BULLETIN 125

STRATIGRAPHY OF THE ROCKY MOUNTAIN GROUP IN THE SOUTHEASTERN CORDILLERA OF CANADA

D. K. Norris

1965

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PLATE I. View from south of Plateau Mountain, Alberta. Hill capped with about 60 feet of Pennsylvanian Rocky Mountain Group.

GEOLOGICAL SURVEY
OF CANADA

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By

D. K. Norris

DEPARTMENT OF
MINES AND TECHNICAL SURVEYS
CANADA

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PREFACE

The late Palaeozoic Rocky Mountain Group in the southeastern Cordillera has recently attracted the attention of petroleum geologists. This bulletin, which reports on the systemic study of the stratigraphy of the group, will therefore be of immediate as well as lasting importance.

The author examined sections for 150 miles along the east margin of the basin in which the strata of the group were deposited and for some 60 miles across it. He then correlated rock-units in widely separated parts of the basin and established a classification that will greatly aid in its exploration.

J. M. HARRISON,
Director, Geological Survey of Canada

OTTAWA, December 19, 1962

Bulletin 125—Die Stratigraphie der Rocky-Mountain Group in den südöstlichen Kordilleren von Kanada.
Von D. K. Norris

Die Stratigraphie spätpaläozoischer Formationen.

БЮЛЛЕТЕНЬ 125 — Стратиграфия серии Рóки Моунтэн в Юго-восточных Кордильерах Канады.
Д. К. Норрис.
Стратиграфия позднепалеозойских отложений

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Abstract

The Rocky Mountain Group in its fullest development in the southeastern Canadian Cordillera is composed of four distinct lithologic units. A basal sandstone assemblage of Lower Pennsylvanian age, which is in gradational contact with Mississippian Rundle Group in the western part of the basin, is overlain with apparent conformity by dolomites of early Middle Pennsylvanian age, and these, in turn, are overlain unconformably by late Lower or early Upper Permian siltstones. The uppermost unit of the succession is chert of Upper (?) Permian age. Triassic Spray River Group unconformably overlies the Rocky Mountain succession in all but Livingstone and Blairmore Ranges, where Jurassic Fernie Group forms the basal beds of the Mesozoic succession.

The sandstones forming the lowest unit of the Rocky Mountain Group are termed the "Misty Formation" (new name), the dolomites are assigned to the Kananaskis Formation (McGugan and Rapson, 1961), the siltstones to the Ishbel Formation (restricted), and the chert to the Fantasque Formation (Harker, 1961).

The formations thin eastward through a combination of non-deposition and erosional truncation so that in the west all four are commonly present whereas in the east either the lowermost units occur or all units are absent. Within the area the group ranges in thickness from somewhat in excess of 2,000 feet west of Elk River, British Columbia; to about 40 feet in northern Livingstone Range, Alberta; to zero at the surface on Moose Mountain, Alberta, and in the subsurface east of the Highwood and Livingstone Ranges.

Résumé

Le groupe des Rocheuses, qui atteint sa plus grande extension dans la Cordillère canadienne du Sud-Est, se compose de quatre unités lithologiques distinctes. L'unité située à la base est un grès du Pennsylvanien inférieur, en contact graduel avec le groupe Rundle du Mississippien dans la partie occidentale du bassin, et recouvert en apparente concordance par des dolomies du début du Pennsylvanien moyen, lesquelles, à leur tour, sont recouvertes en discordance par des siltstones de la fin du Permien inférieur ou du début du Permien supérieur. L'unité lithologique située au sommet de la succession est du chert du Permien supérieur(?).

Le groupe triasique de la rivière Spray recouvre en discordance le groupe des Rocheuses partout, sauf dans les chaînons Livingstone et Blairmore, où le groupe jurassien Fernie constitue les couches à la base de la succession mésozoïque.

Les grès formant la base du groupe des Rocheuses portent le nom de formation Misty (nouveau nom), les dolomies font partie de la formation Kananaskis (McGugan et Rapson, 1961), les siltstones appartiennent à la formation Ishbel (réduite), et le chert à la formation Fantasque (Harker 1961).

Ces formations s'amincissent vers l'Est en raison à la fois de l'absence de dépôts et de l'ablation due à l'érosion. Il en résulte que si dans l'Ouest les quatre unités sont habituellement présentes, dans l'Est les unités supérieures ou même toutes les unités sont absentes. A travers la région, l'épaisseur du groupe, d'un peu plus de 2,000 pieds à l'Ouest de la rivière Elk en Colombie-Britannique, diminue à 40 pieds dans le nord du chaînon Livingstone en Alberta, puis à rien en surface sur le mont Moose en Alberta et en sous-sol à l'Est des chaînons Highwood et Livingstone.

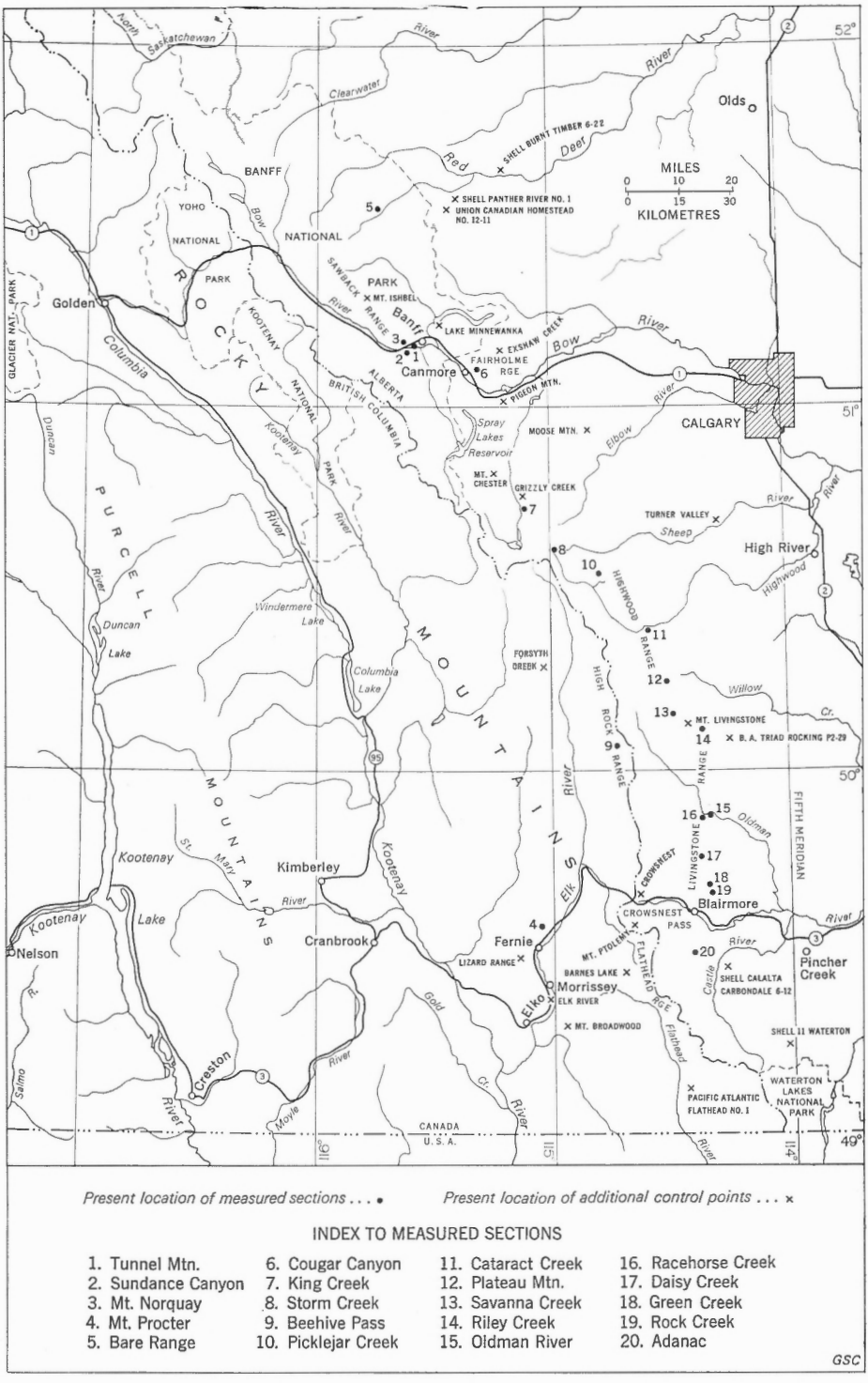

FIGURE 1. Location of measured sections 1 to 20 and additional control points.

