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CAMBRIAN GEOLOGY AND PALEONTOLOGY

II

No. 12.—CAMBRIAN FORMATIONS OF THE ROBSON PEAK
DISTRICT, BRITISH COLUMBIA AND
ALBERTA, CANADA

WITH PLATES 55-59

BY

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INTRODUCTION

Robson, the most majestic known peak of the Canadian Rockies, is situated six miles (9.6 km.) north in a direct line from the Fraser River and the Mount Robson station on the Grand Trunk Pacific Railway, and thirty-two miles (51.2 km.) west-northwest of Yellowhead Pass on the Continental Divide. The Divide trends very irregularly to the northwest and passes between Adolphus and Berg Lakes three and one-half miles (5.6 km.) north-northeast of the summit of Robson. At this point a part of the water derived from the great Hunga Glacier (pl. 58, figs. 1, 2) flows northeast into the Smoky River drainage area of Alberta and thence through the Peace and Slave Rivers to Great Slave Lake and north through the Mackenzie River to the Arctic Ocean. The larger stream flows southwest into Berg Lake and thence through the Grand Fork into Fraser River and on to the Pacific.

For my present purpose I have included in the Robson Peak District an area with a radius of about ten miles (16 km.) to the northeast and south from the summit of Robson. I was prevented by bad weather from visiting the region west of the Peak and across the valley of the Grand Fork. As seen from above it appears to be separated by a great fault line from the Robson massif.

After a short reconnaissance, I decided to examine the geological

section between Robson Peak and Moose Pass, an air line distance of nine and one-half miles (15.2 km.).

Robson Peak is in a broad, shallow syncline that is more or less broken about its outer limits by faults and minor displacements of the strata. To the northeast and east of the Peak, ridge after ridge exposes the strata that slope in toward the Robson massif and thus present a fine opportunity to study the downward extension of the stratigraphic section from Robson to Moose Pass, where a great fault cuts out the base of the Cambrian series of the region and in the ridges of the Tokana Mountains (pl. 55, fig. 1) east and southeast of Moose Pass repeats the Upper and possibly Middle Cambrian beds of Lynx, Phillips (pl. 57, fig. 2), and Titkana Mountains east of Robson.

GEOLOGICAL SECTION

The oldest Cambrian beds occur on the southwest side of Moose Pass (pl. 55, fig. 1). From there the strata are well exposed in Tah Peak, a sharp point (fig. 11) above the Pass, and then in several ridges to the south on the eastern side of the upper Smoky River valley. The line of the section passes through Tah Peak southwest to Mahto Mountain (pl. 55, fig. 2), and south across Coleman Brook, Hota Cliffs, Chetang Cliffs, and Tatay Cliffs (pl. 56, fig. 2), thence south-southeast over Titkana Peak to Phillips and Lynx Mountains (pl. 57, fig. 2) and the ridges to the southeast of Robson Peak. This irregular course of the section is necessary in order to obtain exposures of the strata free from snow fields and glaciers, but by following the strike of the strongly marked strata it was not difficult to maintain a practically continuous section.

The time available for actual field work was greatly limited during the season of 1912 by the unusual rainfall. This condition and also the necessity of making a general reconnaissance before determining where to establish the typical section prevented careful measurements and the working out of detailed sections. Several horizons were found containing fossils and rather careful estimates made of the thickness of the various formations between Tah Pass and the summit of Robson.

The oldest rocks noted were quartzite sandstones on the southwest side of Moose Pass and the valley of Moose River below the Pass. The contact of the Lower Cambrian sandstone with the pre-Cambrian rocks was not seen in the Robson District, but to the north, west, south, and southeast of Yellowhead Pass it is finely

shown in Mount McEvoy and Yellowhead Mountain, Mount Fitzwilliam, and other high points from eight to twenty miles (12.8 km. to 32 km.) east of the mouth of the Moose River.

Location of the section.—The location of the section is graphically shown by the photographs reproduced on plates 55-59. These will enable the future student of the geology of the region to recognize the localities and the general position of the formation.

Lower Cambrian.—In figure 1, plate 55, the lowest Cambrian beds of the Robson section are shown at the foot of Tah Peak. These are more clearly seen in the text figure No. 11. In figure 2, plate 55, the sandstones of the Tah formation and of the lower beds of the superjacent Mahto formation slope to the southwest and pass beneath Mahto Mountain, while the higher beds of the Mahto formation form the south face of the mountain. In figure 1, plate 56, the masses of strata forming Tah Peak and Mahto Mountain are clearly outlined.

The Hota formation on the west and southwest slope of Mahto Mountain is shown on the left side of figure 2, plate 56. It forms the slope in the foreground, also in the ridge back, and passes beneath limestones of the Chetang formation at Coleman Brook.

