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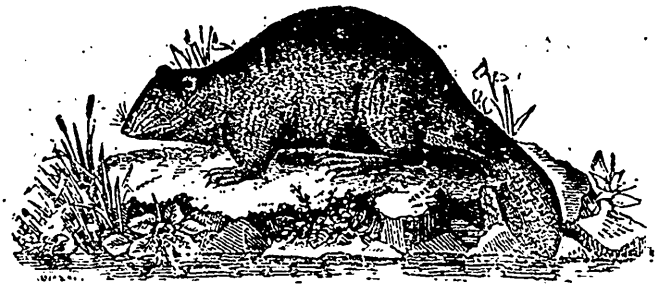
June, 1894.

THE OTTAWA NATURALIST

VOLUME VIII. No. 3.



THE BEAVER (*Castor Canadensis*, Kuhl).

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Treasurer's Balance Sheet Club Year ending 20th March, 1894.

RECEIPTS.

Balance on hand from 1892-93		$34 20
Subscription fees received :—		
Arrears of previous years	$68 00	
For current year	149 00	
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Printing Ottawa NATURALIST Vol. VII	$216 13	
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OTTAWA, 20th March, 1894.

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J. BALLANTYNE, WM. A. D. LEES, } *Auditors.*

OTTAWA EAST, 28th March, 1894.

REPORT OF THE BOTANICAL BRANCH, 1893.

To the Council of the Ottawa Field-Naturalists' Club :

The Leaders have much pleasure in reporting that a considerable amount of good work has been done during the past season, several new plants not previously reported from this locality having been discovered by members of the Club at the Excursions and sub-excursions. Good work has also been done at excursions made by one or two members who have visited localities too far distant to be reached by the whole section. Excursions were made to various points on the Gatineau Valley Ry. by Messrs. R. B. Whyte and John Craig and Prof. Macoun. Mr. Scott and Mr. Fletcher made several visits to the Mer Bleue and Cassleman, and made interesting collections. Mr. R. H. Cowley makes the following interesting report : "The colony of the introduced North Western plant—*Grindelia squarrosa*—first observed some years ago at the old Eddy mill-site in Nepean, is still in a prosperous condition. It is multiplying rapidly and seems to have found a congenial habitat." During the third week of August Mr. Cowley paid a brief visit to Clarendon, in Pontiac County, and visited a few of the neighboring islands in the Chats Lake, on all of which he found many specimens of *Lobelia Kalmii*, *Potentilla fruticosa*, *Pycnanthemum lanceolatum*, and *Aster ptarmicoides* in full flower. The last three were first found by Mr. R. H. Cowley and Mr. R. B. Whyte on the Chats Island in 1891.

The following plants may be mentioned among the more interesting of the season's collections :

RANUNCULUS SCELERATUS, L. This addition to the *Flora Ottawaensis* was made by Mr. R. B. Whyte. The specimen was found at Borthwick's Springs on July 8th.

MYRIOPHYLLUM ALTERNIFOLIUM, DC. Specimens of this rare water weed were found by Mr. Wm. Scott in Brigham's Creek, Hull, Que. They were in fine condition in September and were growing in about a foot of water. The only other recorded locality for this plant is "Lake Memphremagog, July, 1866." (Macoun's Cat. V, p. 322.)

LONICERA CÆRULEA, L. The two bushes of this species which grow near the gas spring in the Mer Bleue were visited this year and good specimens obtained.

L. OBLONGIFOLIA, Muehl. In a small swamp 4 miles past Casselman on the right hand side of the railway, there are hundreds of bushes of this pretty honeysuckle. The bushes are about three feet high, oval and symmetrical in shape. The long pedicelled flowers, which distinguish this from the last species, open early in June and are followed by the two purple, nearly distinct berries in July.

SENECIO AUREUS, L. var. BALSAMITÆ T. & G. Specimens of this variety were collected by Mr. Cowley near the old Bristol wharf up the Ottawa, growing below high water mark in crevices of limestone rocks.