INTRODUCTION

With increased interest in the late Palaeozoic rocks of the southern Canadian Cordillera, correlations are imperative between the standard Bow valley sections and rocks of similar ages or of equivalent stratigraphic positions in the foothills and mountains to the north and south. Systematic mapping of the region south of Bow River is incomplete between the type section of the Mississippian Mount Head and Etherington Formations immediately north of Highwood River and the type section of the Rocky Mountain Group in Bow valley.

To date interpolations between Highwood River and Bow valley seem to have been attempted, either lithologically with little faunal support, or palaeontologically without regard for the lateral extent or persistence of the lithic units containing the fossils. Either way, it must be admitted that the ranges, and hence the intrinsic value of the fossils to effect correlations in these late Palaeozoic rocks, often have not been established. This is especially true of the fossils in the sandstones of the Misty Formation, which are necessarily not too well preserved. Forbes and McGugan (1959)[1] and McGugan and Rapson (1960 and 1961) have nonetheless succeeded in recovering microfossils critical to the dating of the Rocky Mountain succession.

It is apparent however that, with due regard to relative geographic position within the (pre-Laramide) sedimentary basin, there is a persistent and logical stratigraphic succession within the late Palaeozoic rocks in the area. The carbonate assemblage of the Mississippian Rundle Group is overlain by a sandstone sequence of Lower Pennsylvanian age, which is overlain in turn by early Middle Pennsylvanian cherty dolomites. A major hiatus separates the dolomites from phosphatic siltstones of late Lower or early Upper Permian age capped by thick chert, possibly of Upper Permian age. The succession therefore is strikingly analogous to that in the northeast part of the American Cordillera (*see* Sloss and Moritz, 1951) where, for example, Mississippian carbonates of the Brazer Limestone are overlain by brightly coloured Mississippian and Pennsylvanian shales, siltstones, and dolomites of the Amsden Formation, which are in gradational contact with a thick sandstone succession of the Pennsylvanian Quadrant Formation. These latter sandstones are in turn capped by cherts, dolomites, and phosphatic shales of the Permian Phosphoria Formation.

The purpose of this report is (1) to review the historical background of the Rocky Mountain succession in the sense of Warren (1927, 1947, and 1956) and of McGugan and Rapson (1960 and 1961), (2) to point up serious difficulties in nomenclature that have arisen from correlations made purely on palaeontological

[1] Names and/or dates in parentheses are those of *References* at end of report.

premises, (3) to support the obvious lithic correlation between High Rock and Misty Ranges and Mount Rundle (Norris, 1957) with faunal data, and (4) to define or redefine the subdivisions of the Rocky Mountain Group so that they conform as closely as possible with mappable units. Location of measured sections and additional control points are shown in Figure 1.

Field Work and Acknowledgments

Data presented here were acquired primarily during field mapping from 1953 to 1956. P. Harker, G. B. Leech, and R. A. Price of the Geological Survey made helpful suggestions concerning the regional correlation of lithic units. G. G. L. Henderson of the California Standard Company and G. B. Leech provided information on the location of sections on the west flank of the Fernie synclinorium. Fossil determinations are by E. W. Bamber and P. Harker (*see* Appendix B). Miss K. L. Gunn assisted in the preparation of the manuscript figures.

HISTORICAL SUMMARY

The late Palaeozoic sandstone succession in Bow valley was initially included in the 'Upper Banff shales' (McConnell, 1887, p. 15D). Dowling (1907, p. 9) however removed it from this unit and named the sandstones in the area of Canmore, Alberta, the 'Rocky Mountain Quartzite'. There he indicated the formation to be about 1,600 feet thick. Allan (1913, p. 183) reported an exposed thickness of 1,600 feet for the 'quartzite' at Lake Minnewanka, and gave a maximum thickness of 800 feet for it in the Sawback Range, three thrust sheets to the west.

The first published section of the Rocky Mountain succession in Alberta was that of Shimer (1926) from along the north shore of Lake Minnewanka. Following Dowling, he included limestones and dolomites in the lower part of his section I (now known to be of Mississippian, Chesterian age) in the Rocky Mountain Quartzite, and considered the succession to be of Permian age. In the following year Warren (1927) published his measured section of the Rocky Mountain Quartzite on Tunnel Mountain and included faunal data which in his opinion was "undoubtedly representative of Pennsylvanian and, perhaps, of Permian time" (op. cit., p. 37).

In 1947 Warren proposed a subdivision of the "Rocky Mountain formation" into two (unnamed) members, whose names were formally published nine years later (1956) when he designated the upper unit the Norquay Mountain Member and the lower the Tunnel Mountain Member. According to Warren (1956, p. 247) the biota of the former "has definite Permian affinities", whereas that of the latter "is undoubtedly Pennsylvanian in age". Beales (1950) was the first to designate the Rocky Mountain succession on Tunnel Mountain as the type section. He published a detailed description of the type Rocky Mountain strata there, and interpreted the contacts of the members as defined in Warren's original (1927) description in the light of his own observations.

Raasch (1954), in a report prepared for private circulation, interpreted the thick sandstone succession at Storm Creek cirque immediately east of Highwood Pass in the Misty Range as younger than that of the type Rocky Mountain in Bow valley. He named these beds, together with interbedded varicoloured shales and siltstones and the dolomites at their base, the 'Storm Creek Formation' (op. cit., p. 4). In the same paper he reported his identification of the Mississippian Chesterian brachiopod *Composita subquadrata* at Tunnel Mountain "in a 9.5-foot zone lying in the lower part of the Norquay and 410 feet above the base of the Rocky Mountain formation" (op. cit., p. 5). He therefore proposed that the Tunnel Mountain be redefined at the type locality to include all beds which he considered to be of Chesterian age. By so doing he extended the limits of Warren's Tunnel Mountain Member to include the basal 57 feet of Warren's Norquay

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Mountain Member as measured by Beales (1950), and 191 feet of Beales' uppermost 'Rundle'. Thus at the type locality the Tunnel Mountain Member would have a total thickness of 624 (instead of 376) feet.

Two years later Raasch (1956) proposed raising the Rocky Mountain Formation to group status and redefined his Storm Creek Formation to include most of the sandstones at Highwood Pass. The remaining sandstones together with underlying shales, siltstones, and dolomites, he named the 'Norquay Formation' (without the 'Mountain') and ascribed both 'Formations' to the Permian.

Norris (1957) suggested an alternate correlation of lithic units between Storm Creek and Tunnel Mountain because of the likelihood that the thick sandstone succession resting on Mississippian carbonates and generally capped by dolomites, siltstones, and chert was one and the same rock-unit in the High Rock and Misty Ranges and on Mount Rundle. He recognized, moreover, at the pass north of Beehive Mountain in High Rock Range a thin, varicoloured unit of interbedded siltstones, sandstones, and dolomites resting between the thick sandstone sequence above and the Mississippian carbonates below, which he named the Todhunter Member of the Rocky Mountain 'Formation' and correlated it with the lower 105 feet of Raasch's Norquay Formation at Storm Creek cirque. Norris also indicated in his correlation chart that the base of the Rocky Mountain 'Formation' on Tunnel Mountain might be raised slightly and placed more appropriately at the top of the cherty dolomite succession.

Raasch (1958) recapitulated his arguments in favour of a palaeontological correlation of units between Storm Creek and Tunnel Mountain and reproposed his earlier (1956) usage of the Rocky Mountain Group, and Storm Creek and Norquay Formations. With his interpretation, the "Storm Creek formation appears to be absent in Bow valley" (op. cit., p. 195). In the same year Douglas and Harker (1958, p. 179) made a direct correlation of the type Etherington Formation of Chesterian age with Raasch's Tunnel Mountain Formation at Storm Creek, and the Rocky Mountain Formation of the Mount Head area with the type 'Norquay Member' on Tunnel Mountain.

