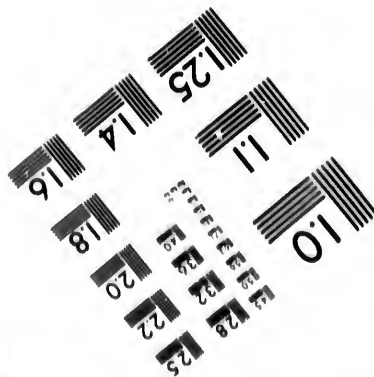
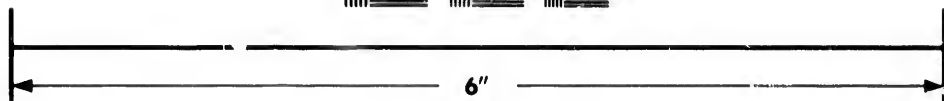
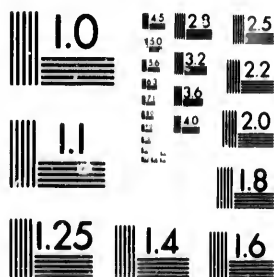


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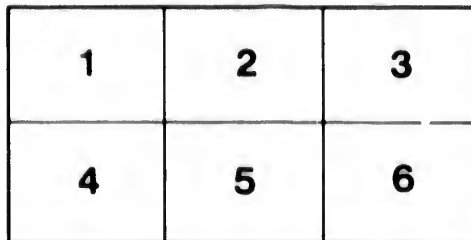
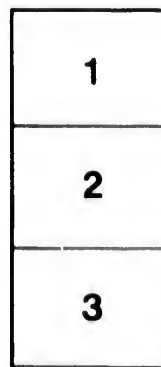
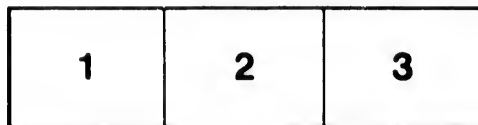
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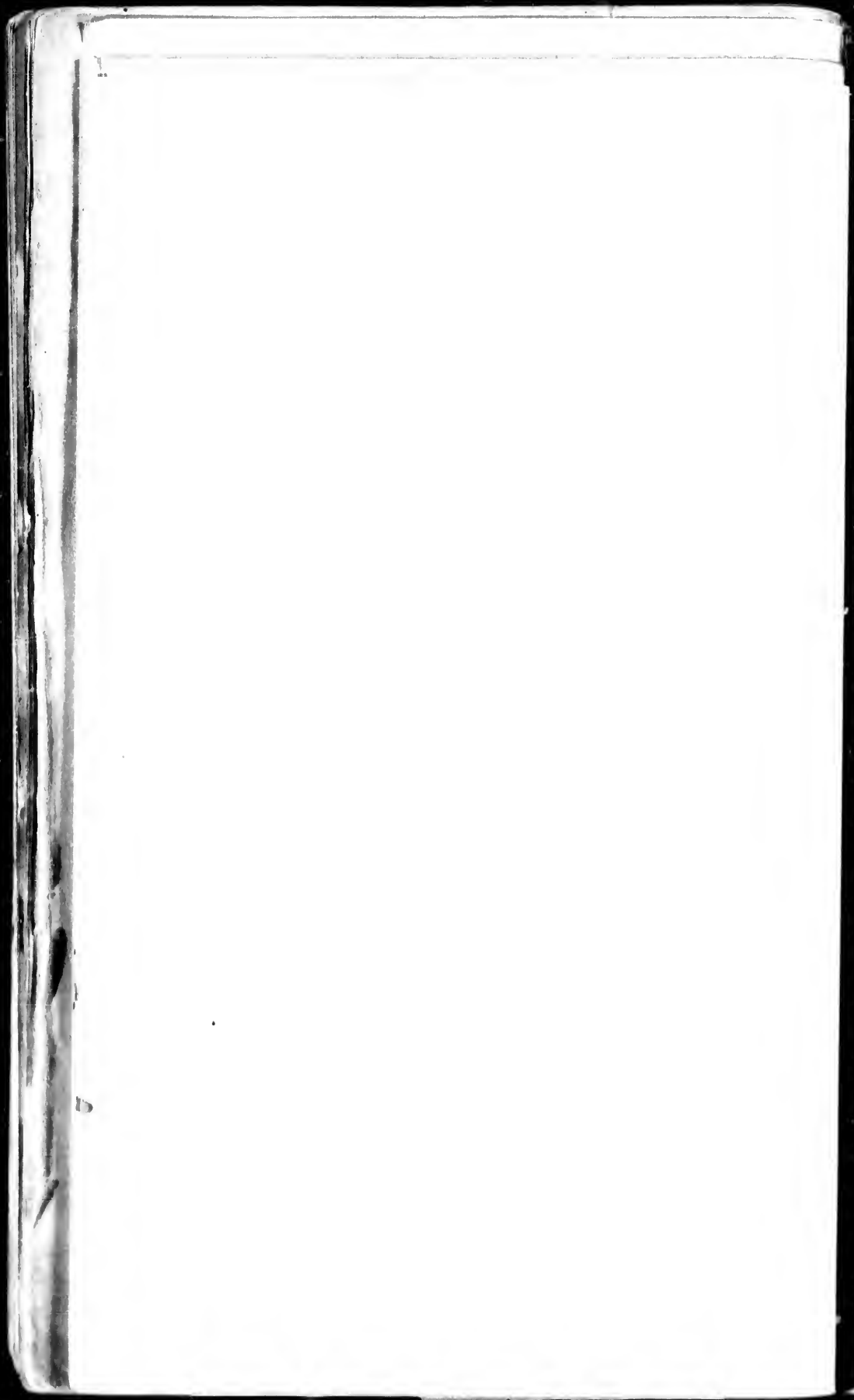
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HISTORICAL AND