Middle Cambrian.—The Chetang limestones rest on the Hota formations on the west side of Coleman Brook and form the Chetang Cliff above the brook (pl. 56, fig. 2; pl. 57, fig. 1) for 900 feet. Above, the siliceous limestones of the Tatay formation form the Tatay Cliffs, and west of the latter the thin-bedded arenaceous limestones and shales of the Hitka formation carry the section up to the massive-bedded arenaceous limestones of the Mumm formation. The latter occur on the westward slope of the ridge east-northeast of the lower end of Lake Adolphus. All these Middle Cambrian strata occur between Coleman Brook and the west slope of the point (marked "x" on pl. 56, fig. 2; pl. 57, fig. 1) northeast of the summit of Titkana Peak.

The Titkana formation forms the north and west slopes of Titkana Peak, and extends over the summit toward Snowbird Pass (pl. 57, fig. 2) and the summit of Titkana Peak as seen in figure 1, plate 58.

The Middle Cambrian formations also form the mountains west of the Smoky River, as beautifully shown by figure 1, plate 57.

Upper Cambrian.—The Lynx formation of the Upper Cambrian begins on the south slope of Titkana Peak near Snowbird Pass, and extends over Phillips Mountain (pl. 57, fig. 2), and into the base of Billings Butte.



FIG. 11.—Near view of Tah Peak rising above Moose Pass. On the left Tokana Mountain. Photograph by R. C. W. Lett, Grand Trunk Pacific Railway, 1012.

Ordovician.—The Robson formation (pl. 58, fig. 1.) is considered to extend from the summit of Robson some 3,000 feet down. This estimate is based on the view obtained from Billings Butte (pl. 58, fig. 2) of the Upper Cambrian beds as they extend along the base of Mount Resplendent into Robson. There is abundant opportunity for error as to the actual thickness of the strata, but I think it is on the side of too low an estimate and that in the future a greater thickness will be assigned to the Ordovician of the Robson massif. One element that could not be estimated for is the faults that have dropped and tipped the mass of strata forming the Helmet between Robson and Iyatunga.

NOMENCLATURE

Although not an original explorer of the Robson Peak District, it fell to my lot to be the first to study the geologic section, and in this connection it was necessary to apply additional names in order to properly locate, describe, and name the geologic formations.

Changes in names.—Of the names previously used and printed on the Wheeler map of 1912,¹ I thought it might be well to change the following:

1. Ptarmigan Peak to Titkana (bird) Peak.
2. Rearguard to Iyatunga (black rock) Mountain.
3. Extinguisher to Billings Butte.
4. Robson Glacier to Hunga (chief) Glacier.
5. Mount Robson to Robson Peak.
6. East Branch Moose River to Moose River.
7. West Branch Moose River to Hihuna (owl) River.
8. Mount Toot-toot to McEvoy Mountain.

My reasons for the above changes are:

1. The name "Ptarmigan" has been applied to a mountain and a lake north of Laggan in Alberta.
2. "Rearguard" does not appear to be an appropriate name for one of the great portals of the main glacier.
3. "Extinguisher" was given by Coleman to a butte that is of the greatest geologic importance as it is made up of rocks containing the finest Cambro-Ordovician fauna yet known in Western Canada. The name "Billings" is proposed for this butte in honor of E. Billings, the distinguished Canadian paleontologist, who described the famous Cambro-Ordovician fauna of Point Lévis, Province of Quebec, and Western Newfoundland.

¹ Canadian Alpine Journal, Vol. 4, 1912.

4. The name "Robson" has been used for six distinct features:
 - Robson Peak, Milton and Cheadle, 1865.
 - Robson Cirque, Wheeler, 1912.
 - Robson Pass, Coleman, 1908.
 - Robson Glacier, Wheeler, 1912, = Main Glacier, Coleman, 1908,
= Great Glacier, Collie, 1912.
 - Lake Robson, Collie, 1912, p. 226.
 - Robson Park, Government of British Columbia, 1913.

Thinking that the name "Robson" is somewhat over-applied I have suggested the Indian name "Hunga" (= chief) for the great glacier.

5. "Robson Peak" is the name given by Milton and Cheadle, 1865, and used by McEvoy on his map of 1900. There does not appear to be any good reason for changing it to "Mount Robson," as it is the highest "Peak" in the Canadian Rockies.

6. The name "Moose River" should be extended up the main river to its head below Moose Pass, as the so-called "West Branch" is quite a distinct stream and should bear a distinct name.

7. Hihúna¹ (owl) River drains the southeast side of the Robson Peak area. It is a large stream and its valley is one of the most beautiful features of the Robson District. At its upper end Resplendent Valley is very attractive. In the future the broad flat slopes of the Hihuna will be a favorite camping place when made accessible by a well-graded road. Hihuna River is the west branch of Moose River as given on the Wheeler map.

8. "Mount Toot-toot," north of Yellowhead Pass, I am calling McEvoy Mountain after J. McEvoy, who first made a map of this area. The mountain furnishes a fine illustration of the Cambrian rocks overlying the pre-Cambrian of the Yellowhead Pass.