A significant development in the resolution of the age of the Rocky Mountain Group was made by McGugan and Rapson (1960, p. 5). Their discovery of fusulinids in chert in the lower part of Warren's type Norquay Mountain Member has established beyond reasonable doubt a Lower or Middle Pennsylvanian age for the beds containing them. They assigned, moreover, a probable Middle Permian age to the topmost cherts of the Rocky Mountain succession in Bow valley because of their interpretation of the presence of the form genus *Helicoprion* Karpinsky in these beds at Sundance Canyon, 3 miles west of Banff. To the Tunnel Mountain Formation they assigned a Mississippian, Chesterian age (McGugan and Rapson, op. cit., Fig. 2). They accepted Raasch's (1956 and 1958) redefinition of the Rocky Mountain as a group and continued to use the term 'Norquay' (without the 'Mountain') for a composite uppermost unit of the succession.

Crickmay (1960) recapitulated the more significant contributions to the dating of the Pennsylvanian and Permian rocks in the mountains and subsurface of south-

western Alberta and provided additional faunal data to confirm the presence of rocks of these ages, especially in the subsurface.

McGugan and Rapson (1961) divided the Rocky Mountain Group into three formations termed respectively from the lowest, the Tunnel Mountain, the Kananaskis, and the Ishbel Formations. They restricted Warren's Tunnel Mountain so as to exclude the basal carbonates (*see* Norris, 1957) and therefore moved the lower contact upwards rather than downwards as Raasch had done six years earlier. They retained Warren's definition of the base of the Norquay Mountain Member and divided that 'member' into two formations, the Kananaskis and the Ishbel. The Kananaskis Formation they proved by means of fusulinids to be of early Middle Pennsylvanian age; the Ishbel Formation they recognized as being made up of two mappable units of Permian age.[1]

[1] Subsequent to this Bulletin being submitted for publication a number of significant contributions have been made to the stratigraphy of the Rocky Mountain Group. The reader is referred especially to "Mississippian Faunas of Western Canada" by S. J. Nelson, in *Geol. Assoc. Canada,* Special Paper No. 2, 1961.

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FORMATIONAL NOMENCLATURE

It is apparent from the preceding that at each locality examined in the southeastern Canadian Cordillera there is one, and only one, thick sandstone succession resting on carbonates of Mississippian age. The stratigraphic nomenclature and dating of these sandstones and related rocks has therefore suffered some serious changes in meaning.

The 'Tunnel Mountain' sandstones have been removed in large part from the Rocky Mountain Group and placed in the Rundle Group, have been equated with the Mississippian Chesterian carbonate succession at Storm Creek, have been called the 'Storm Creek' Formation at Storm Creek, and Warren's defined limits of the unit have been extended upwards and downwards so that the unit no longer bears any resemblance to the unit originally defined at the type locality. Warren's Norquay Mountain Member moreover has been equated in part with Mississippian strata now referred to the Todhunter Member of the Etherington Formation at Storm Creek, has been equated in part with the Tunnel Mountain sandstones there, has lost the cherty dolomites and cherts at its base at the type section, and has even lost half of its name.

Difficulties in the establishment of a simple, yet regionally applicable stratigraphic nomenclature appear to have arisen from the failure to recognize the regional effects of major unconformities within the succession, and from the failure to recognize the presence of Chesterian Etherington strata (s.l.) in the upper part of the type Rundle and the lower part of the type Tunnel Mountain.

The lithic subdivisions of the Rocky Mountain Group used in this report are essentially those of McGugan and Rapson (1961), but certain modifications in their formational nomenclature were considered necessary. The terms Tunnel Mountain and Norquay Mountain have been dropped; they served a useful purpose but are no longer meaningful. The name Misty Formation is proposed to replace the term Tunnel Mountain for the thick sandstone unit at the base of the Rocky Mountain succession. As the Ishbel Formation of McGugan and Rapson (*idem*) is composed of two formational units, it is proposed that the term Ishbel be restricted to include only those beds referred by them to the 'Lower Ishbel'. The term Fantasque Formation (Harker, 1961) is proposed for their 'Upper Ishbel' member. The inconsistency in nomenclature of the Rocky Mountain Group at Tunnel Mountain, Storm Creek, and Beehive pass, is indicated in Figure 2. Some of the underlying units are also shown, as they are involved in the problem of the equivalence, at least in part, of the Tunnel Mountain and Etherington strata.

The Rocky Mountain Group, as used in this report, is made up of four formations, termed respectively from the lowest, the Misty, Kananaskis, Ishbel, and Fantasque.

Misty Formation (new name)

The designated type section of the Misty Formation is the same as for Warren's (1956) Tunnel Mountain Member on Tunnel Mountain, except that the dolomites at the base are excluded (*see* Appendix A, Section 1). There, the formation is 299 feet thick. With reference to Beales' (1950) described section, the Misty Formation would extend from the base of the 29-foot sandstone bed he described on page 44 to the top of the 7-foot quartzite bed on page 43. The Misty Formation so defined, consists largely of fine-grained, grey, dolomitic sandstone with minor limestone and chert. The formation is conformably overlain by Kananaskis strata. Although lithologically gradational with Etherington Formation, Misty strata commonly rest with indentation on underlying beds in Livingstone and Highwood Ranges.

Standard for Highwood Range is the section described at the headwaters of Picklejar Creek (*see* Appendix A, Section 10). There the formation consists of interbedded, fine-grained, grey sandstone and grey dolomite with some chert. It is 126 feet thick.

At Beehive pass (9)[1], Storm Creek (8), Cougar Canyon (6), and Bare Range (5), the Misty Formation is underlain by brightly coloured, interbedded siltstones, dolomites, and sandstones in gradational contact with cherty dolomites typical of Etherington Formation. These rocks were defined (Norris, 1957, p. 253) as the Todhunter Member of the Rocky Mountain 'Formation' at Beehive pass.

As the top rather than the base of the brightly coloured Todhunter is more easily recognized on a regional scale, the Etherington Formation is redefined to include the Todhunter. The contact between Etherington and Misty strata is therefore defined as the base of the first thick sandstone with dolomites predominating below and sandstones above. The Todhunter is now positively dated as Mississippian (Chesterian) (*see* p. 21). Because of onlap it may have no lateral equivalent in the Highwood and Livingstone Ranges although silty mudstones at Adanac section (*see* Appendix A, Section 20) in Blairmore Range may represent it in part.

Outcrop thickness of the formation ranges from about 2,200 feet on Forsyth Creek west of Elk River (McGugan and Rapson, 1961, Figs. 4 and 5) to zero on Moose Mountain. It is also absent in the subsurface in a number of wells in the foothills (*see* Table I). The rapid eastward thinning is believed to be due in large part to non-deposition with some erosional truncation, especially as the pre-Jurassic unconformity.

The Misty Formation is considered to be of Lower Pennsylvanian (Morrowan) age (McGugan and Rapson, 1961, p. 81) on the basis of the occurrence of spiriferids of the group *Spirifer matheri, S. cavecreekensis, S. rockymontanus* (part), *S. opimus,* and *S. occiduus* low in the sandstone succession at a number of points in the southeastern Canadian Cordillera. McGugan and Rapson (idem) report these forms in Storm Creek cirque towards the base of the Misty Formation ('Storm Creek Formation'). They also indicate the presence of *Spirifer* cf. *S. matheri, S.* cf. *arkansanus* and other brachiopods in the lower part of the sandstones at Spray

[1] Numbers in brackets refer to sections in Appendix A.

Lakes. The productid *Dictyoclostus* cf. *D. portlockianus,* of probable Pennsylvanian age, has been reported by the writer (1957, p. 250) from about 90 feet above the base of the Misty Formation at Beehive pass and more recently it has been collected 10 feet above the base of the formation on the east flank of Mount Broadwood (*see* p. 17). *Composita subtilita* Hall? has been collected within 39 feet of the base on Mount Procter, and *Rhynchopora* sp., *Dielasma* sp., and *Orbiculoidea* sp. within 80 feet of the top on Mount Ptolemy. The involute gastropod *Bellerophon* was collected by the writer within 15 feet of the base of the Misty Formation on Mount Broadwood and *Euphemites* within 50 feet of its base at Savanna Creek (13).