ARTEMISIA CANADENSIS, Michx. This interesting addition to our local flora was made by Mr. W. E. Saunders, who found it growing on the rocks below the Hog's Back. It has also been found at Mermaid Mountain, Wakefield, by Mr. R. B. Whyte.

LACTUCA SCARIOLA, L. The Prickly Lettuce, an introduced plant, was found by Mr. Fletcher along the Canada Atlantic Ry. near Stewarton and good specimens were secured.

PHYSALIS VIRGI[illegible]NA, Mill. On a few sandy knolls in a meadow at Clarendon Mr. Cowley found some vigorous colonies of this plant. There were mature fruit and fresh blossoms on the same specimens although the plants had been cut down by the mowers only a few weeks previously.

LOPHANTHUS NEPETOIDES, Benth. This is a rare plant here, so far having only been found at Casselman; good specimens were collected this year by Mr. Scott.

AMARANTUS BLITOIDES, Watson. Found at the side of the road which leads from Rockcliffe to Hemlock Lake by Mr. Scott. (Sep. 3). This species had evidently been overlooked by less wide-awake collectors than Mr. Scott. It has much the appearance of the prostrate form of *A. albus*, L. which frequently grows in roads; but can at once be separated when examined.

In *A. albus* the floral bracts are twice longer than the flowers, while in *A. blitoides* they are shorter than the flowers, and the seed of *A. albus* is less than half the size of that of *A. blitoides.*

LISTERA AUSTRALIS, Lindl. A bed of this rare little orchid, not previously recorded as having been found in Canada, was discovered by

Mr. Fletcher, beyond the Poplar Ridge in the Mer Bleue on June 21.

ARETHUSA BULBOSA, L. This lovely orchid was found in great profusion by Mr. Scott near the gas spring in the Mer Bleue in the second week of June.

POLYGONATUM GIGANTEUM, Dietr. Half a dozen specimens of this handsome plant were collected about a mile and a half from Casselman by Mr. Fletcher. They were growing in low ground along the Canada Atlantic Railway and undoubtedly indigenous. Stems 3-4 feet high, peduncles 3-6 flowered. The occurrence at Casselman of this and such plants as *Thaspium aureum*, Nutt., *Aster Novæ-Angliæ*, L., *Rudbeckia laciniata*, L., *Helianthus decapetalus*, L., *Phlox divaricata*, L., *Saururus cernuus*, L. & *Carya alba*, Nutt. is very remarkable, for all belong to a flora much more western and southern than that of Ottawa.

POTAMOGETON VASEYI, Robbins. Fine specimens of the rare form with emersed leaves and fruit spikes were collected by Mr. Scott, in August, at Kettle Island.

ERIOCAULON SEPTANGULARE, Withering. Specimens of this curious plant were collected in Lake Harrington, Que., on September 22. It had once previously been found by Mr. Latchford at Masham, Que.

ERIOPHORUM RUSSEOLUM, Fries. The cotton rushes were exceptionally beautiful last season. *E. vaginatum*, L., with large silky white heads and the similar *E. russeolum* with its no less handsome tufts of tawny silk were very conspicuous in the Mer Bleue. *E. gracile*, Koch, and *E. polystachyon*, L. formed large beds of waving white tassels along the railway from the St. Louis Dam to the Rideau River. Later in the season *E. Virginicum*, L., both the type and the white variety were abundant at the Mer Bleue.

HELEOCHARIS TENUIS, Schultes. This species omitted from the Flora has been found by Mr. Cowley at Clarendon. It also occurs at several places about Ottawa.

ERAGROSTIS REPTANS, Nees. Two localities for this pretty little grass have been discovered near Ottawa by Prof. Macoun. On the road along the Ottawa to the west of the wharf at Buckingham in September, 1891, and in the same month in a disused quarry to the north of Brigham's Creek, Hull, Q.

PHRAGMITES COMMUNIS, Trin. A few patches of about 6 stems were found in a swamp 4 miles past Casselman.

GLYCERIA ELONGATA, Trin. Large beds of this elegant and rare grass occur along the streams running into the Nation river, along both banks, at Casselman. Specimens were found at the same place by Mr. Fletcher ten years ago, but it had not been collected since till rediscovered again this year by Prof. Macoun and Mr. Scott.

