.3	....	....	s 14.26	6.15	.	.	¶50.28	2.96	....	2.98	24 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	2318	303	234	691	1775	11.84	1239	725	
Duration in hrs..	184	34	27	66	148	98	102	57	28
Mean velocity....	12.60	8.91	8.67	10.47	11.99	12.08	12.14	12.72	

Greatest mileage in one hour was 29, on the 8th.

Greatest velocity in gusts 36 miles per hour on the 8th.

Resultant mileage, 1,655.
Resultant direction, S. 87½° W.
Total mileage, 8,469.
Average velocity 11.38 m. p. h.

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

§ Observed.

† Pressure of vapour in inches of mercury.

‡ Humidity relative, saturation being 100.

¶ 17 years only. s 12 years only.

The greatest heat was 79°.5 on the 31st; the greatest cold was 34°.5 on the 6th, giving a range of temperature of 45.0 degrees.

Warmest day was the 31st. Coldest day was the 5th. Highest barometer reading was 30.266 on the 21st. Lowest barometer was 29.590 on the 19th and 20th, giving a range of 0·676 inches. Maximum relative humidity was 98 on the 24th and 25th. Minimum relative humidity was 30 on the 8th.

Rain fell on 16 days.

Lunar halos on 2nd and 5th. Solar halo on the 2nd. Lunar coronas on the 6th and 7th.

Fog on 5 days. Thunder on 14th, 19th and 22nd.

ABSTRACT FOR THE MONTH OF JUNE, 1898.