The Misty Formation has therefore been dated with reasonable certainty as Lower Pennsylvanian in the Misty and High Rock Ranges and in ranges still farther west where it is commonly several hundred feet thick and is overlain conformably by Kananaskis strata containing early Middle Pennsylvanian fusulinids. As yet no fusulinids have been reported from Misty strata where the formation is thin, but the facts that the formation commonly rests on eroded Etherington Formation and contains Kananaskis-type lithologies in Livingstone and Highwood Ranges would strongly suggest a correlation of the thin sandstone succession there with the upper part of the thick sandstone succession to the west.

Kananaskis Formation (McGugan and Rapson, 1961)

The type section of the Kananaskis Formation is on Mount Chester in the Kananaskis Range, 28 miles southwest of Banff. According to McGugan and Rapson (op. cit., p. 98) the formation there consists of 180 feet of light grey weathering, silty dolomites with chert breccias in the upper beds and thin, nodular, bedded cherts in the lower beds. It is unconformably overlain by dolomitic siltstones of the Ishbel Formation (redefined) and is lithologically gradational with clastics of the Misty Formation.

A standard section of the Kananaskis Formation in Bow valley is on Tunnel Mountain (Appendix A, Section 1) and forms part of the section described by Warren (1927 and 1956) and Beales (1950). There the formation consists of interbedded grey, silty dolomites and grey siltstones with chert breccias. With reference to Beales' described section, it is considered to occupy the interval between the top of the 5.5-foot sandstone unit which he described at the bottom of page 41 to the base of the 10-foot dolomite unit at the top of page 43. It would be 130 feet thick according to his measurements. The writer measured 135 feet for this same interval.

The Kananaskis Formation is rarely more than 200 feet thick (*see* Table I), and then only in the westernmost sections examined by the writer. The maximum thickness known at present is on Mount Procter (Section 4) north of Fernie, British Columbia, in the extreme southwest part of the area studied, where it is about 210 feet thick. It thins rapidly eastward, for the most part by erosional truncation, and is thin and only locally present in Livingstone and Highwood Ranges.

The formation rests with regional conformity on Misty sandstones and is overlain unconformably by younger rocks. In most sections examined by the writer

Table I

Data for Schematic Palinspastic Correlation Diagram (Fig. 4)

Section No.	Location	Total Thickness of Group (ft)	Formation Thickness (in feet)				Thickness of Todhunter Mbr., Etherington Fm. (feet)	[2]Palinspastic Correction (miles)	Reference, if other than that of the author
			Fantasque	Ishbel	Kananaskis	Misty			
1	Tunnel Mtn.	530	11	85	135	299	26?	50 West	
2	Sundance Canyon	158+	64	94+	—	—	—	55	
3	Mount Norquay	223	11	52	108	52	0	55	
4	Mount Procter	1,200	50	240	210	700	0	105	
5	Bare Range	317	0	0	45	272	53	45	
6	Cougar Canyon	268	11	0	65	192	51	45	
7	King Creek	904	0	0	80?	824	0	50	
8	Storm Creek	581	0	0	54?	527	116	50	Raasch, 1956, p. 115, in part.
9	Beehive pass	1,079	0	0	47	1,032	88	80	
10	Picklejar Creek	182	0	0	56	126	0	40	
11	Cataract Creek	77	0	0	5	72	0	40	
12	Plateau Mtn.	59	0	0	7?	52	0	40	
13	Savanna Creek	55	0	0	0	55	0	40	
14	Riley Creek	37+	0	0	0	37+	0	40	

Table I (*cont'd*)

Section No.	Location	Total Thickness of Group (ft)	Formation Thickness (in feet)				Thickness of Todhunter Mbr., Etherington Fm. (feet)	[2]Palinspastic Correction (miles)	Reference, if other than that of the author
			Fantasque	Ishbel	Kananaskis	Misty			
15	Oldman River	102	0	0	0	102	0	40	
16	Racehorse Creek	129	0	0	0	129	0	40	
17	Daisy Creek	100	0	0	0	100	0	40	
18	Green Creek	147	0	0	0	147	0	40	
19	Rock Creek	143	0	0	0	143	0	40	
20	Adanac	48	0	0	0	48	15?	40	
	Shell Burnt Timber	0	0	0	0	0	0	15[3]	Oil & Gas Conservation Board, Prov. of Alta., schedule of wells in 1960
	Shell Panther River No. 1 Well	110	0	0	0	110	0	15[3]	Hunt, 1959, p. 159
	Union Canadian Homestead 12–11	210	0	0	0	210	0	20[3]	Hunt, 1959, p. 159
	Mount Ishbel	729±	72	157	0	500±	0	60	McGugan & Rapson, 1961, pp. 90–93
	Lake Minnewanka	302	0	0	54?	248?	0	45	Shimer, 1926, pp. 11–12
	Exshaw Creek	280	0	0	30±	250±	0	40	McGugan, 1960a, p. 103, and McGugan & Rapson, 1961, p. 80, Fig. 4

Pigeon Mtn.	500	0	0	150	350	0	45	Crockford, 1956, p. 96[1]
Moose Mtn.	0	0	0	0	0	0	20	Beach, 1943, p. 32
Mount Chester	978	12?	136	180	650	0?	55	McGugan & Rapson, 1961, pp. 98–99
Turner Valley	0	0	0	0	0	0	0	Oil & Gas Conservation Board, Prov. of Alta., schedule of wells to 1949
Mount Livingstone	67	0	0	0	67	0	40	
B.A. Triad Sun Royalite Rocking P2–29	0	0	0	0	0	0	30[3]	Oil & Gas Conservation Board, Prov. of Alta., schedule of wells in 1958
Forsyth Creek	2,150±	50	50	50	2,000	0?	100	McGugan & Rapson, 1961, Figs. 4 & 5
Lizard Range	1,000±	—	—	—	—	—	100	Telfer, 1933, p. 570, in part
Elk River	1,000	—	—	—	—	—	90	
Crowsnest	900±	—	—	—	—	—	90	Telfer, 1933, p. 570
Barnes Lake	658	0	0	49	609	53	95	Price, 1958, pp. 274–281
Pacific Atlantic Flathead No. 1	300±	0	0	0	300	0?	45[3]	
Shell-Calalta Carbondale	0	0	0	0	0	0	30[3]	
Shell 11 Waterton	0	0	0	0	0	0	35[3]	Oil & Gas Conservation Board, Prov. of Alta., schedule of wells in 1960

[1] Crockford's 120-foot "lower member" is considered equivalent, at least in part, to the Etherington Formation.
[2] Turner Valley considered fixed; all other locations moved west relative to it.
[3] Correction is for the stratigraphic level of the Rocky Mountain Group in the well.

its basal beds consist of interbedded sandstone and dolomite, so that generally its lower contact is arbitrarily defined. The Kananaskis is everywhere underlain by the Misty Formation; it is overlain by the Ishbel Formation as on Mount Procter (Section 4), by Fantasque chert as at Cougar Canyon (6), and by the Spray River Group as in Bare Range (5).

The Kananaskis Formation contains the early Middle Pennsylvanian fauna *Profusulinella, Pseudostaffella, and Eostaffella* (McGugan and Rapson, op. cit., p. 73) at a number of localities, as, for example, Tunnel Mountain and Mount Chester. Involute gastropods and scaphopods referred to the genera *Euphemites, Bellerophon,* and *Plagioglypta* respectively form a significant part of the biota in the Kananaskis Formation. The scaphopod with or without the gastropod is common at Tunnel Mountain (1), Lake Minnewanka, Plateau Mountain (12), Beehive pass (9), and Mount Ptolemy. In the Kananaskis Formation, they are commonly found associated with one another whereas from Misty strata only the gastropod is known to the writer. They are facies fossils and hence are not diagnostic of age.

Ishbel Formation (redefined)

The type section of the Ishbel Formation is on the west flank of Sawback Range. It is the type 'Lower Ishbel' of McGugan and Rapson (1961, pp. 91-92). The formation is herein restricted because the Ishbel, as originally defined, included two lithologically distinct and mappable units which are moreover separated by a regional disconformity. At the type section the Ishbel Formation (redefined) is 157 feet thick. It consists of dark grey, dolomitic siltstone with black, spicular chert, and is variably phosphatic (op. cit.).

A standard section of the Ishbel Formation in Rundle Range is that on Tunnel Mountain. It is part of the type section of Warren's Norquay Mountain Member (1956) and is the supplementary type section of the Lower Ishbel (*see* McGugan and Rapson, op. cit., p. 93). There the formation is 85 feet thick (*see* Appendix A, Section 1). With reference to Beales' described section (1950), it is considered to occupy the interval between the top of the 5.5-foot sandstone bed mentioned at the bottom of page 41, and the base of the 11-foot chert bed mentioned at the top of page 40; according to his measurements, the formation is 88 feet thick.