ASPIDIUM ACULEATUM, Swartz, *var.* BRAUNII, Koch. Several fine specimens of this fern, together with *Comptosorus rhizophyllus*, Link, and *Asplenium Trichomanes*, L. were found on September 22nd in a ravine near old Chelsea.

In conclusion the leaders beg to express the regret they feel that Mr. Wm. Scott has left Ottawa to reside in Toronto, knowing how much the section owes to the energetic and enthusiastic manner in which he has assisted of late years in working up the flora of the Ottawa district. They trust, however, that he may find it possible to join us in many future excursions.

R. B. WHYTE,
JOHN CRAIG,
R. H. COWLEY, } *Leaders.*

FIRST EXCURSION, 1894.

Of the many delightful excursions held by the Ottawa Field-Naturalists' Club during the fifteen years of its active and prosperous existence, that of Saturday, May 26th, may well be awarded a first place as a typical Outing. It was not quite so large as that of last May, but in addition to the ordinary train accomodation, three special cars were required to convey the happy and enthusiastic party of Nature's students and admirers. Leaving the city at 1.30 p.m. the Chelsea station was soon reached and Vice-President Shutt announced the programme of the afternoon. The members rapidly dispersed through the adjoining fields and groves, armed with plant-boxes, insect-nets, hammers, cameras, sketch-books and other impedimenta. The Gatineau river, here flowing through a picturesque gorge in the forest-clad hills, naturally attracted a large proportion of the party, and the beautiful falls and rapids over which the swift waters madly rush, called forth many exclamations of genuine pleasure and admiration. It was an

ideal afternoon for vigorous exploration or for more leisurely sauntering, and the bright sun and clear sky formed a pleasant contrast to the gloom and dampness of the Wakefield excursion last year. The afternoon passed rapidly and pleasantly in profitable investigations of the surrounding region, and in enjoyment of the many beauties of this wild and romantic stretch of the dark, turbulent river. At 6 p.m. as previously arranged, the party reassembled at the station to hear the Leaders explain and discuss the collections of the day, or refer briefly to special features of interest in connection with the neighborhood or the several branches of investigation. Mr. Shutt, after congratulating the members and their friends upon the profitable and delightful character of the excursion, called attention to the fact that the Club was honored by the presence of Dr. Scudder, of Cambridge, U.S., Prof. Fowler, of Kingston, and Dr. McKay, of Halifax, and that these eminent gentlemen would kindly say a few words to the assembly when the Leaders had delivered their five-minute addresses. Mr. Cowley rose first as Botanical Leader and pleasantly discussed some of the plants collected, including those belonging to the lily and orchid families. He was followed by Mr. Whyte who spoke especially of the representatives of the great rose family, pointing out how unusually early the various species had flowered this season, and what favorable indications there were for a large and early fruit crop. Prof. Fowler spoke in forcible terms of the way in which he had been impressed by the romantic and beautiful scenery, and of the great pleasure which such views of rugged hills and broken river afford to one whose time is mostly passed amid the more peaceful landscapes of a level country. Mr. Fletcher briefly stated the pleasure and advantage to be obtained from the study of his favorite butterflies, and outlined in a very interesting manner the life of these beautiful "flowers of the air." Dr. Scudder's brief speech included some humorous remarks on the methods of investigation pursued by the friendly mosquito, of which he had noted three species during the very enjoyable afternoon. Dr. Ami referred briefly to a deposit of Saxicava sands which occurred not far up the railway track, containing various marine shells, and proving that in past ages the ocean surf had thundered against the rocks of these

Laurentian hills. The hour of departure was rapidly nearing so several of the Leaders had to be omitted and Dr. McKay appropriately concluded with a very enthusiastic expression of the pleasure and profit with which he had followed the proceedings of the afternoon. The knowledge which he had thus acquired of the working methods of the Club, he hoped to utilize in connection with the natural history society which existed in Halifax. The city was reached at 8 p.m., and electric cars were in waiting to carry home the satisfied field-naturalists.—(*Ed.*)

BREPHOS INFANS, MOESCHLER, AT OTTAWA.