SCIENTIFIC SOCIETY

WINNIPEG,

TRANSACTION NO. 4, SEASON 1883-4.

FRAGMENTARY LEAVES

FROM THE

GEOLOGICAL RECORDS

OF THE

GREAT NORTHWEST,

—BY—

J. HOYES PANTON, M. A.

1884.

Read before the Society on the evening of 24th January, 1884.

WINNIPEG:
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Fragmentary Leaves from the Geological Records OF THE GREAT NORTH WEST.

Notes of a Trip in the Far West—Description of the Prairie Steppes—The
Origin of Alkali—The Bow River Valley—Medicine Hat Coal Mines
Discovery of Extinct Reptiles, Etc.

At Thursday's meeting of the Historical and Scientific Society, Mr. J. H. Panton read his promised paper on "Places of Geological Interest in the Northwest," as follows:

To-night I purpose placing before you for consideration the result of some geological investigations, which I have made during the past summer at interesting localities in the Northwest. In August of this year, through the kindness of the Canadian Pacific Railway, I, in company with several members of this society, had the pleasure of visiting the regions as far east as the track was then laid.

Before entering upon a description of places, fraught with considerable geological interest, I shall direct your attention to some general observations upon the vast tract of country between Winnipeg and Calgary, after which I shall treat more particularly of the various outcrops noted, and from which the fossils I have presented to the society have been obtained. Leaving Winnipeg and pursuing our journey westward we soon cross the

FIRST PRAIRIE STEPPE.

the Red River Valley, which at Emerson is 52 miles wide and gradually increases as you proceed north. It is about 800 feet above the sea level and embraces an area of 6,000 square miles. Throughout this level region a rich black soil abounds on level land in many places, by layers of clay to a depth of 50 feet. Immediately below this apparently alluvial deposit is a thin limestone, which is well exposed in several places along the Red River, Rocky Mountain and the shores of Lake Winnipeg.

Beyond this region, distinguished for its almost inexhaustible fertility of soil, we cross the

SECOND PRAIRIE STEPPE.

This has an elevation of 1,600 feet above sea level, 250 miles wide at its

southern limit and narrowing slightly towards the north, it embraces an area of 10,500 square miles. This region differs in some respects from the former. The dark, rich soil is not so common, the surface is much more rolling, and the whole is underlain by Cretaceous deposits. To some these physical characters, indicating a drier and warmer soil, have greater attractions than the level land of the Red River valley. Nothing of particular importance attracted our attention as we passed over this district, which, though containing much rolling land on the east side, passes into a level country westward.

THIRD PRAIRIE STEPPE.