New names.—A number of names are here given to certain mountains and points that are indicated on the photographs. They are mostly derived from the language of the Assiniboine Indians. Of these names, the following have received the approval of the Geographic Board of Canada:

*Iyatúnga*¹ (black rock) for the mountain southwest of Hunga Glacier (pl. 58, fig. 1).

Titkána (bird) for the peak on the northeast side of Hunga Glacier (pl. 58, fig. 1).

Chetáng (hawk) for the line of cliffs above and southwest of Coleman Glacier (pl. 56, fig. 2).

¹ The accent mark is used here merely to indicate the syllable to be accented.

The following additional names are used in this paper and may in due time come before the Geographic Board for its consideration:

Billings Butte (pl. 57, fig. 2), a rocky butte rising above Hunga Glacier on a north ridge of Mount Resplendent and west of Lynx Mountain. (The Extinguisher of Coleman.) Named in honor of the late Mr. E. Billings of the Geological Survey of Canada.

Chápa (beaver) *Point*, northwest point above Mural Brook and Smoky River at the southern end of Shota Mountain (pl. 57, fig. 1).

Chúshina (small) *Glacier*, west slope of Phillips Mountain (pl. 57, fig. 2).

Chupó (fog, mist) *Glacier*, southwest glacier of northwest snow field of Robson Peak (pl. 58, fig. 1).

Hihúna (owl) *River*, west branch of Moose River extending into Resplendent Valley.

Hítká (brown) *Mountain*, south point above Mural Brook and above Smoky River and Mural Glacier (pl. 57, fig. 1).

Hóta (gray) *Cliffs*, of southwest slope of Mahto Mountain above Coleman Brook (pl. 57, fig. 1).

Húnga (chief) *Glacier*, great north glacier of Robson Peak = Robson Glacier of Wheeler (pl. 58, fig. 1).

Hútam (east) *Mountain*, 2.75 miles (4.4 km.) west-northwest of Yellowhead Pass on the Continental Divide.

McEvoy Mountain, point on Continental Divide northwest of Yellowhead Pass. Named in honor of James McEvoy who surveyed the Yellowhead Pass region.

McLaurin Mountain (9,004 feet), northwest of Berg Lake. The Whitehorn east station of the Wheeler map.

McNaughton Mountains, mountain ridges between Moose River and Grant Creek, of which Mowatt Mountain is the southeastern point. Named in honor of Mrs. McNaughton, who crossed the Yellowhead Pass and was the author of a book on the subject in 1862.

Mahtó (grizzly-bear) *Mountain*, between Smoky River and Calumet Creek (pl. 55, fig. 2).

Minióhan (through the water) *Mountains*, west and northwest of Robson Peak, across the Valley of a Thousand Falls (pl. 58, fig. 1).

Phillips Mountain (9,542 feet). Named for Donald Phillips who climbed Robson Peak with Dr. Kinney in 1909 (pl. 57, fig. 2).

Sápa (black) *Mountain*, ridge northeast of Smoky River and northwest of Calumet Creek.

Shió (grouse) *Point*, high point northwest of Moose Pass.

Shóta (smoke) *Mountains*, southwest side of Smoky River, below mouth of Calumet Creek (pl. 57, fig. 1).

Tah (moose) *Mountain* (8,817 feet), peak southwest side of Moose Pass (pl. 55, figs. 1, 2; pl. 56, fig. 1).

NEW FORMATION NAMES

FEET

- ROBSON LIMESTONES.**—[Ordovician] massive and thin-bedded limestones forming the upper portion of Robson Peak.
 Estimated thickness 3,000
Fauna.—Fossils occur near the base where there is a commingling of Upper Cambrian and Ordovician types; also from higher up, where numerous Lingulæ of Ordovician characteristics occur.¹
- LYNX LIMESTONES.**—[Upper Cambrian] thin-bedded gray and bluish-gray limestone with bands of shale.
 Estimated thickness 2,100
Fauna.—None found.
Name derived from Lynx Mountain, which is almost entirely formed of the strata included in the formation.
- TITKANA LIMESTONES.**—[Middle Cambrian] massive beds of thin layers of bluish-gray limestone, interbedded with bands of dolomitic limestone.
 Estimated thickness 2,200
Fauna.—Characteristic Middle Cambrian fossils, which may be compared with the fauna of the Stephen formation that occurs 200 miles (321.8 km.) to the south.
Name derived from Titkana Peak, where the formation is extensively developed.
- MUMM LIMESTONES.**—[Middle Cambrian] massive-bedded gray arenaceous limestones.
 Estimated thickness 600
Fauna.—No fossils.
Name derived from Mumm Peak, where the limestones form the upper part of the mountain.
- HITKA FORMATION.**—[Middle Cambrian] alternating bands or thin layers of arenaceous limestones and shales.
 Estimated thickness 1,700
Fauna.—No fossils.
Name derived from Hitka Mountain that rises above Smoky River Valley east of Mumm Peak and north of Titkana Peak.
- TATAY LIMESTONES.**—[Middle Cambrian] massive-bedded gray arenaceous limestones.
 Estimated thickness 800
Fauna.—No fossils.
Name derived from Tatay Cliffs, east of Lake Adolphus and northwest of Titkana Peak.