A good specimen of this rare and beautiful moth was taken on April 12th in the firwoods behind Rideau Hall by Lady Marjorie A. Hamilton-Gordon. One had been seen at the same spot two days previously, flying high up among the trees. *B. infans* is a very showy moth; it expands over an inch and a quarter, having the upper wings of a deep mottled brown crossed by two white bands towards the tips; the under wings are bright orange-scarlet margined with black, and have also a broad black band running from the base to the anal angle from the end of which a narrow zigzag extensions runs across the middle of the wing.

The genus *Brephos* belongs to the small family BREPHIDÆ of which there are only five species catalogued from North America, three of which belong to *Brephos* and two to *Leucobrephos*. Dr. Packard says of this family as follows (Guide to the Study of Insects, p. 316):—

"In *Brephos* the hind wings are bright orange, the body is hairy and the antennæ are ciliated; the abdomen is slender, and the wings are broader than usual. The larva is smooth, elongate, with 16 legs, though the first two abdominal pairs are useless for walking; hence the larva has a semi-looping gait. It feeds on trees and makes a slight cocoon in moss or under bark. *B. infans* Moeschler inhabits Labrador and New England. It flies early in April before the snow has left the ground."

Lady Marjorie has collected several other good insects this spring but the species mentioned above, has previously been looked for in vain by Ottawa collectors.

J. F.

A BROOD OF FLICKERS AND HOW THEY WERE FED.

By A. G. Kingston.

In an article under the above title published in *The Auk* for July last Mr. Wm. Brewster, the well-known ornithologist, of Cambridge, Mass., recounts some highly interesting observations made by him on the breeding and feeding habits of a pair of these woodpeckers.

The decayed tree in which the nest had been excavated in this instance was accidentally broken off when the nestlings were about a week old, in such a way as to leave them almost entirely uncovered; and Mr. Brewster, by concealing himself not many feet away, was able to view clearly all the operations of this woodland nursery. His notes are given in minute detail. They show that in this species the young are fed by *regurgitation*.

The old bird used to visit the nest to feed the young at intervals of from twenty to sixty minutes. It was seen that no food was carried in the bill and apparently little or none in the mouth or upper throat; but looking down into the five clamourous and wide-open mouths, the parent would plunge its bill deep into the first, "as if," says the writer, "with the design of piercing its offspring to the vitals," and by a series of quick, convulsive movements, would seem to pump up the food from its own stomach and inject it into that of the young bird. And so with the next nestling and the next, until all were satisfied or the store was exhausted. The prey of the Flicker is known to consist largely of ants, together with such larvæ, &c. as inhabit dead wood; and it is apparent that by swallowing each insect as soon as captured, the bird would be able to collect, and hold securely to the end of the trip, sufficient food to supply the whole or a large portion of the family.

It is pleasing to learn that in spite of the exposure to the weather through the unroofing of their home, and in spite of the loss of the mother bird, which seems to have been destroyed about the time that Mr. Brewster began his observations, the whole five nestlings were safely reared, at least until able to fly away from sight.

Opportunities like this for studying the breeding habits of woodpeckers and other birds that breed in holes are rare indeed, but they may occur to any student of bird life. One who is lucky enough to stumble on another such chance should not fail to use diligently both eye and pencil.

THE TRANSMUTATIONS OF NITROGEN.

By Thos. MacFarlane, M.E., F.R.S.C.