In this great table land of the Northwest, extending from the western boundary of the last region to the Rocky Mountains, 465 miles wide on its southern boundary, with an elevation of 3,000 feet, there is an area of 134,000 square miles. As this possesses some features of more than ordinary interest, I shall direct your attention to it for a few moments. This district, while rolling in character, has also much prairie land. Here vast coal fields are found among the Cretaceous deposits, and in this region many of the lakes and ponds are strongly alkaline.

At the time of my visit this region indicated drought, but did not present that desert appearance I had anticipated from the reports of some who had described it. Although there are some parts comparatively sandy, yet there are vast areas of good soil, immeasurably better than many places which are now under cultivation in the eastern provinces. The soil seems sufficiently fertile, but the climate, owing to a limited rainfall, may be at fault. The problem which requires solution in this part of the Northwest, is to what extent can the rainfall of a country be modified or increased by ordinary cultivation and the planting of trees?

The sooner data can be collected concerning this, and experiments undertaken to collect results bearing upon it, the sooner will much land become of value which now seems to offer no inducements to settlers, and at certain seasons present a very uninviting appearance.

At Moosejaw I observed fields in which the crops appeared in good condition, while the surrounding prairie presented a parched look.

There is no doubt but cultivation will tend to preserve moisture in the soil, by preventing the sun's rays acting directly upon the surface, and thus rapidly carry off the moisture by evaporation.

Many travelers over this part of the Northwest during the past summer have been struck with the growth of grain growing by the track, where it had likely fallen during the construction of the road. We observed it frequently, and were convinced that fertility was in the soil if favorable conditions surrounded the plant as it developed.

THE ORIGIN OF ALKALI IN PRAIRIE PONDS.

The appearance of some of the alkali ponds in this district present a rather novel feature, especially those observed near Maple Creek. Here, as we approached in the evening, we saw the ponds lying to the north of the track presenting a most weird-like appearance, surrounded by the rings of white "alkali," left as the waters evaporated. Bordering these were red rings, made up of a mass of "alkali" plants, largely of the species *Salicornia herbacea*. These peculiar plants exist and flourish in a soil impregnated with saline substances. In the struggle for existence they have survived where other forms of plant life have ceased to exist, and now hold a monopoly in the so-called "salty" districts. The presence of "alkali" in these comparatively dry areas is not a matter of surprise when we remember all soils contain a certain amount of soluble salts. In our Western districts these are carried into ponds which have no outlet. As evaporation goes on the waters become more and more saline, until they are so strongly impregnated that when the ponds dry up an alkaline incrustation is left. If the rain-fall was greater in these localities and the water carried off, as we find in other countries, the shallow ponds would no longer show incrustations from the accumulated salts held in solution. This alkali seems in most cases to be a mixture of calcium and magnesium sulphates, small quantities of calcium and magne-

sium carbonates and some soluble chlorides.

ORIGIN OF THE DEPRESSIONS AROUND LARGE BOULDERS ON THE PRAIRIE.

Another peculiarity observable in this district is, in many cases, the large stones occupy the centre of a considerable depression. So common is this feature one is led to seek a reason for it. Some have attributed this to the work of buffaloes tossing up the dirt around the stone and frequenting such places until a considerable hole has been formed. I think that in addition to this wind and rain have done much to enlarge the depression.

One can readily understand that wind sweeping over these immense treeless districts would drive away any loose earth around the stone. A small space thus left for the accumulation of water running into the depression. This would wear down more soil which on dry weather would be again thrown out by the wind sweeping around the stone. Allow time to continue for a lengthened period a large depression would be formed, large enough to form the nucleus of a pond, which, on evaporating and loose dirt from the bottom swept up on sides so as to form banks, would be increased in depth. Might not these agencies explain the formation of many of these ponds with no outlet and which in many cases show one or more large stones that may have been important factors in the first steps to their formation as they were ploughed round by buffaloes in amusement or swept by strong winds which encircled them? Having made a few remarks upon some of the most striking features observed as I crossed the country lying between here and Calgary, I shall ask your attention to some localities of more than ordinary paleontological interest. In placing the results of my labors before you I shall consider the places in the order in which they were visited and endeavor to enter your minds with me to these localities which to me have been spots of intense interest and much instruction.

CALGARY.