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 pressure of vapor.	‡Mean relative humidity.	Dew Point.	WIND. General direction.	Mean velocity in miles per hour	SKY CLOUDED IN TENTHS. Mean.	Max.	Min.	Per cent. possible Sunshine.	Rainfall in inches.	Snowfall in inches.	Rain and snow melted.	DAY.
1	70.07	82.3	58.0	24.3	29.9573	30.035	29.871	.164	.4713	65.5	57.3	N.	7.08	1 5	4	0	94	...	....	.....	1
2	66.78	75.8	57.0	18.8	29.9482	30 015	29.911	.104	4771	73 5	57.8	N.	7.92	5.5	8	0	43	...	....	....	2
3	63.17	72.3	55.9	16.2	30.1720	30 252	30 015	.237	.4388	76 3	55.3	N.	16.58	4.3	9	0	84	....	....	....	3
4	62.63	69.3	56.1	13.2	30.2763	30. 336	30.225	.111	.4473	78 8	55.7	N.	13.87	4.5	10	0	58	....	....	....	4
SUNDAY.....5	.....	79.2	56.1	23.1	.....	.....	.....	....	.....	....	...	N.W.	10, 12	...	..	..	58	0.14	....	0.14	5.....SUNDAY
6	61.43	67.6	54.9	12.7	30.1612	30. 193	30.130	.063	.3618	66 5	50.0	N.	10.29	7.3	10	2	11	0.00	....	0.00	6
7	65.40	74.0	54.7	19.3	30.1080	30.202	30.021	.181	.3932	62 0	52.0	S.	7.25	6 8	10	0	63	....	....	....	7
8	68.60	76.7	62.2	14.5	29.8173	30 021	29.709	.312	.6152	87.7	64.7	S.	13.16	9.2	10	5	4	0.15	....	0.15	8
9	67.52	76.6	57.0	19.6	29.8478	30.008	29 709	.299	.5302	78 2	60.5	S.	17.08	4.7	10	0	78	0.08	....	0.08	9
10	54.91	62.6	46.0	16 6	30.1542	30 215	30.000	.207	.2666	62 3	41.8	N.	9 58	2.2	8	0	78	....	....	....	10
11	55.68	59.7	50.4	9 3	29 9113	30 132	29 834	.298	.3882	86 5	51.5	N.E.	8.00	10.0	10	10	2	0.23	....	0.23	11
SUNDAY.....12	....	63.2	54.2	9.0	.....	.....	.....	.....	.....	....	....	N.E.	8.50	...		..	00	0.72	...	0.72	12.....SUNDAY
13	67.75	74.8	59.7	15.1	29 9000	29 969	29 819	.150	.5525	81.7	61.7	N.E.	5.67	8.3	10	4	47	0.01	....	0.01	13
14	70.32	80.5	61.1	19.4	29.7042	29.844	29.625	.219	.6202	83.7	65 0	S.	15.46	7.8	10	3	56	0.80	...	0.80	14
15	55.65	63.0	47.9	15.1	30 1980	30 271	29.844	.427	.2747	62 5	42.5	N W.	14.33	1.8	10	0	91	....	..	....	15
16	61.87	69.7	51.1	18.6	30.2150	30 302	30.132	.170	.3685	67.0	50 5	S.	13 22	2.5	8	0	72	...	....	....	16
17	66.62	74.6	54.0	20.6	30 0885	30.142	30 040	.102	.3877	59.3	51.7	S.	8.50	2.2	8	0	82	...	....	....	17
18	64.88	74.1	54.6	19.5	29.8228	30.041	29 687	.354	.4948	80.0	58.0	S.E.	13.83	7.3	10	0	18	0.72	....	0.72	18
SUNDAY.....19	.....	71.1	57.6	13.5	.....	.....	.....	.....	.....	...	....	S.W.	10.58	....	..	.	26	0.18	....	0.18	19.....SUNDAY
20	62 05	71.4	55.1	16.3	29 6285	29.656	29.601	.055	.4077	74 2	53.3	W.	16.25	4.5	10	0	69	0.00	....	0 00	20
21	58.67	66.5	52.7	13.8	29 7733	29.900	29.624	.276	.3868	78 3	51.7	W.	11.29	7.2	10	0	30	0.22	....	0 22	21
22	59.88	68.8	53.5	15.3	30 0415	30.108	29 900	.208	.3960	77.3	52.5	N.	10.08	4.7	10	0	64	0.17	....	0.17	22
23	66.33	74.8	52.8	22.0	30 0138	30.141	29.861	.280	.4283	66.8	54.5	S.W.	14.12	4.3	10	0	77	0.00	....	0.00	23
24	68.70	74.8	61.3	13.5	29 6575	29 861	29.404	.457	.5412	75.8	60.7	S W.	19.71	9 2	10	5	12	0 02	....	0.02	24
25	70.43	77.8	64 5	13.3	29.3288	29.404	29.271	.133	.6470	87 0	66.3	S.W.	16.71	9.8	10	9	5	0.27	....	0.27	25
SUNDAY..... 26	....	78.0	62.0	16 0	.....	.....	.....	.....	.....	....	....	S.	14.87	....	..	..	53	1.00	....	1.00	26.....SUNDAY
27	66.60	73.4	59.0	14 4	29 9872	30.013	29.921	.092	.5418	82 8	61.2	S.	7.33	8.5	10	4	51	0.85	....	0.85	27
28	66.43	74.2	63.5	10.7	29.8513	29.991	29.796	.195	.5972	91.5	63 7	S	11.04	8 0	10	0	4	....	....	....	28
29	69.88	78.2	63.1	15.1	29.9477	29 978	29.857	.121	.5567	76.7	61.8	N.	6 96	3.8	10	0	82	0.01	....	0.01	29
30	72.65	82.2	61.7	20.5	29.8983	29.989	29.770	.219	.6067	75.7	64.2	S.W.	14.12	3.7	10	0	63	....	....	....	30
Means.....	64.80	72.90	56.59	16.31	29.9388	30.0392	29.8302	.2090	.4694	75.29	56 38	S. 65¼° W.	11.79	5.75	9.4	1.6	49.2	5.57	....	5.57	.....Sums.
24 Years means for and including this month	64.84	73.58	56.32	17.25	29.9061	.....	.....	.152	.4356	70.0	....	....	s 13.05	5.61	.	..	¶53.28	3.60	....	3.60	24 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	2785	218	184	219	2828	919	1292	31	
Duration in hrs..	274	28	21	19	227	48	97	4	2
Mean velocity....	10.16	7.79	8.76	11.53	12 46	19 35	13.22	7·75	

Greatest mileage in one hour was 32, on the 25th.

Greatest velocity in gusts 42 miles per hour on the 25th.

Resultant mileage, 1,630.
Resultant direction, S. 65¼° W.
Total mileage, 8,486.
Average velocity 11.79 m. p. h.

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

§ Observed.

† Pressure of vapour in inches of mercury.

‡ Humidity relative, saturation being 100.

¶ 17 years only. s 12 years only.

The greatest heat was 82°.3 on the 1st; the greatest cold was 46°. 0 on the 10th, giving a range of temperature of 36.3 degrees.

Warmest day was the 30th. Coldest day was the 10th. Highest barometer reading was 30.336 on the 4th. Lowest barometer was 29.271 on the 25th, giving a range of 1·065 inches. Maximum relative humidity was 98 on the 28th. Minimum relative humidity was 42 on the 15th.

Rain fell on 19 days.

Fog on 3 days. Thunder storms on 9th, 12th, 14th 18th, 21st, 24th, 26th and 28th.

Earthquake on the 1st.