¹ For lists of fossils see detailed geologic section, pp. 336-340.

Paha Mt.

Tokana Mountains

Calumet Peak



FIG. 1.—Panoramic view from Shio Point, looking down Moose River Valley. The strata are of Upper Cambrian age. A fault line with a throw of about 9,000 feet has thrust the Lower Cambrian strata up against the Upper Cambrian.

Moose Pass = M. P.

Tah Peak

Lynx Mt. = L.



FIG. 2.—Panoramic view of Tah Peak, Mahto Mountain, and Calumet Creek. On the left are Titkana Peak and Robson Peak. On the right Calumet Creek with Mummichog Lake.

Moose River Valley Moose Pass Mahpiya Snow Field Tah Peak Lynx Mt.



the mountains on the right of the Pass are of Lower Cambrian age, and those on the left of the Pass are of Upper Cambrian over the Upper Cambrian on the line of the Pass. Photograph by C. D. W., 1912.

Titkana Peak = T.	Robson Peak = R.	Mahto Mt. = Ma.	Mumm Peak = M.	Mural Glacier = M. G.	Gendarme Mt. = G.
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Calumet Creek=C.

Peak slopes to the northwest, merging into Mahto Mountain, and beyond in the distance to the right of the Peak Mural Glacier. Photograph by C. D. W., 1912.

CHETANG LIMESTONES.—[Middle Cambrian] bluish-gray thin-bedded limestones.

Estimated thickness 900

Fauna.—Characteristic fossils of the lower portion of the Middle Cambrian, found at two horizons.

Name derived from Chetang Cliffs above Coleman Glacier, north of Titkana Peak.

HOTA FORMATION.—[Lower Cambrian] gray arenaceous limestones and siliceous shales alternating with massive quartzitic sandstone.

Estimated thickness 800

Fauna.—*Olenellus* and other genera characteristic of the upper part of the Lower Cambrian.

Name derived from Hota Cliffs rising above Coleman Brook which runs along the southwest base of Mahto Mountain.

MAHTO SANDSTONES.—[Lower Cambrian] massive-bedded quartzitic sandstone with bands of siliceous shale.

Estimated thickness 1,800

Fauna.—Fragments of *Olenellus* in the upper portion on Mahto Mountain.

Name derived from Mahto Mountain, which faces the valley on the south side of Calumet Creek east of Smoky River.

TAH FORMATION.—[Lower Cambrian] siliceous shale and interbedded siliceous limestones.

Estimated thickness 800

Fauna.—No fossils found.

Name derived from Tah Mountain, east-northeast of Mahto Mountain and southwest of Moose Pass. The formation occurs just above the Pass at the base of the mountain.

McNAUGHTON SANDSTONES.—[Lower Cambrian] quartzitic sandstones.

Estimated thickness 500

Fauna.—No fossils found.

Name derived from McNaughton Mountain, situated opposite the mouth of the Hihuna River where it enters Moose River.

MIETTE SANDSTONES.—[Pre-Cambrian] Belt series, massive gray sandstones with interbedded siliceous shales.

Estimated thickness 2,000+

Fauna.—No fossils found.

Name derived from Miette River, which cuts through the Miette formation for many miles in the vicinity of Yellowhead Pass.

STRATIGRAPHIC SECTION FROM ROBSON PEAK NORTH-NORTHWEST TO MOOSE PASS

ORDOVICIAN SYSTEM

FEET

ROBSON LIMESTONES.—Light-gray or dove-colored and bluish-gray thin-bedded limestones, forming massive strata on cliff exposures 3,000

The upper 1,500 feet of Robson Peak are practically inaccessible. The limestones appear to be more massive-bedded and arenaceous than the strata below. They weather like the great arenaceous limestones of the Kicking Horse Pass section 150 miles to the south. Large blocks of the arenaceous and dolomitic buff-weathering limestone, also siliceous and calcareous gray shale with buff-weathering magnesian limestone in thin layers, were brought down from high up on Mount Robson by the central moraine of Hunga Glacier.

There is no known well-defined lithological break between the Ordovician and the Cambrian. A line is now tentatively drawn in a series of thin-bedded and shaly limestones, at Billings Butte, where there is a commingling of the lower Ordovician and Upper Cambrian faunas.

Fauna.—(61u) In the gray thin-bedded limestones brought down by Chupo Glacier on the northeast slope of Robson Peak four species of fossils were found that indicate an horizon very close to if not within the base of the Ordovician:

Lingulella cf. *L. manticula* White

Acrotreta sp. undt.

Hyalithes sp. undt.

Ptychoparia sp. undt.

In Billings Butte (Locality 61n) in the upper part of the shaly limestone the fossils are distorted. The collection includes a *Lingulepis* that appears to be identical with *Lingulella* (*Lingulepis*) *acuminata* Conrad, and a species of *Asaphus* the fragments of which indicate a rather large species.