At Calgary I separated from our party they pushed on to view the magnificent scenery of the Rockies, I to investigate some of the outcrops bordering the Bow River, near this place. We met no more again till my work was largely finished and the trip at an end. On the morning after our arrival in this town of ten thousand with hammer in hand I started west-

and some soil to seek the rich fossil fields that lay beyond. At the confluence of the Elbow River with the Bow, there is an exposure of grey sandstone, but although of considerable thickness, it supplied no traces of primeval life, neither animal nor vegetable. Beyond this I walked over the beautiful oval-shaped valley in which it is that at that time supposed the future site of Calgary lay. I was surprised at the mat of grass that covered this attractive valley, and on examination found that the soil overlying a bed of coarse gravel was not very deep. As I wandered over this apparently fertile locality, my mind was led to consider how this deposit had been formed. A closer examination of the gravel and alluvial soil on it seemed to indicate that at one time the Bow River, which now skirts the valley, occupied a more central position, that the banks on either side were the result of its denuding power, and that at that time this coarse gravel was the bed of a river much larger than that which now remains. In the course of the river current shifted to the side, the waters of the valley became more or less calm, and silty material was laid down until the whole valley became enriched with the deposit. The river seems then to have deepened its channel along the sides until all the water flowed through it and the former river bottom was left high and dry. On such an alluvial deposit rich herbage would naturally grow, and as years rolled on, the vegetation of the valley assume its present luxuriant condition. This conclusion seems to be borne out by the comparatively thin layer of rich dark soil and the bed of coarse gravel below it.

BOW RIVER EXPOSURE.

About five miles beyond Calgary an exposure of sandstone rock appears on the right bank of the Bow River and continues for some distance farther west, at least for two miles, the distance I examined. At this point I turned and began the work of investigation, knowing that long ere my steps were retraced for two miles, sufficient fossils would be obtained to test my carrying capacity. On every side the fragments of rock, which had been left as the "graders" completed their work, contained excellent impressions of fossil leaves of many varieties. The bank is about 200 feet high and is largely made up of layers of grey sandstone, much of which is exceedingly fossiliferous. At this place I saw no other fossils but the remains of leaves. The

rock was of such a soft nature that complete forms were difficult to obtain, and it was only by taking a large fragment that a good specimen could be secured.

As the broken rock was used to protect the bank from the action of the swift current of the river there was no difficulty in finding excellent pieces for examination. I examined fragment after fragment, and endeavoured to chip off the superfluous stone so as to obtain a well defined leaf, but in vain, and I found that the only way to secure such was to submit to the work of carrying good sized specimens. But remembering that the escarpment farther east showed a harder rock I refrained making much of a collection from this locality and did not feel downcast when I saw many a beautiful leaf in this soft sandstone crack under the blows from my hammer. Here the lesson was thoroughly impressed upon me that although a rock may be rich in fossils it largely depends upon its nature whether well defined specimens can be secured.

Having come east to a place about five miles west of the supposed town site of Calgary the sandstone was found much harder, and did not break so irregularly as the rock already referred to. Here I secured some very fine specimens, and had my means of transport been better the society would have superior specimens to those in its possession. At this locality a high bank, probably 250 feet, overlooks the Bow River.

The track comes close to the water here, and considerable blasting of rock has been done to make way for it. The broken fragments lie along the river's edge as a protection to the bank, and thus become very convenient for examination.

Among this loose material I found innumerable remains of vegetable life, some stems, but chiefly leaves, very complete and readily identified if proper books of reference were accessible. From an examination of some works upon fossil leaves I am inclined to locate the specimens obtained among the genera, *Protophyllum*, *Corylus*, *Alnus*, *Platanus* and *Populus* allied to some of our modern representatives such as the hazel, alder and poplar. Among the specimens secured at this exposure and donated to the society is a small but beautiful fern of a more or less feather-like appearance. In the higher layers of this escarpment many fossil shells were observed, em-

bracing several genera of univalves, and one bivalve, as the bivalves, of which there were many, belong to the genus *Unio*, and bear a close resemblance to some of our modern clams. The univalves seem to belong to several genera, *Vivipara*, *Campeloma*, *Bulinus* and *Planorbis*. On breaking up some of the rock which contained the bivalve shells very complete casts dropped out. I might add here that the sandstone containing the shells seemed to be more compact and harder than that in which the leaves were found.