I am to speak to you this evening about Nitrogen. Very likely I might not have had the honor of thus addressing you had I not felt bound to try to repay your worthy Vice-President, Mr. Shutt, for the kind turn he did St. George's Church Association in lecturing to them a year or two ago on Oxygen, an equally important element, but much more energetic and meddlesome than Nitrogen. Now since Oxygen and Nitrogen may be said to be partners in many of the operations of nature, I may be said, in giving this lecture, to be paying Mr. Shutt back in his own coin. I prefer this expression and must carefully avoid referring to the transaction as an exchange of gas, for "gas" has come to be used as a figurative expression for other things besides oxygen and nitrogen: in fact, generally speaking, for eloquence of an unreliable character. Of course it is part of my task to-night to avoid eloquence of this nature and confine myself to sober and well authenticated facts

In choosing "Nitrogen" for my subject to-night it has seemed to me that I could not do better than call attention to this more abundant, although less active and less positive constituent of the atmosphere, and trace certain of the wonderful changes which it undergoes in nature, for nitrogen, no less than oxygen, performs its rounds, and moves in stupendous cycles through the inorganic, the animal and the vegetable worlds. Not unfrequently, these changes are so mysterious, and their results so strange and inexplicable that I have ventured to characterise them as transmutations. This term, as you well know, is applied to the supposed process in which the old alchemists believed, by which one metal was supposed to be actually converted into another; and more especially base metals changed into gold. Conversions almost as miraculous, transformations almost as astonishing are produced in the properties of the compounds into whose composition nitrogen is introduced. That element assists by turns in building up an atmosphere, a food, a poison, a colour, the bloom of a flower, the fibres of a muscle, the feathers of a fowl, the force of an explosive. We may therefore truly speak of its transmutations.

But what is Nitrogen? A simple body, colorless, tasteless, in odorous, as the chemical text books tell us. And they used also to say that it was always gaseous when uncombined. So it is at ordinary temperatures, but it can be frozen at 346° below zero Fahrenheit when under enormous pressure. Then it becomes, according to Professor Dewar, a white crystalline substance. His apparatus for producing it cost something like £5000 and cannot very well be reproduced here. But although we cannot have the solid nitrogen we have plenty of the gas. When the ladies use their fans it is mainly to put nitrogen in motion. It is the sleeping partner of oxygen in carrying on the business of the atmosphere. It is a mysterious element, fickle, indifferent and unstable, but it is most abundant and constitutes four-fifths of the ocean of air at the bottom of which we live, move and have our being. The experiment which demonstrates this is very old, but like a good story is none the worse of being twice repeated.

All the interesting positive properties of the atmosphere are due to oxygen. Nitrogen is only present as a diluent, a restraint, a drag. It is mixed with the oxygen in a mechanical sort of way to prevent its doing too much damage, like water in whiskey. There is no intimate chemical combination betwixt the gases of the atmosphere. In fact nitrogen does not combine willingly with the other elements and is always ready to part company with them at very short notice.

The question "What is nitrogen?" can, however, be asked and answered with the same significance as the enquiry "What is butter to-day?" when asked by purchasers at the market. Nitrogen has its price like butter, and in fact the latter is sometimes sold at no higher price per pound. Here we have three jars containing respectively dried blood, sulphate of ammonia, nitrate of soda; all articles of commerce and used in Canada chiefly as fertilisers. All contain nitrogen, although in different combinations, and in all of them the nitrogen is worth about 16 cents per pound. Inside of these bottles then its value is considerable; outside of them, in the atmosphere, it is valueless. Inside the bottles it is combined, outside it is free; free as air and as cheap. But just fancy how rich we should all be if this free nitrogen could be fixed and realized in the form of money. Fifteen pounds of air press upon

every square inch of the earth's surface : that contains 12 lbs. of nitrogen at 16c. ; very nearly $2 per square inch or $288 per square foot. If we calculate at these rates the value of the atmospheric nitrogen resting upon a square acre it amounts to twelve and a half million dollars and on a farm of 100 acres one thousand two hundred and fifty millions. It would be quite interesting if we were to give a history of the attempts that have been made to realize or fix this nitrogen and get it into the form of ammonia, nitric acid or cyanogen. But the chemists have all failed to do this economically and the only person who has it in his power to utilize it to a certain extent is that humble individual the farmer.