Below the *Lingulepis* zone, limestones occur interbedded in the shaly layers that indicate by the contained fossils the base of the Ordovician. Locality 61q is in Billings Butte which rises above Hunga Glacier 2.5 miles (4 km.) north of the summit of Mount Resplendent (fig. 2, pl. 58). The following fauna was collected:

Lingulella cf. *L. isse* Walcott

Acrothele sp. undt.

Acrotreta cf. *A. sagittalis* Salter

Eoorthis desmopleura Meek

Eoorthis ?

Syntrophia nundina Walcott

Bellerophon sp. undt.

Orthoceras sp. undt.

Agnostus sp. undt.

Hungia billingsi n. sp.

Triarthrus sp. undt.

Solenopleura sp. undt.

Peltura (Pygidia)

Apatoccephalus

Chuangia robsonensis n. sp.

Illanurus n. sp. (a)

Illanurus n. sp. (b)

Shio Point = S.

Tokana Mts. = T.

Moose Pass = M.



Calumet Creek

FIG. 1.—Looking south across Calumet Creek and Flats. In the center Tah Peak; the Tokana Mountains and Cal

Mt. Mahto = Ma.

Mahpiya Snow Field = Mp. Coleman Glacier = C.



FIG. 2.—Looking southwest from south slope of Mahto Mountain. On the left Coleman with Robson Peak in the di



right Mahpiya snow field and the dark mass of Mahto Mountain; to the left of Tah Peak
 k. Photograph by C. D. W., 1912.

Titkana Peak = T.

Iyatunga Robson
 Mt. Peak
 = I. = R.

Miniohan
 Range
 = Mi.



Man Brook = C. B.

er and Creek and rising above the creek Chetang Cliffs, Tatay Cliff, and Titkana Mountain.
 Photograph by C.D. W., 1912.

CAMBRIAN SYSTEM

UPPER CAMBRIAN

LYNX LIMESTONES.—Thin-bedded bluish-gray limestone with interbedded bands of light gray shale, and at the base a band of about 200 feet in thickness of gray, greenish and reddish-brown shale 2,100

Fauna.—No fossils were found below the arbitrary line drawn at the base of the shaly limestones containing the fauna from Locality 61q.

MIDDLE CAMBRIAN

TITKANA LIMESTONES.—Massive-bedded bluish-gray limestone in thin layers interbedded with gray siliceous, buff-weathering limestone that occurs in bands 50 to 100 feet thick. 2,200

This formation is best seen in the west slopes of Titkana Peak and Iyatunga Mountain. Fossils were found at two horizons that clearly correlate the lower part of the Titkana formation with the Stephen formation of Mount Stephen.

Fauna.—At the upper horizon the following species occur (Locality 61v) 1 mile (1.6 km.) each of summit of Titkana Peak in cliff above Hunga Glacier:

Micromitra zenobia Walcott
Obolus mcconnelli Walcott
Obolus septalis Walcott
Acrotreta cf. depressa Walcott
Wimanella ? borealis n. sp.
Hyalithes carinatus Matthew
Selkerkia major Walcott
Agnostus montis Matthew
Zacanthoides spinosus Walcott
Kootania dawsoni Walcott
Ptychoparia n. sp.

Of the above all but *Wimanella ? borealis* occur in the Stephen formation.

At an horizon estimated to be 1,000 feet lower, the following genera are represented in the collection from localities 61l and 61m, about 1.5 miles (2.4 km.) west-northwest of the summit of Titkana Peak on slopes above Lake Adolphus:

<i>Acrothele</i>	<i>Olenoides</i>
<i>Acrotreta cf. sagittalis</i> Salter	<i>Zacanthoides</i>
<i>Agnostus</i>	<i>Ptychoparia</i>

MUMM LIMESTONES.—Massive-bedded, gray siliceous limestone weathering to gray and buff tints on cliffs. 600

Exposed at northwest base of Titkana Peak and north face of Mumm Peak.

Fauna.—No fossils found.

HITKA FORMATION.—Alternating bands of gray thin-bedded arenaceous limestone and siliceous, arenaceous, and argillaceous shales, that form very striking broken cliffs and steep slopes. . . 1,700

This formation forms high slopes along the valley of Smoky River below Lake Adolphus and east of Mumm Peak.

Fauna.—No fossils found.

TATAY LIMESTONES.—Massive-bedded gray siliceous and arenaceous limestones 800

Fauna.—No fossils found.

CHE Tang LIMESTONES.—Bluish-gray, thin-bedded limestones forming a cliff beneath the Tatay formation [limestones], a talus slope of about 100 feet, and then a second cliff above Coleman Glacier and Brook. 900

This formation is well shown in Chetang Cliff, 3 miles (4.8 km.) north of the summit of Titkana Mountain.

Fauna.—At about 100 feet (30 m.) from the summit of the formation (61o):

Nisusia sp. undt.

Zacanthoides sp. undt.