AN ENTOMBED BUFFALO.

At this place a condition was observed worthy of notice, as it explains how easily a person might be led astray by a too hasty explanation of certain facts.

The contractor at work on this division, (for at the time of my visit the track was not laid as far west as this) called my attention to the remains of a buffalo which his men found twenty-five feet below the surface, in a cutting through the river bank, while upon the surface stumps of huge trees were seen. Nothing seemed more natural than to suppose this buffalo had lain entombed for a long period of time, during which the deposits over it had accumulated and immense trees matured upon the soil which covered the imbedded remains.

Before venturing an answer to the question "How many thousands of years do you think this 'critter' has been buried?" after special attention had been called to the size of the trees which grew above it, I looked up the high banks and at once saw how the entombment might have taken place in recent times. A land-slide explained the mystery. Beneath this the buffalo had been buried, and as the trees carried down had been but little disturbed, they continued to flourish as if no change had occurred in their position. My questioner was pleased, and quaintly remarked to standers-by "that the buffalo aint so very old after all."

LARAMIE DEPOSITS.

The question which now presents itself is: To what period in geology do these deposits belong? Regarding this there seems to be a diversity of opinion, some locating them in the upper Cretaceous; others as lower Eocene; in other words, at the summit of the Secondary, or base of the Tertiary rocks. There is no doubt that there is a striking contrast between these fossils and what we find farther

east. In fact, among those found there is no resemblance to the Cretaceous which came under my examination.

From a comparison with fossils found elsewhere it would seem that these remains belong to what is known as the Laramie series of rocks, which are considered as a transitional group between the Cretaceous beneath and the Tertiary above.

These rocks were likely formed before the Rocky Mountains had made their appearance, as their arrangement and condition seem to indicate that the great changes which brought these mountains into existence, took place after their position.

BOW RIVER NEAR THE 12TH STATION.

Having completed my observations at Calgary, the next place which engaged my attention was along the banks of the Bow River, about 100 miles west of Medicine Hat. I had been told by an enthusiastic passenger on the way that in the banks of the river at this place, it was a common thing to find petrified fish. To obtain such was worth any collector's effort.

For several hours I wandered along the river banks at this lonely spot, east of the Crowfoot Crossing, thoroughly examining the escarpment from the water edge to the prairie level, 150 above the river. Not a trace of extinct life was discovered in the gravel and clay of the banks. Had I been fortunate enough to have left the train at the Blackfoot Crossing farther west, I certainly would have been better rewarded, for at that point a coal seam appears, near which there are no doubt objects of paleontological interest.

But here I had followed the instructions of one of the uninitiated in geology and learned, as I have on several occasions before, that such guides are not to be relied upon. They always see fossils in a magnified form and are never at a loss to identify them as belonging to existing types. They find fish in rocks which were formed long ere fish came into existence; backbones in formations deposited in seas which had passed away ages before vertebrates appeared; petrified wasps' nest in periods which had long preceded the creation of insects, and even mastodon teeth long anterior to the appearance of these gigantic forms upon the earth.

After a wearisome search, disheartened and greatly disappointed, I resought the track, which is not far from the river.

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To secure such it is necessary to be furnished with a number of small boxes into which they can be carefully packed.

110 feet above the river a red band of clay appears, which likely owes its color to the action of fire in the seam of coal below. Farther down the river this clay has a richer color, almost approaching vermillions. As neither lime nor magnesia is present, and as it possesses a fine compact texture we may reasonably expect that ere long the banks of the Saskatchewan will supply clay for the manufacture of a superior kind of pottery.

The deposits of this locality seem to indicate that they are of Cretaceous age.

IRVINE RAVINE.

Twenty miles east of Medicine Hat we reach Irvine station. Lying south of this about one mile is a locality of more than ordinary scientific interest, and which for convenience I shall call Irvine Ravine. Here in the spring of this year Mr. Lawson, of Medicine Hat Coal Mine, while prospecting for coal discovered the remains of what appeared to be an animal of reptilian nature. On his return to Winnipeg a reporter interviewed him, and, as most of you remember, a short notice describing this fossil appeared in the daily papers at that time.