For nearly a century and a quarter the question of the utilisation of nitrogen by plants has been a subject of controversy among scientific men. It was the famous Priestly who began it in 1771. He and, a few year's later, Ingenhous pointed out that plants are able to assimilate very appreciable quantities of nitrogen from the air. Saussure denied this, so did Woodhouse and Sennebier, all of them basing their conclusions upon experiment. The famous Liebig also wrote on the same sides. Then the question slept until 1851 when Boussingault renewed the controversy and both he and George Ville from their experiments maintained the affirmative side of the discussion. A commission of the Academy of Paris took their side, but later Cloëz, Mène, Hartung and Gunning came to an opposite conclusion. In 1861 Lawes, Gilbert and Pugh ranged themselves on the negative side, but Bretschneider two years later made experiments with lupins and dwarf bean plants obtaining most positive proof of the assimilation of atmospheric nitrogen. Perhaps the conflicting conclusions previously arrived at had been owing to a want of sufficient care in the observations made on different sort of plants. In any case Bretschneider's results only confirmed what was known about the cultivation of the papillionaceæ away back in the t me of the Romans. W. Strecker has disinterred a passage in Pliny (Natural History: Book XVIII.) of which this is a translation ; " Lupins, Lentils or Pulse require so little manure that they in fact replace it ; Vetches make the land fertile. Corn should be sown where previously lupins, vetches or beans have stood, because these only make the land more

fertile." Here we have the experience of antiquity agreeing with the practice of the modern intelligent farmer who ploughs clover into the ground in order to obtain a good crop of wheat.

From 1863, experiments and disputations on the question again ceased until 1881, when an intelligent land owner in North Germany, named Schultz, published his experiences in farming, and awakened the attention of the agricultural world of Europe. Both practical farmers and scientific agriculturists are now fully agreed that the fixation of nitrogen by leguminous plants is a reality. The most decided pronouncements ever made on the subject were delivered at Halle, in January, in 1891, at the 64th meeting of German investigators and physicians. Prominent among those were Maercker, Wagner and Hellriegel, but American and English authorities were also present including Atwater, Lawes and Gilbert. The last named gentleman, Sir Henry Gilbert, who visited Canada a few months ago, gave a discourse on the fixation of free nitrogen from atmospheric air by plants. He had presided in 1886 at Berlin, when Hellriegel gave the results of his first investigations regarding the question of nitrogen and the leguminosæ. Previously, in 1884, Hellriegel had brought the formation of the little bulbs on the roots into connection with the fixation of nitrogen. Sir Henry Gilbert told his audience that at Rothamsted, since 1888, elaborated trials on this subject had been carried on, the characters of which were illustrated photographically. Those experiments entirely confirmed Hellriegel's results. They shewed that peas, vetches, lupins, lucerne, white and red clover, are all capable of directly assimilating nitrogen, although in different measure. The lecturer discussed minutely the nature and action of the tubercles, without however coming to very decided results as regards their mode of activity. Some of them are as large as walnuts, and the investigators are still inclined to believe that the bacteria they contain are instrumental in digesting the nitrogen. Hellriegel was of opinion that the study of these tubercles was far from ended, and would occupy them a long time yet. He stated that peas are unable to appropriate either nitric acid or ammonia from the soil; that lupins cannot thrive when supplied with nitrate of lime, but perhaps with nitrate of ammonia. Meyer was glad to be able to observe that although Hellriegel's investigations had overtaken and

passed those of Rothamsted, the work was being continued in the friendliest manner, and utterly free from envy and dispute.

From these memoranda regarding this great meeting of agricultural scientists at Halle, it will be seen that the fixation of atmospheric nitrogen by plants of the sub-order papillionaceæ, is now established beyond all possibility of doubt and that that farmer will be the truest artist and become the richest man who makes the best use of these well established results of scientific investigation in agriculture.

But although it is a fact that these humble leguminous plants are so highly gifted by nature, it is equally certain that the cereals and other plants of a higher order cannot appropriate nitrogen in this direct way. They and their rootlets must search for it in the soil in the form of nitric acid, which may have been brought from the atmosphere into the soil or have originally existed as nitrogen in its organic matter or humus, or may have been produced by the oxidation of ammonia. Decayed vegetable matter, peat and black muck contain quantities of nitrogen varying from ¼ to 2 per cent. in the air dried condition. When this is composted or mixed with other soil and stable yard manure the nitrogen is gradually made available for plant food; in fact it undergoes a process of oxidation, being first changed into ammonia and then if bases are present into nitric acid. This lecture would certainly be incomplete without some notice of these important compounds. We shall now make some reference to ammonia; later on to nitric acid.