Bathyuriscus sp. undt.

At about 350 feet (105.6 m.) down in the formation at top of lower cliff (61p) the following fauna occurs:

Albertella bosworthi Walcott (Occurs at about same horizon in Mount Bosworth section¹).

In a drift block (Locality 61w) the following species were found:

Albertella cf. *bosworthi* Walcott

Albertella n. sp.

Agraulos sp. undt.

Ptychoparia sp.

LOWER CAMBRIAN

HOTA FORMATION.—Massive-bedded arenaceous limestone in great bands of light and dark gray color with a band of gray, pinkish-weathering limestone at the top that forms the south slope of the ridge on the north side of Coleman Brook and the south-west spur of Mahto Mountain. 800

Fauna.—Fragments of *Olenellus*, etc., were found in the upper layers of the formation on the line of the section.

At Locality 61s, west slope of Mahto Mountain about 300 feet (90 m.) from the top,

Olenellus canadensis Walcott.

At Locality 61t, gray siliceous limestone near top of the formation on west slope of Mahto Mountain,

Olenellus sp. undt.

Ptychoparia ?

¹ Smithsonian Misc. Coll., Vol. 53, 1908, No. 5, p. 214.

Titkana Peak = T. Robson Iyatunga Peak = R. Mt. = I. Berg Lake = B. Miniohan Mts = Mi.



Coleman Brook = C. B.

FIG. 1.—View from the south slope of Mahto Mountain, showing on the left Coleman Cr and to the right of Berg Lake, Mumm Peak, Hitka Mountain, Chapa Point, a

Chushina Glacier Phillips Mt. (9,542 ft.) Lyn M (17)



FIG. 2.—View from southwest slope of Titkana Peak, looking south. On the left Phillips M to the right Mount Resplendent, Billings Butte, and portions of Hunga Glacier. Photograph portions of Hunga Glacier.

Snowbird Pass

Shota
Mts.
= S.

Mummi Peak = M. Hitka Mt. = H. Gendarme Mt. = G. Chapa Point = C.



Smoky River = S. R.

Hota Cliffs = H. C.

Smoky River = S. R.

... above Chetang Cliff, Tatay Cliff, and Titkana Mountain. In the distance Robson Peak, Shota Mountain rising above Smoky River. Photograph by C. D. W., 1912.

Mt. Resplendent = Rs.
(11,173 ft.)

Billings Hunga
Butte Glacier
= B. = H. G



... with the slope toward Snowbird Pass. Back of Phillips Mountain, Lynx Mountain, and ... by C. D. W., 1912. Fig. 2 joins fig. 2 of plate 58, forming a panoramic view of the upper

At Locality **61k**, 2.5 miles (4 km.) west of **61t** beneath the north face of Mumm Peak and just above Mural Glacier, the following 12 species were found in a band of dark siliceous shale:

- Planolites* (Annelid trail.)
- Cystid ? sp. undt.
- Lingulella chupo* Walcott
- Lingulella hitka* Walcott
- Obolella hota* Walcott
- Obolella* cf. *chromatica* Billings
- Hyalithes* sp. undt.
- Callavia eucharis* Walcott
- Callavia perfecta* Walcott
- Wanneria occidentis* Walcott
- Olenellus trucmani* Walcott
- Hymenocaris* sp. undt.
- Agraulos* sp.

MAHTO SANDSTONES.—Massive-bedded quartzitic sandstones with thin-bedded hard sandstones and dirty grayish-brown shale in thin bands 1,800

This series extends down the northeast face of Mahto Mountain and the slope of Tah Mountain nearly 800 feet (241 m).

Fauna.—No fossils found.

TAH FORMATION.—Hard, green and purple siliceous shales with irregular massive beds of gray and purple, compact limestone interbedded in central portion..... 800

Fauna.—No fossils found.

McNAUGHTON SANDSTONES.—Light gray, massive-bedded quartzitic sandstone 500+

Fauna.—No fossils found.

At Moose Pass there are only a few layers of this formation exposed, but to the southwest toward Yellowhead Pass the sandstones have a thickness estimated at 500 feet (151 m.) . This, however, is very uncertain as it is difficult to determine the line of demarcation between the sandstone of Cambrian and pre-Cambrian (Belt) age.

UNCONFORMITY BY EROSION

PRE-CAMBRIAN

BELT SERIES, MIETTE FORMATION.—Massive-bedded gray sandstones with thick bands of gray and greenish siliceous shales. . . 2,000+
The best exposures seen of the Belt series were along both sides of Yellowhead Pass from the vicinity of Grant Brook on the west to Fitzhugh on the east.

In the Yellowhead Pass the cuts of the Grand Trunk Pacific and the Canadian Northern railroads afford fine sections of the Miette sandstones and shales. Some of the layers of sandstone are clean and fresh, but most of the rock suggests deposition of the sand in muddy water.

It may be that more than one formation occurs in the Belt series, but without detailed study and mapping it will be difficult to determine the limits to be assigned to the strata provisionally grouped in the Miette formation.