In July Principal Dawson, of McGill College, while visiting the Northwest heard of this discovery and set out to obtain the remains, but was unable to find them. When I visited the Saskatchewan coal mine in August I saw Mr. Lawson, told him of Dr. Dawson's failure and desired him to give me another sketch of where it lay, at the same time showing him the outline Dr. Dawson had kindly given me to make corrections if necessary.

Furnished with a sketch somewhat different from the one I had, I set out with considerable enthusiasm to seek this fossil of higher type than I had as yet discovered. It was a bleak day on which my companion (a stranger whom I had met at Medicine Hat, and who when he heard the errand upon which I was going desired to take part in the search) and I left Irvine station to wend our way across the flats to the ravine.

A FORLORN HOPE.

We followed the directions, and gradually ascended the hill on the trail which leads to the Cypress Hills. As soon as we reached the summit and beheld the complicated nature of the coulee, an im-

mense central ravine and innumerable lateral ones, we were convinced that we were undertaking a forlorn hope. The sketch was consulted, but all was observed in this wild spot. Among the rugged ravines we climbed hour after hour, seeing in vain the reptile that had lain so long among these lonely hills. Though apparently unsuccessful seeking the reptilian remains, still we saw much that was exceedingly interesting and instructive.

WORN ROCKS.

The effect of "weathering" upon the rocks of this place is astonishing. The striking result is that my companion observed frequently, "It looks as if some of these hills had been pounded to pieces." Among the debris we observed numerous crystals of selenite, which appear to have been in the upper layers of clay. We also found many fragments of large shells, not unlike the genus *Maclurea*, but no complete specimens were seen on those denuded hill tops. The weather had destroyed all. Some that appeared comparatively whole broke to pieces on handling. But at one place, where the weather had effected less change, we found one very complete shell, well replaced with silica.

On several of these "weathered" hills the selenite lay about almost like gravel, much of it in perfect single crystals three inches long and in beautiful masses of compound forms.

In several parts of the ravine layers of ironstone were observable, intercalated among strata of gray sandstone, and exposures of coal in several places, but the seams were comparatively thin. What the hope of finding reptilian remains was beginning to fade, and my companion becoming disheartened, for he had come expressly to see the interesting relics of past life, our energies were revived by finding four thoroughly petrified fragments of bone. These lay on the side of the hill, and appeared as if they had fallen from the layers higher up. Our fallen hopes much revived by this discovery, with renewed vigor we climbed the hill-side, where we expected to find more remains in their original position.

EXTINCT REPTILES.

Though this seemed from our sketch not be far from what we sought, still we were forced to abandon further search for the reptile, cross over to another part of the ravine and confine our attention to the lofty sides of the escarpment there.

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REPTILES.
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Here a magnificent exposure appeared
ly made up of beautiful sandstone,
comparatively soft, interspersed with
nds of stone more or less ferruginous
d in some places seams of inferior
al.

The effect of the weather upon this
sandstone was very marked, much of
appeared to have crumbled away leaving
elves of the ironstone, along which we
ould walk. In some cases the crumbling
and had fallen down the sides and cover
ed over cave-like spaces, into which we
ometimes fell as we walked along the
ides of the ravine, the sandy cover
which appeared to bridge over these
oles proving too thin to sustain our
ight.

Along the face of this escarpment and
ually near the layers of coal we saw
veral bones protruding from the rock,
ut as often as we attempted to dig them
at all crumbled away except the portion
saw and which seemed to have hard-
ed by weathering.

On some of the elevated shelves we
and excellent fragments which the
eather through long periods had
red for us. As we found these frag-
mentary remains in eight different places
considerably removed from each other we
concluded that we had recured parts of
ight different animals. A small pick
ould have done good service in this soft
andstone.

My companion no longer doubted that
e remains of extinct animals could be
ound in Irvine ravine and felt amply re-
id for all his exertions in this wild,
ugh and lonely spot. We did not
ve the good fortune to find any teeth
skull bones, and though we found
gments of immense thigh bones, a hip
ant and some huge vertebrae, still we
eured nothing by which we could
entify the species to which these creta-
ous dinosaurs belong.

Had I been able to have carried the
ones I might have brought many more
th me, consequently I took those only
hich were the most typical, such as the
eculiar vertebrae of this extinct order
nd other parts, showing that these ani-
als were of gigantic size.