(Here experiments were introduced illustrative of the great solubility and alkaline character of ammoniacal gas; the formation of ammonium chloride and the oxidation of ammonia in the ignition of the bichromate.)

But it is our business this evening to go further and ask what use the plant makes of the nitrogen which it appropriates. It is immaterial whether we suppose that the nitrogen is assimilated as such or as ammonia or as nitric acid, in any case the use which is made of it by plants, and the wonderful products into which it is transformed by the vital activities at work in these, are simply miraculous. A very high authority, Mr. Warington, a colleague of Sir Henry Gilbert and Sir

John Lawes in the investigation at Rothamsted thus expressed himself on this wonderful peculiarity of the vegetable world:—"The immense variety of substances produced in the vegetable kingdom has always been a source of astonishment to the chemist. The plant is indeed the finest chemical laboratory with which we are acquainted. While some kinds of chemical work are common to all plants, there is hardly a species which does not possess some special capabilities, which does not produce some products different from its neighbors. When we survey the whole vegtable kingdom, the extent to which this specialisation is carried, and the immense variety of the products obtained become simply overwhelming. Chemists are still unacquainted with the larger part of the substances produced by plants. When we turn from the products of plant work to the materials employed our wonder still increases, for these materials are of the simplest kind—water, carbonic acid, oxygen, nitric acid and a few inorganic salts—yet out of these the whole of the immense variety of vegetable products is constructed."

In the interesting lecture by Mr. Shutt to which I have already referred, he traced the travels of oxygen and the manner in which that element carries carbon to the vegetable kingdom, and assists in storing it up in plants in the form of carbohydrates, such as starch and sugar and cellulose. These substances are, however, quite destitute of nitrogen, and we cannot say much about them now. We are tracing now the fortunes of nitrogen, and that element occupies itself in the plant in building up an entirely different set of compounds from the carbohydrates, namely, the albumenoids, or as Beilstein calls them the albuminates, or as Mulder christened them the proteids. In casting round for the word which indicates popularly those of them which occur in the vegetable world, I should be inclined to fix on the word gluten, but that substance is only a mixture of insoluble albumenoids, and it is doubtful as to whether it exists in the original grain.

No doubt this general name of albumenoids has been conferred upon all these bodies from the resemblance they bear in some of their properties and always in chemical composition to ovalbumen or white of egg. This substance is soluble in water in its natural state and coagulates on heating.

The albumenoids, whether of vegetable or animal origin have been characterised as "infusible, non-volatile amorphous solids, neutral in re-action and indifferent in combination." Thus it seems that their characterising element nitrogen has been able to impress its own individuality upon them, and the most characteristic chemical re-action they can show in one indicating the presence of nitrogen. When they are well dried and heated with soda lime, or even alone, they give off ammonia, which can be recognised by smell and reaction. There is always produced a disagreeable smell on burning nitrogenous substances (wool); not so when nitrogen is absent; (cotton).

The composition of animal and vegetable albumenoids is very nearly the same, and their chemical properties very similar. It is not usual to recognise the properties of white of egg in vegetable products, but it can be shown that a similar substance may be obtained from wheaten flour. On shaking some of it up with cold water, and filtering, a solution is obtained which coagulates on heating, on admixture with dilute acids, alcohol, &c.

The precipitate produced when the cold solution from wheat flour is heated is called plant albumen, but if this be filtered off and a little acid added to the filtrate we obtain a separation of what is called legumin or vegetable casein. This sort of casein is the chief albumenoid formed in the leguminosæ, in peas and beans, in their little laboratories, whenever they undertake, as is their proud privilege, to utilise the nitrogen of the atmosphere.