On both the north and south sides of Yellowhead Pass the Miette formation occurs in rounded, wooded ridges that rise over 2,500 feet (754 m.) above the Pass. To the north the Cambrian of McEvoy Mountain rises as great castellated masses on the northwest side of Miette River, and on the west side Hutam Mountain forms an outlying butte of Cambrian sandstone and limestone.

To the south of the Pass the banded cliffs of Cambrian rocks in Mount Fitzwilliam and Mount Pelee rise high above their base of Miette sandstones.

At the Pass the valley is essentially the same type as the valley of Bow River near Laggan. In both, the valley is eroded in the Belt series of impure sandstones and the Cambrian sandstones and limestones form high, bold mountains to the north and south of the valley.

Titkana
Peak

Phillips Mt.
= P.

Hunga
Glacier
= H. G.

Iyatunga M.
(9,000 ft.)



FIG. 1.—Panoramic view of the Robson massif from a point on the ridge south of Mumm on left side of Hunga Glacier, water on right flowing to the

Mt. Resplendent = Rs.

Billings Butte = B.

Hunga Glacier



FIG. 2.—Panoramic view of the Robson massif and adjoining mountains, with the great Hunga Glacier above the glacier on the slope of Titkana Peak

Blue Glacier = B.

Robson Peak (13,000 ft.)

Chupo Glacier = C.

Little Grizzly Peak = L. G.



Berg Lake

Miniohan Mountains

at 1,800 feet (546 m.) above Berg Lake. The Continental Divide passes over the rock knoll on left to the Arctic Ocean. Photograph by C. D. W., 1912.

Robson Peak

Iyatunga Mt.



Glacier in the foreground. The photograph was taken from a point nearly 2,000 feet (604 m.) with figure 1. Photograph by C. D. W., 1912.

SUMMARY OF ROBSON DISTRICT

STRATIGRAPHIC SECTION

		Formation	Character	Estimated thickness in feet
<i>Ordovician</i>	{	Robson	Massive and thin-bedded limestones partly siliceous, arenaceous and dolomitic.	3,000
<i>Cambrian</i>	Upper {	Lynx	Thin-bedded gray and bluish-gray limestone with bands of shale	2,100
	Middle {	Titkana	Massive beds of thin layers of bluish-gray limestone interbedded with bands of dolomitic limestone	2,200
		Mumm	Massive-bedded gray arenaceous limestones	600
		Hitka	Alternating bands of thin layers of arenaceous limestones and shales	1,700
		Tatay	Massive-bedded gray arenaceous limestone	800
		Chetang	Bluish-gray thin-bedded limestones	900
	Lower {	Hota	Gray arenaceous limestone, alternating with massive quartzitic sandstone	800
		Mahto	Massive-bedded quartzitic sandstone with bands of siliceous shale	1,800
		Tah	Siliceous shale and interbedded siliceous limestones	800
Mc Naughton		Quartzitic sandstones	500	
	Total thickness, Cambrian sediments		12,200	
<i>Unconformity</i>				
<i>Algonkian</i>	{	Miette	Massive gray sandstones with interbedded siliceous shales. Base concealed.	2,000+

For purposes of comparison a summary of the Bosworth section as it occurs along the Kicking Horse Pass route of the Canadian Pacific Railway is inserted here, as published in 1908.¹

¹ Smithsonian Misc. Coll., Vol. 53, No. 5, 1908, pp. 216, 217.

SUMMARY OF MOUNT BOSWORTH SECTION
STRATIGRAPHIC SECTION

	Formations	Character	Feet	Feet	
UPPER CAMBRIAN	Sherbrooke . . .	Gray, partly cherty limestones	175		
		Oölitic limestones and shaly band	590		
		Arenaceous dolomitic limestone	610	1,375	
	Paget	Massive-bedded bluish-gray limestone	60		
		Oölitic limestone with bands of shale	300+	360+	
	Bosworth	Gray, arenaceous, dolomitic limestone	600+		
Shaly and thin-bedded dolomitic limestone with two bands of shale		987			
Shales		268	1,855+		
MIDDLE CAMBRIAN	Eldon	Siliceous and arenaceous limestone	788		
		Bluish-gray limestone	95		
		Arenaceous limestone	1,845	2,738	
	Stephen	Thin-bedded, dark and bluish-gray limestone	315		
		Alternating limestones and shale	325	640	
	Cathedral	Arenaceous dolomitic limestone	1,595	1,595	
LOWER CAMBRIAN	Mount Whyte	Thin-bedded limestones	224		
		Sandstone	31		
		Siliceous shale	115		
		Gray limestone	20	390	
	St. Piran	Sandy shales and quartzitic sandstones as exposed at Lake Agnes	2,705	
	Lake Louise	Compact siliceous shale as exposed at Lake Louise	105	
	Fairview	Quartzitic sandstones as exposed at Lake Louise	600+	
	Total thickness of sections examined				12,353+