AN INTERESTING LAND-MARK.

The bones of one of the largest forms
served lay at the foot of the escarpment
ar the entrance of the ravine a short
istance to the right of the trail leading
to the Cypress Hills, and not far from a
urveyor's mound, marked section 30,

township 11, range 3, west of fourth
meridian.

Taking this mound as a starting point,
I am quite sure prolific results will reward
future explorers who investigate the main
ravine and some of the principal lateral
ones. At places in the coulee we came
upon large quantities of petrified wood,
which had fallen from the rocks above.
It lay in a confused heap, and bore a
marked resemblance to a pile of ordinary
stove wood, but closer inspection showed
that it was the silicified remains of extinct
trees, portions of which could be seen in
the sandstone. As the strata at one of
these places seemed well defined, I took a
sketch of the escarpment, a vertical section
of which may be represented as follows,
but it must be remembered that this is
not a uniform arrangement in the ravine,
for the strata varied very much in differ-
ent parts:—

Prairie level.....	1 foot
Dark soil.....	3 "
Dark clays.....	3 "
Brown layer.....	4 "
Light clay.....	4 "
Dark sandstone.....	40 "
Light " with petrified wood.....	6 "
Dark clay.....	8 "
Greenish clay, with some selenite ...	25 "
Light-colored sandstone.....	20 "

I have directed your attention to this
place, which I have endeavored to de-
scribe carefully, so that our society may
follow up research in a locality where
there will likely be found some well pre-
served forms of extinct reptilian life, and
probably some birds allied to those won-
derful forms which have been discovered
in the cretaceous deposits of the United
States.

There is still to be found the remains
which Mr. Lawson saw. I was told by a
member of the Mounted Police that there
is, about fifteen miles up the ravine, the
remains of a huge lizard-like creature in
the rocks: that it has been known to the
Indians for a long time, and by them held
in superstitious awe under the name of
the "great lizard."

There are sufficient attractions for a
visit to this place, and who would venture
to foretell the future discoveries that may
be made in the sandstone strata of these
lofty weather-worn hills by enthusiastic
followers in the line of original work.

BUFFALO LAKE.

This is an enlargement of the Qu'Ap-
pelle River which runs like all the rivers
of the 2nd prairie level through valleys
from 150 to 200 feet below the surface of
the prairie. It is about fifteen miles
north of Moose Jaw, some thirty-two

miles long and from half a mile to a mile wide. At the place first examined the banks were chiefly sand with a pebbly beach. We proceeded about half a mile westward. Here the whole shore was strewn with broken rock and fossil remains. These were the debris of an escarpment some thirty feet high, sloping back from the lake, covered with a dense growth of shrub and underbrush.

From the cliff, fragments of the coarse grained sandstone of considerable size were found mixed with the sandy drift which lay on top of the cliff. The remains were evidently of the Cretaceous Age. The cliff had at one time been an oyster bed, and numerous specimens of the genus *Inoceramus* were found. No fossil wood was observed, and although the fossils were comparatively numerous the species were limited to few forms. A thorough examination of this exposure would likely be well rewarded by the discovery of some interesting fossils.

PENSE STATION.

Here I had the pleasure of examining some boulders of great interest. At this place the drift is very thick. A well has been bored 400 feet and solid rock not yet reached. About three miles from Pense Station on Section 30, Township 16, Range 22, west of the second meridian, a well was dug this summer on the farm of J. H. Poyser, Esq., which has attracted considerable interest. When about 35 feet below the surface, a large oval-shaped stone of a somewhat gray color was encountered. There were no external indications of its being fossiliferous. Too large to handle, a sledge was given to the digger who found to his surprise that with but a comparatively slight blow it broke into many pieces, and revealed an innumerable quantity of most beautiful shells. At the time of my visit many had been carried away, but I secured some six varieties, consisting of one exceedingly beautiful *Ammonite* about three inches in diameter, bearing two rows of tubercles with distinctly marked sutures of the septa, and the shell in a highly nacreous condition. One *Baculite* two inches in length, one rare univalve with highly sculptured shell, and three varieties of bivalves, most of which belong to the genus *Ostrea*. The stone, large portions of which I examined, seemed to contain cavities not unlike what are observed in older rocks bearing quartz crystals, seams filled with a yellowish mineral substance also appeared, and these, no doubt,

rendered the boulder so easily broken. The matrix which contained the fossils when compared with the cretaceous limestone of the Rocky Mountains, appears to be much the same in physical characters and chemical composition.