But the proteids which the cellular tissue of a plant manufactures from its nitrogenous food are not all soluble in water. In fact, however soluble they may be in the plant itself, comparatively little of them in quantity is found to be so after we get them into our hands. If we make a little dough from wheaten flour and knead it enclosed in a piece of calico, either in water, or with occasional immersion, the starch of the flour exudes through the small holes in the cloth, along with the soluble proteids. If this kneading is continued until no more white particles can be kneaded out, and the cloth is then opened there is found inside a grey coloured, elastic, sticky substance, which is known as "crude gluten." Its stickiness is characteristic; the Germans call it "kleber,"

from the verb kleben, to stick. "It is the presence of gluten in wheaten flour that imparts to it its viscidity or tenacity, and confers upon it its peculiar excellence for the manufacture of macaroni, vermicelli and similar pastes. The superiority of wheaten over other bread, depends upon the greater tenacity and elasticity of its dough and this is owing to the presence of the "gluten" we are speaking of. The dough during the fermentation and baking is puffed up by the evolved carbonic acid, and so stretched out as to produce the vesicular texture, so much valued *in the light loaf.*"

This gluten is eminently nutritious, because it consists of albumenoids, which though insoluble in water, are easily acted on by the digesting fluids. It is not, however, a simple chemical compound but consists very largely of gluten fibrin. That it is highly nitrogenous may be proved by applying the same test as in the case of the white of egg.

The percentage composition of gluten fibrin I shall write down alongside of the other albumenoids, so that you may see how very little they vary from one another.

PERCENTAGE COMPOSITION.

		C.	H.	N.	S.	O &c.
Proteids (Vegetable)	Plant Albumen (from wheat)	53.10	7.20	17.60	1.60	20.50
	Legumin (peas)	51.50	7.00	16.80	0.40	24.30
	Gluten Fibrin (wheat)	54.30	7.20	16.90	1.00	20.00
Albumenoids (Animal)	Ovalbumen	52.5	6.9	15.25	1.93	23.42
	Casein	53.6	7.1	15.70	1.00	22.60
	Fibrin of blood	53.4	7.0	18.10	1.20	21.30
General Molecular Formula		72.	112.	18.	1.	22

We shall recognize more fully the great importance of these vegetable albumenoids, or proteids as I prefer to call them, when we come to consider later on those of the animal kingdom. Meanwhile what we have again to point out is that these bodies so complicated in their composition and so curious in their properties, are built up in the interior of plants from such inorganic materials as nitrogen, ammonia and nitric acid by the agency of no other apparatus than those tissues

SUMMARY

— OF —

Canadian Mining Regulations.

NOTICE.

THE following is a summary of the Regulations with respect to the manner of recording claims for *Mineral Lands*, other than Coal Lands, and the conditions governing the purchase of the same.

Any person may explore vacant Dominion Lands not appropriated or reserved by Government for other purposes, and may search therein, either by surface or subterranean prospecting, for mineral deposits, with a view to obtaining a mining location for the same, but no mining location shall be granted until actual discovery has been made of the vein, lode or deposit of mineral or metal within the limits of the location of claim.

A location for mining, except for *Iron*, shall not be more than 1500 feet in length, nor more than 600 feet in breadth. A location for mining *Iron*, shall not exceed 160 acres in area.

On discovering a mineral deposit any person may obtain a mining location, upon marking out his location on the ground, in accordance with the regulations in that behalf, and filing with the Agent of Dominion Lands for the district, within sixty days from discovery, an affidavit in form prescribed by Mining Regulations, and paying at the same time an office fee of five dollars, which will entitle the person so recording his claim to enter into possession of the location applied for.

At any time before the expiration of five years from the date of recording his claim, the claimant may, upon filing proof with the Local Agent that he has expended $500.00 in actual mining operations on the claim, by paying to the Local Agent therefor $5 per acre cash and a further sum of $50 to cover the cost of survey, obtain a patent for said claim as provided in the said Mining Regulations.

Copies of the Regulations may be obtained upon application to the Department of the Interior.

A. M. BURGESS,
Deputy of the Minister of the Interior.

DEPARTMENT OF THE INTERIOR,
Ottawa, Canada, December 1892.