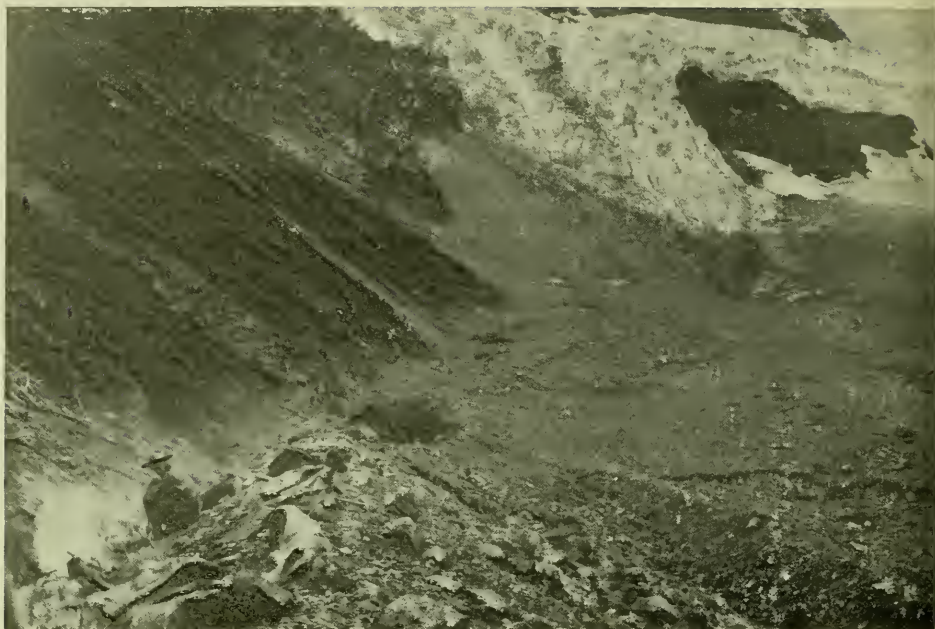
**COMPARISON OF ROBSON SECTION WITH
BOSWORTH SECTION**

The Mount Bosworth section¹ has been much more carefully studied than the Robson section, but with the data available the two sections show a general similarity and yet there is such variation as to prevent the correlation of the various formations of the two sections; therefore, the same formational names cannot now be used.

In the following table the formations are arranged so as to present a rough correlation between the two sections. The data for further comparison are to be found in the summaries of the two sections

¹ Smithsonian Misc. Coll., Vol. 53, No. 5, 1908, pp. 204-217.

Base of Mumm Peak



Gendarme Mt. = G.



FIGS. 1 and 2.—Panoramic view of Mural Glacier. In the lower cliff on the left at "x" foreground is covered with loose rock and débris, and the cliff over which th

acier

Gendarme Mt. = G.



Shota Mts.

Chapa Point

Valley of Smoky River

Sapa Mts. = S.



) above the camp fire Lower Cambrian fossils are abundant. The entire glacier in the tumbles is formed of Lower Cambrian rocks. Photograph by C. D. W., 1912.

(pp. 341, 342) and in the detailed sections (pp. 336-340) for the Robson section and for the Bosworth section in my paper on the Cambrian sections of the Cordilleran area.¹

COMPARATIVE STRATIGRAPHIC SECTIONS

ROBSON DISTRICT		MOUNT BOSWORTH SECTION	
Formations		Formations	
	<i>Feet</i>	<i>Feet</i>	
<i>Upper Cambrian</i>	Lynx 2,100	1,375 Sherbrooke	}
		360 Paget	
		1,855+ Bosworth	
		3,590+	
<i>Middle Cambrian</i>	Titkana 2,200	2,728 Eldon	}
	Mumm 600		
	Hitka 1,700	640 Stephen	
	Tatay 800	1,595 Cathedral	
	Chetang 900		
	6,200	4,963	
<i>Lower Cambrian</i>	Hota 800	390 Mount Whyte	}
	Mahto 1,800	2,705 St. Piran	
	Tah 800	105 Lake Louise	
	McNaughton 500+	600+ Fairview	
	3,900+	3,800+	
Total thickness Cambrian sediments 12,200+		12,353+	

There are strong points of resemblance between the McNaughton and Fairview formations, both being formed of layers of quartzitic sandstone that weather to a dark, rusty-brown color and both being unconformably superjacent to the sandstone of the Belt series.

One of the most noticeable differences is in the thickness of the massive arenaceous limestones in the Robson section which is much less than in the Bosworth section. There is a thickness of only 1,400 feet (422.8 m.) in the Middle Cambrian, while in the Bosworth section the Eldon and Cathedral arenaceous limestones of the Middle Cambrian have a combined thickness of 4,333 feet (1,308.5 m.).

Future study of the Robson section and discovery of other fossil-bearing beds will undoubtedly lead to a shifting of the lines of demarcation, but the larger divisions of the section will probably be preserved.

¹ Smithsonian Misc. Coll., Vol. 53, No. 5, 1908, pp. 204-216.