This boulder removed far from its parent rock, had likely been transported during the Glacial period when an immense river of ice carried fragments of rock eastward and left them upon the prairies hundreds of miles from where they were *in situ*.

These fossils are remarkable, not only for their numbers, but also for the beautiful condition in which they are found, more nearly resembling the pearly shells of modern seas than the remains of mollusks extinct for ages. Some of these formed a portion of the society's exhibit at St. John and Boston where they were greatly admired.

This isolated fossiliferous boulder indicates that there is a rich fossil field somewhere along the eastern border or summit of the mountains west, where shells, characterized by great beauty, are likely to be discovered.

About six feet above this stone another boulder not quite so large was found. This was much harder than the former, a reddish color and somewhat of a granular nature. One surface was well polished and distinctly marked with glacial striations.

This closes a description of the various outcrops visited during my trip to the gory, and from what has been placed before you for consideration, one can readily infer that our Northwest Territories offer great inducements for geological investigation, and will for many years afford great attractions to the members of this society who are inclined to work in the department of science.

The results of my visit to the places referred to in this paper may be summarized as follows:

SEVEN MILES WEST OF CALGARY—LARGE DEPOSITS.

Impressions of leaves belonging to genera *Protophyllum*, *Corylus*, *Alnus*, *Platanus*, *Populus*.

Univalve shells of the genera *Caudofoveata*, *Bulinus*, *Planorbis*, *Viviparus*.

Bivalve shells of the genus *Unio*.

MEDICINE HAT—CRETACEOUS DEPOSITS.

Petrified wood and coal.

Bivalve shells 200 feet below the present level, largely of the genus *Ostrea* and undetermined species.

boulder so easily broken which contained the fossilized wood with the cretaceous lignite. The Rocky Mountains, appear to be the same in physical and chemical composition.

When removed far from the coast, it had likely been transported during a glacial period when an immense mass of ice carried fragments of wood and left them upon the shore, hundreds of miles from where they were *situ*.

These shells are remarkable, not only for their size, but also for the perfection in which they are preserved, more nearly resembling the shells of modern seas than those of mollusks extinct for ages. These shells formed a portion of the collection at St. John and Boston, and were greatly admired.

The fossiliferous boulder in question is a rich fossil field situated on the eastern border or summit of the mountains west, where shells, of great beauty, are likely to be found.

Twenty feet above this stone another boulder quite so large was found, which is harder than the former, and somewhat of a granular texture. Its surface was well polished, and is very marked with glacial striations. A description of the various shells obtained during my trip to Canada, and what has been placed in the collection, for consideration, one is of the opinion that our Northwest Territory offers great inducements for geological exploration, and will for many years be an attraction to the metallurgical and scientific society who are inclined to the department of science. The result of my visit to the places mentioned in this paper may be summarized as follows:

WEST OF CALGARY—LARVAE AND DEPOSITS.

Remains of leaves belonging to *Alnus*, *Populus*, *Phyllium*, *Corylus*, *Abies*, and *Pinus*.

Remains of the genera *Campoplex*, *Phanorhis*, *Vivipara*.

Remains of the genus *Unio*.

AT CALGARY—CRETACEOUS DEPOSITS.

Remains of fossil wood and coal.

Remains 200 feet below the present surface of the genus *Ostrea* and other species.

VINE RAVINE—CRETACEOUS DEPOSITS.

Fragmentary wood in large quantities. Fragmentary remains of eight extinct vertebrates, some of which are of the order Dinosauria.

Unnumerable crystals of selenite.

Shell fragments of the genus *Ostrea*, and a very complete specimen of *Mactra*.

BUFFALO LAKE—CRETACEOUS DEPOSITS.

Remains of the genera *Mactra* and *Inoceramus*.

A mass of shell fragments not identified. Some small cretaceous Bivalves.

PENSE SPATION—CRETACEOUS DEPOSITS.

Many fossils of the genera *Inoceramus* and *Ostrea*.

A rare specimen of the Ammonite, one *Baculite*.

Many small shells of an undetermined species.

A beautifully sculptured Univalve.