The maximum observed thickness of the Ishbel Formation is about 240 feet on Mount Procter in the Fernie area. It is absent in Flathead, High Rock, and Misty Ranges, in Fairholme Range, and in points east of there. The formation is bounded above and below by disconformities; it is overlapped eastward by the Fantasque Formation, as in Cougar Canyon in Fairholme Range.

The age of the Ishbel Formation in the southeastern Canadian Cordillera is based on the recovery of fossil vertebrates in Sundance Canyon (*see* Appendix A, Section 2). Warren (1956, p. 248) reported a specimen referred to the genus *Helicoprion* Karpinsky "from the phosphate bed in Sundance Canyon". More recently W. Langston, Curator of Vertebrate Palaeontology, National Museum of Canada, compared the Sundance Canyon fossils with other specimens of *Helicoprion* and reported (pers. com. January 1961) that they are very close to, if not conspecific with, *Lissoprion ferrieri* Hay. He concluded that the *Lissoprion-*

bearing rocks in Sundance Canyon are probably temporal correlatives of the Meade Peak Member of the Phosphoria Formation and hence about late Lower or early Upper Permian. A comparison of de Schmid's detailed section (de Schmid, 1916, p. 16) at Sundance Canyon with that of the writer (Appendix A, Section 2) would strongly suggest that the vertebrate remains were recovered from unit 8 of the Ishbel Formation and not from the chert of the overlying Fantasque. It is therefore concluded that the Ishbel Formation (redefined) is probably of late Lower or early Upper Permian age.

Fantasque Formation (Harker, 1961)

The designated type section of the Fantasque Formation in Yukon Territory is on the north side of Beaver River southwest of Merrill Mountain (Harker, 1961, p. 8). There the formation consists of massive, grey or black chert overlain by calcareous sandstone and has a total thickness of 180 feet.

Because of the widespread occurrence of such a chert unit, in precisely the same stratigraphic position, from Northwest Territories (Harker, 1961) to Wyoming (McKelvey, *et al.*, 1959) it is hereby proposed to adopt the name Fantasque for this uppermost Palaeozoic formational unit, and in so far as nomenclature in Canada is concerned, to use it in place of all others. The topmost unit of Warren's Norquay Mountain Member (1956, p. 244) on Tunnel Mountain may be considered a standard section for the southeastern Canadian Cordillera.

The Fantasque Formation in the southern Rocky Mountains consists primarily of resistant, grey and black chert, locally with pockets of grey, unchertified sandstone. The maximum recorded thickness is 72 feet, on the west flank of Mount Ishbel in Sawback Range (McGugan and Rapson, 1961, p. 90); on Tunnel Mountain it has an exposed thickness of 11 feet (*see* Appendix A, Section 1), the top being covered by Bow River.

The formation is bounded both above and below by regional disconformities. In the southeastern Cordillera it is known to truncate and overlap the Ishbel Formation eastward to rest on Kananaskis strata, as in Cougar Canyon. Westward, new beds may well be expected beneath the Fantasque. Pre-Triassic erosion may be responsible for the absence of both the Fantasque and Ishbel in Bare Range (Appendix A, Section 5), and in Misty, High Rock, and Highwood Ranges.

No fossils have been reported from the Fantasque Formation in the southeastern Canadian Cordillera so that the age of the unit can only be inferred. The occurrence however of fossiliferous Ishbel below and of early Lower Triassic Spray River strata above (Warren, 1956, p. 247) would suggest that the Fantasque is probably of Upper Permian age and therefore equivalent to the Rex Chert Member of the Phosphoria Formation (*see* Table II).

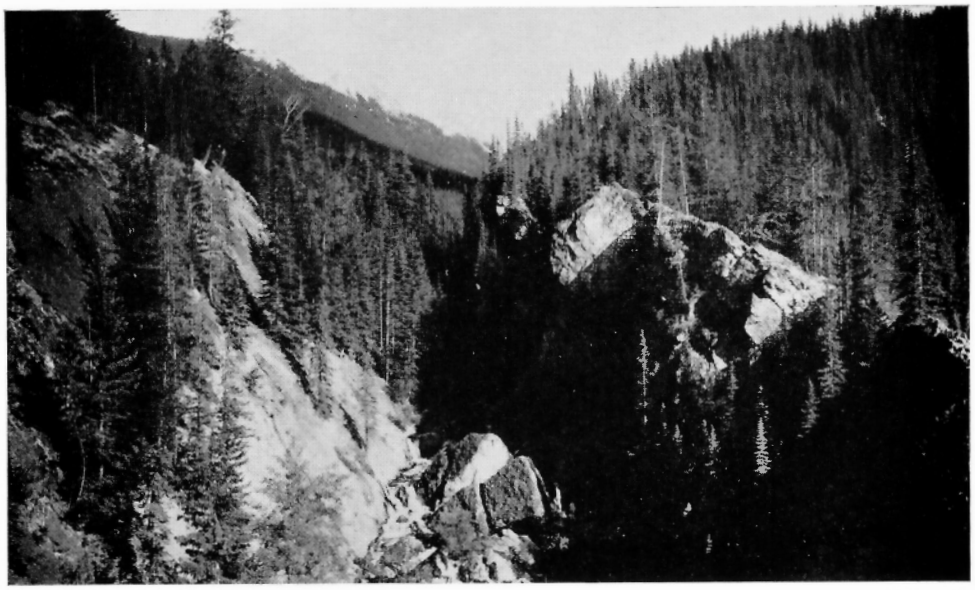
STRATIGRAPHY

The sections of the Rocky Mountain Group studied by the writer may be divided for convenience into two parts. The first includes the thick successions, representing the fullest known development of the group in the deepest parts of the late Palaeozoic sedimentary basin (Appendix A, Sections 1 to 9); the second includes the thin, eroded, and truncated successions on the eastern flank of the basin (Appendix A, Sections 10 to 20). Commentaries on these sections begin with the standard sections on Tunnel Mountain and generally proceed from west to east. Sections interpreted to represent a more or less common depth in the basin are treated systematically from north to south. Selected sections illustrating the lithological character, thickness, and correlation of the various formations in the Rocky Mountain Group in widely separated parts of the basin are graphically portrayed in Figure 3.

Tunnel Mountain

Fresh outcrops in road-cuts permit close examination of the greater part of the standard sections of the Kananaskis, Ishbel, and Fantasque Formations on the southwest flank of Tunnel Mountain. The type section of the Misty Formation may be examined to advantage at or near water level on Bow River.

The Rocky Mountain Group on Tunnel Mountain has a measured thickness of 530 feet (*see* Appendix A, Section 1; Fig. 3). Of this the lowest 299 feet, consisting predominantly of medium and light grey, variably dolomitic sandstone, is designated as the type Misty Formation. The base of the Misty is lithologically gradational and is drawn at the base of the lowest thick sandstone bed. Unit 1 of Section 1 corresponds to Beales' 29-foot bed, 114 feet above the base of his described section of the Rocky Mountain Group (Beales, 1951, p. 44). Thus a considerable thickness of dolomite at the base of Warren's Tunnel Mountain Member is excluded from the Misty Formation. Unit 18, Section 1, corresponds to Beales' 7-foot quartzite bed mentioned near the top of page 43 of his described section, so that the top of the Misty conforms with his interpretation of the top of Warren's Tunnel Mountain Member. The Kananaskis Formation, consisting of interbedded dolomite, chert and sandstone, overlies the Misty with apparent conformity. It is 135 feet thick. With reference to Beales' described section, the top of the Kananaskis corresponds to the top of his 5.5-foot sandstone bed which he described at the bottom of page 41. The Ishbel Formation (redefined), consists of interbedded dark grey siltstone and dolomite with chert and rests unconformably on the Kananaskis. It is 85 feet thick and forms a noticeably recessive and darker unit near the top of the Rocky Mountain succession. With reference to Beales' described section (Beales, op. cit.), the top of the Ishbel corresponds to the top of



DKN, 1-3-61

PLATE II. The Permian Rocky Mountain succession in Sundance Canyon (Section 2). Resistant west-dipping chert of the Fantasque Formation overlies recessive siltstone and sandstone of the Ishbel.

