que de dire comme certains naturalistes qu'on ne doit faire des espèces qu'à *son corps défendant*, et de se lamenter sur le nombre de celles qui se trouvent dans les catalogues. Je suis convaincu qu'on n'a pas reconnu toutes celles qui existent dans les collections, ou que beaucoup sont encore confondues sous le même nom. Si nous ne pouvons reconnaitre les modifications presque infinies de la nature, nous ne devons nous en prendre qu'à la faiblesse de notre intelligence; mais vouloir les borner et les restreindre, c'est une petitesse d'esprit, c'est s'éloigner de toute étude philosophique, c'est vouloir abaisser la nature à son niveau, mais non chercher à la comprendre. Il y a bien plus d'inconvénients de confondre une espèce, que de présenter une variété, comme une espèce; en effet, dans le premier cas il se trouve offrant de très-grands rapports d'organisation et de mœurs avec les espèces voisines, présente aussi quelques différences, qui lui sont propres, et qui constituent sa spécialité; c'est un très minime anneau de la grande chaine, qui necessairement unit, ou se lie d'une manière intime avec ceux qui lui sont proches; c'est un passage, une nuance de rapports qui nous échappe; c'est un fait de moins dans la science. Dans le second cas, c'est un être étudié sous plus de rapports; c'est un fait de plus dans la science. Ici la science s'est enrichie, là il y a ignorance; et, qu'importe qu'on ait donné un nom à cette variété, puisqu'elle mérite être notée, l'étude des variétés n'est-elle pas le complément nécessaire de l'histoire de l'espèce; mais l'erreur reconnue, il n'y a qu'un nom de trop, le fait reste. On me dira ce que un être omis, méconnu, qui cependant, tout en vous appelez espèce, nous l'appelons variété, et nous l'avons noté; mais il est évident que si cet être eût été suffisamment étudié dans tous ses caractères, on en aurait fait une espèce. Je ne chercherai pas à définir l'espèce, on a dit que c'était un être qui dans ses générations successives présentait toujours les mêmes caractères d'organisation, *et il faut ajouter dans les mêmes localités et les mêmes circonstances extérieures; car il y a des variétés qui dans certaines localités et circonstances, présentent des différences constantes, et qui pourtant ne paraissent pas des espèces*, ce sont des modifications locales que la sagacité de l'observateur doit reconnaitre; mais quelquefois la chose est difficile: c'est dans ce cas surtout qu'il vaut beaucoup mieux les présenter comme des espèces,[1] car en agissant ainsi on sera porté davantage à les étudier sous tous leurs rapports. *Les espèces sont certainement dues à une différence des localités ou des circonstances extérieures.* Ainsi les espèces enfouies dans la terre et qui ont été détruites par les cataclysmes, sont toujours différentes des nôtres, et les espèces sont généralement différentes aussi, selon les divers points de la terre; mais il est impossible de comprendre pourquoi, et à quelle époque la nature a mis pour ces êtres un terme dans leur modification et les a constitués espèces; et quoique bien certainement il ne paraisse plus s'en former, il *est cependant certains insectes qui semblent à peine limités dans leur modification.*

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[1] Certaines localités peuvent quelquefois influer d'une manière remarquable sur les èspèces; ainsi, dans les îles de Corse et de Sardaigne, qui ne sont que la même chaine interrompue, des insects du continent qui se présentent toujours sous leur véritable type dans la plus grande partie de l'Europe, ont éprouvé dans ces îles, dont certains points ne sont pas à cinquante lieues en mer, une modification telle, que l'observateur se demande avec doute si ce ne sont pas des espèces réelles; ainsi notre *Vanessa urticæ* est devenue *V. ichnusa;* mais aussi la larve se nourrit d'une nouvelle espèce d'*Urtica*. Les *Satyrus megera, semele*, se sont modifiés en *Sat. tigelius, aristeus*. Chez les uns la modification est plus prononcée que chez d'autres.

GLACIAL NOTES FROM THE CANADIAN ROCKIES AND SELKIRKS.

INVESTIGATIONS upon the largest of the accessible glaciers along the line of the Canadian Pacific Railway were begun by the writer in 1902, carried forward during the season of 1904 under the auspices of the Smithsonian Institution and continued during the season just closing. The precipitation from the coast to the Rockies during the winter of 1904–5 was exceptionally light. At Victoria for the months September to April, inclusive, the total precipitation reported was but 21.18 inches, or only 57.1 per cent. of the normal for this region. At Banff, east of the Continental Divide, the total amount for these months was 5.83 inches, or but 53.3 per cent. of the normal. The official records for Glacier, in the Selkirks, are incomplete, but the snowfall for the winter is reported as fifteen feet, which is but one quarter to one third of the usual amount. Following this exceptionally mild winter the summer has been bright

and warm and much melting over and about the glaciers has occurred. Snow has been removed from portions ordinarily covered throughout the year, exposing numerous crevasses and concentrating relatively large quantities of foreign material upon the surface of the ice. The dirt zones, dirt bands, stratification and all the phenomena based upon the differential melting of the ice have stood forth with unusual clearness, so that the season has been an exceptionally favorable one for glacial study. A reexamination was made of the five glaciers upon which a preliminary report was published in May, 1905.[1]

