

TRANSACTIONS  
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SESSION OF 1892-'93.

NOTES ON THE MIOCENE TERTIARY ROCKS OF THE CYPRESS  
HILLS, NORTH-WEST TERRITORY OF CANADA.—BY T.  
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(*Read December 12th, 1892.*)

The first mammalian, reptilian and fish fossil remains found in the Lower Miocene rocks of the North-West Territories were discovered in 1883 by Mr. R. G. McConnell, of the Canadian Geological Survey, in the vicinity of Swift Current, a portion of the Cypress Hills district, about long.  $109^{\circ}$ , lat.  $49^{\circ} 40'$ . The following summer the writer received instructions from Dr. Selwyn, the director of the Survey, to make a further examination of the rocks containing these interesting fossil bones.

Accompanied by Mr. James Macoun as assistant, we left Ottawa May 21st, and arrived at Maple Creek, one of the Cypress Hills stations on the Canadian Pacific Railway, on the 30th, where we fitted out with waggon, buck-board, horses, saddles, two half-breed Indians and one month's provisions.

The following morning we left at 7 a. m. and proceeded south forty-eight miles where we camped for the night, in close proximity to a large encampment of Blackfoot Indians who were engaged collecting Buffalo bones, to be used for the refining of sugar and fertilizing purposes.

Next day we reached our field of research, a great verdant

valley extending many miles in a north and south direction. Within a short distance of our camp, water flowed south into the White Mud River, and north into Swift Current Creek. From this main valley coulees branch off at right angles, and extend from a short distance to several miles till they are lost on the table-land of the great prairies. In these coulees are found the best escarpments of Miocene Tertiary rocks, which, although several hundred feet in thickness, are seldom seen in vertical sections of more than fifty feet. The sides of the coulees slope at various angles up towards the table-land, and are partly covered with scrubby brush, grass and wild sage (*Artemisia cana*), while in the bottom a stream of clear cold water flows, and willow, pine and other trees form a shelter for the antelope and other smaller game.

The Miocene rocks of the Cypress Hills plateau consist of gravel in which pebbles of quartzite from half an inch to a foot in diameter predominate (*h* of section). In all the overlying strata, fragments of fossil bones, either fish, reptilian or mammal, have been found; but it is in the agglomerate band that most of the vertebrate remains now in the cases of the Dominion Museum were obtained. This consists of (in places) a four-foot bed of yellowish sandy limestone which when treated with hydrochloric acid leaves a residue of grains of quartz and fragments of a variety of other rocks—angular and partly rounded pieces of a rock similar to the matrix. Occasionally pebbles of red, black and other coloured jasper, banded quartzites, chert and porphyry are found, all derived from the Laurentian mountains east of these deposits, and transported during a glacial epoch of the world's history.

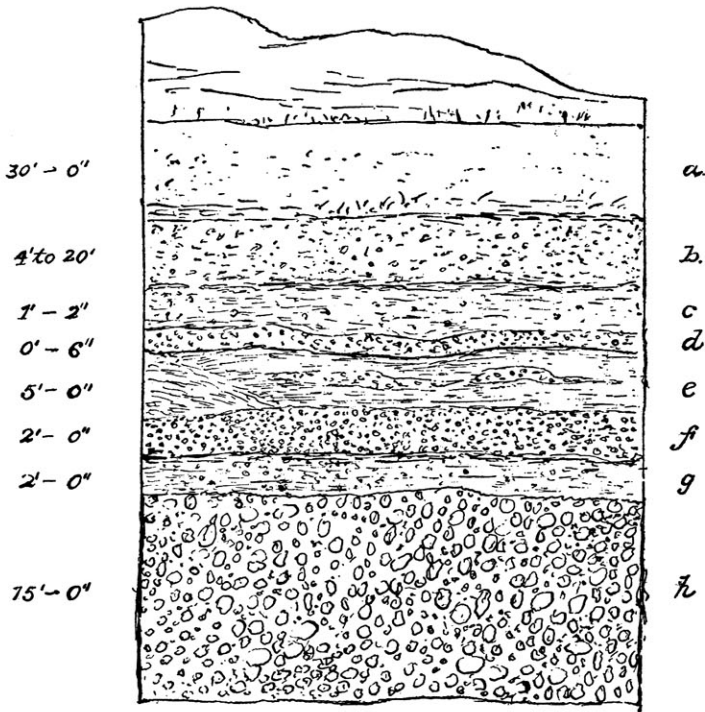
#### SECTION OF MIOCENE TERTIARY ROCKS NEAR THE HEAD WATERS OF SWIFT CURRENT.