DKN, 2-1-61

PLATE III. The Pennsylvanian Misty Formation, 102 feet thick, on Oldman River (Section 15). Recessive Mississippian Etherington strata barely visible in extreme lower right corner of photograph; 2-foot basal conglomeratic sandstone of the Jurassic Fernie Group forms the prominent stripped surface at top of succession.

his 7.75-foot dolomite bed mentioned near the top of page 40. The Fantasque Formation is the resistant 11-foot chert and pebble-conglomerate bed at the top of the succession. It unconformably overlies the Ishbel and is in turn unconformably overlain by the Spray River Group. Its upper surface is locally stripped and is covered in part by Bow River.

The varicoloured siltstones and dolomites characteristic of the Todhunter Member of the Etherington Formation at Beehive pass, Storm Creek, Cougar Canyon, and Bare Range were not recognized beneath the Rocky Mountain succession on Tunnel Mountain. Homotaxial beds may be represented, however, in the 27-foot interval of interbedded cherty dolomites and sandstone immediately beneath the 29-foot sandstone bed described by Beales (1950, p. 44).

Dating of the Rocky Mountain Group on Tunnel Mountain has proved exceedingly difficult because of the paucity of identifiable fossils. Preservation of many of the forms is poor and this is especially true in the Misty Formation.

Raasch (1954, *in* Surface Geologic Section and Faunal Zones at Tunnel Mountain, Banff) reported an extensive Mississippian, Chesterian fauna from the interval between the base of what is here designated the Misty Formation and the base of Warren's Tunnel Mountain Member. In so far as this interval lies immediately below the continuous sandstone succession it is belived to be homotaxial in part with type Etherington Formation.

Few fossils have been reported from the type section of the Misty Formation and dating there is dependent upon lithic correlation with fossiliferous Misty strata elsewhere. Warren (1956, p. 247) reported a coral and spirifer, presumably *Caninia torquia* (Owen)? and *Spirifer rockymontana* respectively, from dolomite near the base of his Tunnel Mountain Member. Without knowledge of the precise stratigraphic position from which these forms were recovered it is impossible to say whether they came from Etherington or Misty rocks as now defined. It would appear however that they were collected from the 61-foot bed at the base of his described section (op. cit., p. 245) and therefore from top Etherington strata. The positive dating of Mississippian, Chesterian rocks below and early Middle Pennsylvanian rocks above would suggest that the Misty Formation on Tunnel Mountain may be of late Chesterian to Lower Pennsylvanian age.

The Kananaskis Formation there is positively dated as early Middle Pennsylvanian through the recovery of early Atokan fusulinids in chert near the base of the formation (McGugan and Rapson, 1960, p. 5).

Thus far neither the Ishbel nor the Fantasque Formation has been dated on Tunnel Mountain, so that a Permian age is assumed from their stratigraphic position and correlation with fossiliferous Ishbel strata in Sundance Canyon.

Sundance Canyon

The Fantasque Formation and part of the Ishbel are well exposed on either side of Sundance Canyon (Pl. II), 3 miles southwest of Banff (*see* Appendix A, Section 2). The section is in the Sulphur Mountain fault plate and is therefore structurally farther west than Tunnel Mountain. The exposed thickness of the Ishbel

Formation is 94 feet, of which the upper 54 feet appears to be beds not represented on Tunnel Mountain. The lower part, of which 40 feet is exposed, is dark grey, dolomitic siltstones typical of the Ishbel elsewhere. The upper part, somewhat more resistant, consists of interbedded light grey siltstone and sandstone with minor limestone and dolomite. Specimens of *Lissoprion ferrieri* Hay are interpreted as having been recovered from unit 8, about 7 feet below the top of the Ishbel Formation.

The Ishbel Formation is unconformably overlain by massive, resistant, grey chert of the Fantasque Formation. The exposed thickness of the chert is 64 feet, the top of the formation being a prominent stripped surface. It is presumed to be nearly complete. No fossils were recovered from the Fantasque Formation.

Mount Norquay

The Rocky Mountain Group is well exposed along Trans-Canada Highway on the south slope of Mount Norquay (*see* Appendix A, Section 3) in the Sulphur Mountain fault plate. It is unusually thin relative to the Tunnel Mountain succession. Although all formations are present, the group is only 223 feet thick. The Fantasque, Ishbel, and Kananaskis Formations are comparable in thickness to the occurrences on Tunnel Mountain. The Misty Formation on the other hand is only about one-sixth as thick as it is in the Rundle fault block. No fossils were recovered from the Rocky Mountain succession in this section although McGugan (pers. com. 1960) reports Lower Atokan fusulinids in the Kananaskis Formation there.

Mount Procter

The Mount Procter section of the Rocky Mountain Group west of Elk River was studied to assist in the interpretation of Telfer's pioneer work (Telfer, 1933) in the Fernie area (*see* Appendix A, Section 4; Fig. 3). The group occurs in an overturned succession in the hanging-wall of Hosmer thrust. It is approximately 1,200 feet thick, which is about 200 feet more than reported by Telfer "in the vicinity of Fernie" (op. cit., p. 570). All four formations are present and, with the exception of the Fantasque chert, are abundantly fossiliferous. The lower contact of the group with Mississippian Etherington rocks is exposed. Recessive siltstones of the Triassic Spray River Group are exposed within 10 feet stratigraphically of the top of the Fantasque.

The Misty Formation, in gradational contact with Etherington strata, contains abundant *Orbiculoidea* sp. and *Composita subtilita* Hall? in the lowest 52 feet of beds. Well-preserved *Hustedia* sp., *Punctospirifer* sp. cf. *P. cristata* Schlotheim and *Waagenoconcha* sp. were recovered from the lower 40 feet of the Kananaskis Formation. Abundant *Crurithyris* sp.? were recovered from the Ishbel, especially from the top third of the formation.

As a check on the thickness of the Rocky Mountain Group in Lizard Range, a cursory inspection was made of exposures of the group along British Columbia highway 3 immediately northeast of the tunnel in Rundle strata between Morrissey

and Elko, British Columbia. Although both upper and lower contacts are covered, the limits of the group may be estimated with reasonable accuracy. The section (indicated as 'Elk River' on Fig. 1) has a measured thickness of about 1,000 feet.

Additional information on the dating of the Rocky Mountain succession in the area is provided by Telfer (loc. cit.), who included determinations by P.S. Warren of fossils collected from the Rocky Mountain succession "in the vicinity of Fernie". They are as follows:

Base of Quartzite, Line Creek .....*Orbiculoidea arenaria* Shimer
Middle of Quartzite, Fernie .....*Deltopecten occidentalis* var. *arenaria* Shimer
Phosphate bed, Hartley Creek .....*Squamularia perplexa* McChesney?
Paraphorhynchus obscurum Shimer
Phosphate bed, Spruce Creek .....*Squamularia perplexa* McChesney?

Telfer assigned the Rocky Mountain Quartzite to the Pennsylvania epoch (op. cit., p. 568). Warren (1928, Section IV, p. 116) reported three forms in a collection made by Telfer from the Rocky Mountain Quartzite near Fernie and not included in the above assemblage. They are *Productus inflatus* McChesney, *Productus cora* d'Orbigny, and *Spirifer rockymontana* Marcou. These forms together with *Orbiculoidea arenaria* Shimer and *Deltopecten occidentalis* Shumard constitute a fauna which according to Warren "represents Pennsylvanian time".

Mount Broadwood

On the east limb of the Broadwood fold immediately north of Lodgepole Creek, British Columbia (*see* Henderson and Dahlstrom, 1959, Fig. 5, photo 3), the lower part of the Rocky Mountain Group is well exposed in an overturned succession. As on Mount Procter and at Beehive pass, the contact with the Mississippian, Rundle Group is lithologically gradational and is drawn at the base of the continuous succession of very pale orange, coarse-grained sandstones. Light grey, fine-grained sandstones occur as interbeds up to 12 feet thick in light grey, finely crystalline, cherty dolomite at the top of the Etherington Formation of the Rundle Group. Varicoloured siltstones characteristic of the Todhunter Member are not exposed although they may be present in a 19-foot covered interval beginning 29 feet below the defined base of the Rocky Mountain Group.