I. *Victoria Glacier.*—Located at the head of the Lake Louise Valley, this glacier is nourished by the snow which falls between Mount Lefroy and Mount Huber, the snow and ice which are avalanched from these mountains and Victoria and that supplied by the double tributary. The avalanches during the spring and summer have been exceptionally numerous and heavy from the hanging glaciers, partially making up for the loss occasioned by the unusual warmth of the summer and the diminished precipitation of the past winter. Along the oblique front the retreat has been much greater for the year than for any other since observations began in 1898. From September 13, 1904, to September 2, 1905, this amounted to 20.35 feet, the average retreat for the last six years being, at this point, 14.5 feet. Some 300 feet farther down the valley the retreat between the above dates amounted to 13.2 feet.

The real nose of the Victoria glacier is completely veneered with rock debris, so that the ice is not visible and is effectually protected from melting. The last episode here was one of advance, the glacier having invaded the forest and mounted an ancient moraine. From July 9 to September 13, 1904, a small stream of clear, ice-cold water was observed to flow from this part of the glacier and stones embedded in the front had settled back an inch. During the year this very small amount of recession has been made up, the points selected upon the boulders lacking but .03 to .06 of a foot of regaining the position occupied when the stations were established, and the nose has been practically stationary.

July 9, 1904, a line of 18 steel plates was set across the Victoria glacier, approximately 100 feet apart and 3,600 feet back from the nose. Although the glacier is here straight, the maximum movement was found to be two thirds of the way across, at plate No. 13, and averaged for 20 days (July 9 to July 29) 2.74 inches daily. In remeasuring the distances moved by the series of plates (July 29, 1904, to September 5, 1905) it was found that plate No. 11 had made the greatest advance, 71.8 feet, giving a daily average of 2.14 inches, or 80 per cent. of its midsummer motion. Forbes's dirt-bands were located in 1904 from the surface of the glacier itself and their distances approximately determined. This season it was found that their upper margins were sharply defined, when seen from a distance of two thirds of a mile, or more, and with the help of an assistant these margins were marked by means of small cairns and their distances afterward measured with a steel tape. From the base of the ice slope upon which they are formed some 19 bands were thus located, their distances apart, expressed in feet, running as follows: 159, 174, 126, 124, 113, 109, 100, 83, 75, 100, 86, 88, 57, 81, 66, 83, 83 and 45. These bands, which are transverse to the glacier at the time of their formation and but slightly curved, become more and more convex down stream and indicate by their shape the locus of maximum surface motion, and there is reason for thinking the approximate annual motion of the ice.

II. *Wenkchemna Glacier.*—As reported previously, this is a piedmont type of glacier, near the head of the Valley of Ten Peaks, made up of some twelve component streams, placed side by side. It lies close in upon the northern side of the great Wenkchemna series of peaks, which form here the Continental Divide. These peaks supply the snow, protect the meager névé field from the noonday sun and contribute quantities of rock debris with which the glacier is almost completely covered. In August, 1904, a series of eight stations was

[1] *Smithsonian Miscellaneous Collections*, Quarterly Issue, Vol. 47, Pt. 4, pp. 453–496.

established along the front and accurate measurements made between definite points upon boulders firmly planted in the front of the glacier and others in the moraine and temporarily stationary. During a period extending over 34 days in 1904 (August 9 to September 12) it was found that the extremities of some of the component streams were stationary, some slowly wasting and others advancing. From September 12, 1904, to September 8, 1905, all the blocks carried at the front of the glacier indicated an advance, the horizontal component of which varied from .15 foot to 1.7 foot. The least movement occurred about the ends of those streams which make up the eastern half of the glacier, while the greatest was about half-way up the long front, opposite Mount Deltaform, where the rolling stones from the glacier are now cutting trees. All the evidence points to the fact that we have here an exceptionally sluggish glacier, which owes its existence to the peculiar conditions under which it has been formed and is now maintained.

At the head of Paradise Valley, the next valley to the west, the Horseshoe glacier is also of the piedmont type, with some fifteen or sixteen component streams. The supply of snow is meager and derived from Mounts Hungabee, Ringrose and Lefroy. The glacier carries much less surface debris than the Wenkchemna and is in slow retreat, the western end having already separated from the main body. In front of each portion there lies a collection of coarse, weathered fragments of the mountains, which are to be correlated with the 'block moraines' of the neighboring glaciers.

III. *Wapta Glacier.*—This imposing ice stream occupies the head of the picturesque Yoho Valley, to the west of the Continental Divide, and is nourished from the great Waputehk snow-ice field. From its great 300-foot archway issues the north branch of the Kicking Horse River. The nose of the glacier lies to the east of this stream and rests upon bed-rock, over which it has been slowly retreating. During the past year (August 18, 1904, to August 31, 1905) this retreat has amounted to 9 feet, as compared with 23 feet of the previous year. The average annual retreat for the past four years is 30 feet. From certain data discovered last season it was calculated that the glacier is shrinking laterally down the eastern mountain slope at the rate of five to six feet a year. Upon the west side of the river the ice front at one point has receded 4.6 feet during the past year.