*a.* Superficial and other deposits in which, in a bed of yellowish-white silt 20 feet above the agglomerate beds (*b* of section), the teeth of an extinct deer, *Leptomeryx mammifer* Cope, were found. 30 feet.

*b.* Agglomerate beds, containing rounded pebbles of quart-

zite, jasper and chert. These are the beds from which *Menodus angustigenis*, *M. Proutii*, *M. Americanus*, *Hemipsalodon grandis*, and other genera and species were found. 4 to 20 feet.

- c. Yellowish sand with a few pebbles of quartzite. 1'—2".
- d. Fine conglomerate in which a few fish remains were found. 0'—6".
- e. Sand and thin beds of conglomerate. 5 feet.
- f. Conglomerates in which a large bone was seen. 2 feet.
- g. Sand and fine gravel. 2 feet.
- h. Gravel, loose pebbles varying in size from half an inch to a foot in diameter. 15 feet.



Section of Miocene Tertiary Rocks near Head Waters of Swift Current, N. W. T.

At the request of Dr. Selwyn these remains were examined by Prof. E. D. Cope, of the Academy of Natural Science, Phila-

delphia, who in his valuable illustrated quarto memoirs describes portions of twenty-five species of fish, tortoise and mammals. Among the remains described is an anterior vertebra of a fish belonging to the Amiidæ family. It has received the name *Amia Whiteavesina*, having been dedicated to Mr. Whiteaves, palæontologist to the Geological Survey of Canada.

Prof. Cope states: "They occur abundantly in the Bridger Eocene, but have not been known from later formations till discovered by Mr. Weston in the Cypress Hill Oligocene beds." It is interesting to know that this species occurs in the agglomerate band (*b* of section) in which are also found the remains of *Menodus angustigenis*, Cope, which name applies to the largest hoofed animal yet found in the Miocene deposits of Canada. It is an extinct rhinoceros. Of this genus we have in the Geological Museum the largest part of the cranium of what appears to have been an adult individual. The supraoccipital, occipital condyles, zygomatic arch, a large portion of the left upper maxillary, with two large molars, are well preserved. Situated on either side of the nasal-bone are two horn-cores, making a striking difference between this species and animals with the horns posterior to the eyes. The brain-cavity is small for so large an animal, being only  $5 \times 4\frac{1}{4}$  inches, while the width from between each side of the lateral crest is 12 inches. The grooves for the branches of the meningeal artery are larger and better developed than in the human cranium.

Belonging to the same genus, there are in the museum cases of the Geological Survey large portions of the lower jaws, large portions of the superior maxillary bones with eight molar teeth, several femurs, one almost perfect humerus, several tibiæ, portions of the pelvic arch, a number of the vertebræ, and numerous small bones. One of the most interesting specimens from the agglomerate beds (*b* of section) is an almost perfect left mandibular ramus of an extinct wild boar, *Elotherium arctatum*, Cope. This specimen is in a small block of conglomerate, only one side is seen. The teeth are beautifully preserved, and the whole shows that the creature was of much larger proportions than the existing boar.

Another interesting specimen is one of the rami of a large flesh-eating animal allied to the Hyæna, a portion of one of the canine teeth of this powerful and ferocious animal measures one and a half inches in diameter.

I shall only mention one other species belonging to the animal kingdom, out of the twenty-five described by Prof. Cope, viz., *Anchitherium Westonii*, portions of the jaw of an extinct horse which could not have been as large as a Newfoundland dog, as this was found in the same beds (b of section) as the flesh-eating *Hemipsalodon grandis*, Cope. We may presume our little horse must have had a tough time keeping clear of this savage beast.

#### FOSSIL INVERTEBRATES.

While no leaves or grasses have been found associated with these bone beds, silicified wood is every where abundant, and portions of the trunks of trees measuring two feet in diameter show on the weathered surface the lines of growth which at once prove them to be exogenous. Many microscopic sections from the various specimens collected have been prepared by the writer. These have been examined and reported on by Sir J. W. Dawson, who recognizes among those from *b* to *a* of section, *Populus*, *Carya* and *Ulmus*.

#### SUPERFICIAL DEPOSITS.

In the superficial deposits of the Cypress Hills, a fine quartzite spear-head, an arrow-head, and many chippings show that the aborigines utilized the pebbles of the Miocene conglomerates in the construction of their weapons of war and the chase. These were associated with fragments of utensil and pipe pottery. They were with the exception of the quartz spear-head all found in a cut bank two feet below the surface.

Now that these rocks can be reached in a day and a half from the Canadian Pacific Railway, we may expect to see other interesting fossil remains from this locality.