Abundant *Euphemites* sp., *Orthotetes* sp., *"Meekella"* sp., and *Dictyoclostus* cf. *D. portlockianus* Norwood and Pratten were collected in a 15-foot interval beginning 10 feet above the base of the (overturned) continuous sandstone succession on Mount Broadwood. According to Harker, these forms are all probably of Pennsylvanian age. Eighty-five feet below the top of the interbedded sandstones and dolomites of the stratigraphically underlying unit, Harker identified abundant *Spirifer leidyi* Norwood and Pratten, *Spirifer* sp., and fenestrate and tubular bryozoa which confirm the conclusion that the beds containing them belong to the Mississippian Etherington Formation. It is apparent therefore that at

both Beehive pass and 55 miles to the southwest on Mount Broadwood, the Mississippian-Pennsylvanian boundary may lie approximately at but not necessarily coincident with the mappable lithic break between the interbedded carbonates and sandstones below and the continuous sandstones above.

Bare Range

On the southwest face of Bare Range, the Misty and Kananaskis Formations, including their upper and lower contacts, are well exposed (*see* Appendix A, Section 5). At the top of the Mississippian Rundle Group is a 53-foot unit of interbedded, varicoloured shales, siltstones, sandstones, and dolomites assigned to the Todhunter Member of the Etherington Formation. The 11-foot bed of very pale orange, medium-grained sandstone at the top of the Todhunter is channelled, with a local relief of 2 feet, although in gross aspect the contact appears lithologically gradational. Overlying this is the Misty Formation, a 272-foot sandstone succession with a basal bed of chert and chert breccia resting on the aforementioned channelled surface. The Kananaskis Formation, 45-feet thick, consists of interbedded cherty and dark grey dolomites and sandstones. Neither Ishbel nor Fantasque strata are present between the Kananaskis and dark grey siltstones of the Triassic Spray River Group.

The topmost bed of the Todhunter Member of the Etherington Formation contains abundant silicified crinoid fragments and sparse solitary cup corals. No identifiable fossils were recovered from the Rocky Mountain Group although indeterminate productids, belerophont (?) gastropod fragments and bryozoa were noted in a 4-foot cherty sandstone bed (unit 14, Section 5) 210 feet above the base of the continuous sandstone succession.

Lake Minnewanka

The classic Rocky Mountain succession at the west end of Lake Minnewanka was first reported in detail by Shimer (1926, pp. 11-12). With reference to his described section, the writer would draw the base of the Rocky Mountain Group at the base of his unit 15, a 150-foot bed of light grey quartzite. According to his measurements the group would therefore be 302 feet thick. Of this the writer would tentatively ascribe the lowest 248 feet of quartzite and limestone (Shimer's units 13 to 15 inclusive) to the Misty Formation and the remainder to the Kananaskis. Warren (1927 and 1956) following Shimer (1926) reported an extensive fauna from within the sandstone succession (presumably Shimer's unit 14) and from near the top of the group (presumably Shimer's unit 10).

With reference to the fauna in strata here referred to the Misty Formation at Lake Minnewanka, Warren (1956, p. 247) included the following: *Orbiculoidea arenaria* Shimer, *Schuchertella*? sp. indet., *Dictyoclostus semireticulatus* (Martin), *D. coloradoensis* (Girty)?, *Juresania nebrascensis* (Owen), *Paraphorhynchus obscurum* Shimer, *Dielasma arkansanum* Weller, *Phricodothyris perplexa* (McChesney), *Bakewellia parva* M.&H., *Myalina wyomingensis* (Lea), *Deltopecten*

occidentalis var. *latiformis* Shimer, and *Euconospira turbiniformis* M.&W. According to Warren (op. cit.) this fauna, in conjunction with *Caninia torquia* (Owen)? and *Spirifer rockymontana* Marcou collected from dolomite beds near the base of his "Tunnel Mountain member" on Tunnel Mountain, is undoubtedly of Pennsylvanian age.

With reference to the fauna in strata here referred to the Kananaskis Formation, Warren (op. cit., p. 247) included the brachiopods *Linoproductus multistriatus* (Meek), and *Dictyoclostus ivesi* (Martin)? with *Euphemites arenarius* Shimer and *Plagioglypta canna* White and indicated that the biota has definite Permian affinities. The rocks containing it are however correlated with part of the early Middle Pennsylvanian Kananaskis Formation. If the obvious lithic correlation is correct, the brachiopods would appear to have been misidentified (McGugan and Rapson, 1961, p. 78).

Cougar Canyon

The Rocky Mountain Group is well exposed in Cougar Canyon opposite Canmore, Alberta (*see* Appendix A, Section 6; Fig. 3). There, at the mouth of the canyon on the northwest side, the group has a measured thickness of 268 feet. The Misty Formation is a continuous, pale yellowish grey sandstone succession, 192 feet thick. The Kananaskis is a dark unit, 65 feet thick, consisting of dark grey to black cherty siltstone, dark grey to black sandstone, and medium light grey dolomite with scattered angular fragments of black chert. The Fantasque is an 11-foot, chert breccio-conglomerate at the top of the succession. The Ishbel is absent, presumably because of pre-Fantasque erosion. Triassic Spray River strata are not exposed at this point but the presence of platy fragments of brown weathering siltstone in the soil on top of the breccio-conglomerate would suggest that the latter beds mark the top of the group. No fossils were recovered.

Underlying the Rocky Mountain Group and in gradational contact with it is the Todhunter Member of the Etherington Formation. Bedrock and float indicate it to be made up of yellowish grey weathering, quartzose dolomite, and pink weathering, calcareous sandstone. No fossils were recovered from the Todhunter.

Beneath the Todhunter and in striking colour contrast to it, is a thick succession of cherty, light grey, finely crystalline dolomite with thin olive-grey, earthy and shaly weathering, strongly calcareous siltstone partings, unfossiliferous towards the top, but containing unidentified solitary corals lower down. The unit is lithically similar and in equivalent stratigraphic position to type Etherington strata.

King Creek

At King Creek the Rocky Mountain Group (*see* Appendix A, Section 7) is very thick (904 feet) although faulting is not obvious. The succession rests with apparent conformity on limestones ascribed to the Mississippian Etherington Formation. The Todhunter Member is absent either through removal prior to deposi-

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tion of the sandstone succession or more probably through non-deposition. The member is present, however, to the south and north as at Storm Creek and Cougar Canyon respectively.

The 824-foot grey, fine- and medium-grained sandstone sequence with minor limestone interbeds towards the base is capped by 80 feet of grey, cherty sandstones, siltstones, and chert. At the top of this is a 0.6-foot bed of medium grey sandstone, locally brecciated, the interstices being filled with an irregular network of black chert. This bed marks the top of the exposed Rocky Mountain Group. A 220-foot covered interval occurs between it and medium brown, platy weathering siltstones ascribed to the Triassic Spray River Group. The uppermost 80 feet of beds of the Rocky Mountain Group there is assigned to the Kananaskis Formation and the underlying thick sandstone succession to the Pennsylvanian Misty Formation. No fossils were recovered from the Rocky Mountain Group at King Creek.

Storm Creek

The succession of late Palaeozoic strata in the cirque at the head of Storm Creek (*see* Appendix A, Section 8) is almost identical with that at Beehive pass, 40 miles to the south. The upper part of the Etherington Formation consists for the most part of medium and light grey cherty dolomites overlain by a 116-foot unit of interbedded red siltstones, and brightly coloured dolomitic sandstones and quartzose dolomites. The latter unit is, by lithic correlation, the Todhunter Member of the Etherington Formation. It is overlain with gradational contact by a thick sandstone unit which Raasch (1954 and 1958) chose to split into an upper 503-foot unit termed 'Storm Creek formation' and a lower 87-foot unit termed Member No. 1 of his 'Norquay formation'. The writer would assign 527 feet of grey, dolomitic sandstone overlying the Todhunter to the Misty Formation. The upper 54 feet of the succession, described by Raasch (1958, pp. 204-205) as being made up of sandstone and chert, is assigned to the Kananaskis. The Ishbel and Fantasque Formations were apparently removed by pre-Spray River erosion.