IV. *Illecillewaet Glacier.*—Passing westward to the Selkirks, we have two glaciers occupying adjoining valleys, the larger of which has more visitors each year than any other glacier upon the western continent. Owing to its size and easy accessibility it has been longer under observation than any other of the Canadian glaciers. Since 1887 it has been in continuous retreat at a mean annual rate of 33.6 feet. For the last seven years this rate has been 25.6 feet. The retreat for the year 1903–4 was 11 feet and for 1904–5 (September 1 to August 25) was but 2.1 feet. This diminution in the recession of the ice front suggests that the glacier is preparing to inaugurate an advance, which would probably have been begun this season had the summer been less warm. Such a result was to have been anticipated from observations made in 1899 by George and William Vaux. Upon comparing their photographs of the glacier, taken from the same view point in 1898 and 1899, it was noted that the ice was increasing in volume in the upper part of the glacier. Along the western side of the glacier, near the nose, a wall of ice about 60 feet high has withdrawn 2.4 feet from the bed-rock, in two years. Around upon the eastern side, at two stations, there has been a retreat of 14 and 16 feet, respectively, during the past year, while higher up the ice has practically held its own for two years.

V. *Asulkan Glacier.*—Owing to its covering of fine gravel and glacial sand the nose of this glacier has behaved exceptionally during the past six years. In August, 1899, the Vaux brothers established a line of reference, marking the position of the nose. During the year following the nose withdrew up the valley a distance of 24 feet. On September 17, 1903, the writer found that the nose had pushed its

way 13.5 feet beyond this line, was ploughing into ground moraine and overturning boulders. August 27, 1904, the nose stood 12.5 feet beyond the Vaux line, indicating but little change. August 27, 1905, it was found to have retreated 34 feet from its position of last year, with its nose embedded in debris, standing 21.5 feet back from the reference line of 1899. This nose now consists of a thin slab of ice, sloping to the west and veneered with fine debris, so that a small amount of melting will lead to a further recession of 30 to 35 feet. The ice in the left lateral moraine is seen to extend four feet beyond the reference line, 25.5 feet beyond the nose, and probably extends several feet farther. Thus while its neighbor, the Illecillewaet, seems preparing for an advance, the Asulkan has made an unusually, for it, great retreat and seems ready, the coming year, to repeat the performance.

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BOTANICAL NOTES.

THE MISSOURI BOTANICAL GARDEN.

The administrative report for 1905, of which advance galleys have been received at the office of Science, is an unusually long and full one. The officers of the board of trustees preface their annual financial statement by an abstract history of the institution for the sixteen years during which it has been under their charge.

Attention is called to the fact that while the gross revenue from the Shaw estate has increased 32.5 per cent. general taxes have increased 62 per cent., while heavy special street and sewer taxes have compelled close economy in the administration of their trust and ultimately absorbed a large fund saved out of the revenue to meet these or other emergency calls. By the conversion of unproductive property bequeathed for the support of the garden into income-yielding property, however, they are hoping to largely increase their revenue; and the belief is expressed that the full realization of the purposes of the founder of the garden and the plans of its director is only a question of time —the foundation being ample and safe.

The value of the original garden, with permanent improvements, is said to have nearly doubled, and details are given of the larger items of improvement. Its area has also been increased nearly one half. Plant houses and frames have been more than doubled in capacity, and the collection of living plants has grown from not over 3,000 to about 16,000 species. The library has been enlarged from about 5,000 to over 50,000 books and pamphlets, and is valued at $84,248. The herbarium, from about 60,000 unmounted specimens, has increased to 524,000 mounted sheets, valued at $79,216.

From a gentleman's country estate, the institution has thus been brought into a well-grounded scientific establishment which now has exchange relations with 859 institutions interested wholly or in part in gardening, horticulture or forestry. The average annual expenditure on its maintenance is said to be $43,675.33, of which the larger items are $23,271.39 for gardening, $5,217.67 for office expenses, $4,418.82 for the library, $2,531.91 for the herbarium, $930.34 for the instruction of garden pupils and $1,000.83 for research purposes. An average of 83,500 persons visit the garden yearly.

Training in gardening has been given to 39 persons, of whom 15 completed the four years' course; and twenty of the number are stated to be now responsibly and successfully employed. In addition to participating in undergraduate botanical work in Washington University, with which the garden is closely allied, though it is independently managed, graduate opportunities have been offered which have enabled five persons to win the master's and six the doctor's degree, with major work in botany. Through the entire period, the policy of administration has been to afford the freest use of the garden facilities for investigation, and to provide for the research use of a part of the time of capable employees, and the Annual Reports of the garden are well known for their original contributions to botanical knowledge.

It may not be generally known that the