The carbonates below the Todhunter Member yielded abundant *Spirifer leidyi* Norwood and Pratten, *Linoproductus* cf. *L. ovatus* (Hall), small form, *Echinoconchus* sp., *Archimedes*?, and well-preserved tubular and fenestrate bryozoa. These forms, occurring in beds homotaxial with type Etherington strata, are probably of Chesterian age (P. Harker, pers. com. 1960).

Within the Todhunter Member on the south wall of Storm Creek cirque the only fossils recovered by the writer were indeterminate red, jasperized, fenestrate bryozoa 35 feet above the base. Thus, barring the possibility that the Todhunter is diachronic, the age of the member is inferred to be Mississippian, Chesterian on the basis of an obvious lithic correlation with the type section where its age has been proved.

The lowest 100 feet of the overlying thick sandstone succession was examined in detail and the only fossils recovered in place were some indeterminate red, jasperized fenestrate bryozoa 43 feet above the base. Sixty-five feet (stratigraphically) above the base, a dolomitic sandstone block was recovered from talus

against the bedrock face and found to contain well-preserved *Spirifer matheri* Dunbar and Condra which E. W. Bamber (pers. com. 1961) stated would date the block as probably early Pennsylvanian. With a steep west dip to the beds at this point, these fossils must have come from this stratigraphic level or higher, so that the lower part of the thick sandstone succession at least can be dated with reasonable certainty by them. This conclusion was later confirmed by the recovery of spiriferids of the group *Spirifer matheri, S. cavecreekensis, S. rockymontanus* (part), *S. opimus* and *S. occiduus* (McGugan and Rapson, 1961, p. 81) from approximately the same stratigraphic interval both north and south of Storm Creek cirque.

Beehive Pass

The Rocky Mountain Group was studied on the north side of Beehive pass in the Lewis thrust plate (*see* Norris, 1957; Appendix A, Section 9, and Fig. 3 of this report). There, the fine- and medium-grained sandstone succession of the Misty Formation is 1,032 feet thick. The overlying Kananaskis Formation consists of grey, cherty, quartzose dolomite. It is about 50 feet thick on the north side of the pass, and 47 feet on the south side. Beneath the Misty is an 88-foot, brightly coloured unit of interbedded siltstone, shale, sandstone, and arenaceous dolomite (the type Todhunter Member of Norris, 1957). The upper contact of the Rocky Mountain succession with Triassic Spray River strata, although locally covered, is unconformable. The lower contact is, however, gradational and some sandstones are necessarily included in the underlying unit. The base of the lowest massive sandstone appears to be a mappable surface although precisely equivalent horizons at widely separated localities no doubt cannot be recognized.

Since the Todhunter Member was first erected, additional faunal data collected by the writer have established it as Mississippian, Chesterian age (Harker, pers. com. 1959). The total fauna from this 88-foot interval is as follows (bed numbers are those of Norris, 1957)[1]: Bed 18–*Spirifer increbescens* Hall, *Spirifer* sp., *Composita* sp., large coarse spirifer, possibly *S. increbescens* Hall, and fossil fragments indet.; Bed 19–*Spirifer* sp., *Composita* sp., fenestrate bryozoa in chert; Bed 20–*Spirifer* sp., *Composita* sp., *Archimedes* sp., and fenestrate bryozoa; Bed 24–*Spirifer increbescens* Hall, and coarse solitary coral fragments indet., possibly *Caninia* sp. The Todhunter is of similar age, lithology and stratigraphic position to the lower Amsden Formation of south-central Montana (*see* Gardner, *et al.*, 1946, pp. 4, 7).

The thick sandstone succession at Beehive pass is largely unfossiliferous and the only identifiable form recovered there, of value as an index fossil, is *Dictyoclostus* cf. *D. portlockianus* Norwood and Pratten. This indicates a probable Pennsylvanian age for the rocks containing it. The collection was made from bed 15, a 2-foot sandstone unit 94 feet above the base of the Misty Formation. Three miles to the northwest on the west slope of Mount Gass, C. H. Crickmay (pers. com., 1960) reported *Caninia torquia* Owen from a 2-foot shale bed about 300

[1] Bed numbers of Norris, 1957, do not correspond with unit numbers of Section 9 of this Bulletin.

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feet below the top of the sandstone succession. In his first report (1955, p. 2) he stated that it is an unquestionable Pennsylvanian form and in his second (1960, p. 2) he correlated it as Pennsylvanian.

A later study of the interbedded cherty dolomites and dolomitic sandstones of the Kananaskis Formation on the south side of Beehive pass revealed abundant *Bellerophon* sp.? and *Plagioglypta* sp. 5 to 8 feet above the base of the unit. McGugan and Rapson (1961, p. 79) report an unusual and as yet unidentified fauna of corals and brachiopods including *?Rhynchopora* sp. from the Kananaskis on the north side of the pass.

Mount Ptolemy and Flathead Range

Locally the Rocky Mountain Group is partly exposed at a number of places in Flathead Range. There, as in High Rock Range along strike to the north, the Misty and Kananaskis Formations are present. The group is overlain unconformably by the Triassic Spray River Group and underlain conformably by the Mississippian Etherington Formation.

On the northwest-trending ridge from Mount Ptolemy, the Kananaskis Formation is about 150 feet thick and locally is moderately well exposed. There the formation consists of interbedded cherty sandstones and dolomites, with the latter predominant in the upper 45 feet. Well-preserved, silicified *Rhynchopora* sp.?, *Dielasma* sp., and *Orbiculoidea* sp. were recovered 125 feet below the top of the Kananaskis Formation. Towards the base is a pinching and swelling coquina of *Plagioglypta* sp. and indeterminate pelecypods which by lithic correlation corresponds with the shelly horizon on Plateau Mountain (Section 12, unit 9) and near the top of the Kananaskis at Lake Minnewanka (Shimer's Unit 10).

Price (1958, p. 363) collected *Plagioglypta canna* White, *Caninia* sp., cf. *Tabulipora* and indeterminate brachiopod and crinoid fragments from strata that the writer would correlate with the Pennsylvanian Kananaskis Formation at scattered localities in Flathead Range and on the east flank of the Fernie synclinorium.

Picklejar Creek

The key to the correlation of the Misty Formation in High Rock Range with that in Livingstone Range rests in a comparative study of the sandstone succession in the Misty and northern Highwood Ranges. Near Crowsnest Pass where relative displacement on the Lewis thrust was large (about 40 miles) the thickness of Misty strata changes abruptly from that on Livingstone and Blairmore Ranges to its thickness on Flathead and High Rock Ranges. This change is due in large part to telescoping of the flank of the sedimentary basin, primarily by shortening on the Lewis thrust. The change from Misty Range to northern Highwood Range on the other hand is not nearly so abrupt, and the section on Picklejar Creek is intermediate in thickness between those in Storm Creek cirque and on Cataract Creek.

The Rocky Mountain Group on Picklejar Creek is 182 feet thick (*see* Appendix A, Section 10; Fig. 3). Of this, the upper 56 feet is ascribed to the Kananaskis Formation and the remainder to the Misty. There the Misty Formation consists of interbedded dolomitic sandstone and quartzose dolomite, typical of the Highwood and Livingstone Ranges succession. Fossils were first reported from the west flank of Highwood Range by Allan and Carr (1947, p. 15). Abundant silicified spiriferid brachiopods of the *Spirifer occiduus* type were collected from about 100 feet above the base of the formation and may suggest an early or Middle Pennsylvanian age for the beds containing them (E. W. Bamber, pers. com., 1961).

The Kananaskis Formation, consisting of interbedded dolomite and sandstone with bedded chert towards the top, has an exposed thickness of 56 feet. An examination with binoculars of a similar section on the next ridge to the south would suggest that the formation where measured is about complete and that the covered slope above the uppermost exposures is underlain by recessive shales of the Spray River Group. No fossils were recovered from the Kananaskis Formation, and recognition of this unit is based on lithic correlation.

Cataract Creek

A moderately well exposed section of the Rocky Mountain Group, complicated by several vertical tear faults, was measured in the Highwood Range on the west bank of Cataract Creek about one-quarter mile above its junction with Highwood River (*see* Appendix A, Section 11). There a succession of grey chert and sandstone of the Misty Formation is in gradational contact with dolomites, sandstones, and minor green shale of the Etherington Formation. It is capped by a 4-foot chert breccia assigned to the Kananaskis Formation. The exposed thickness of the Misty is approximately 72 feet, compensation being made for tear faults the offsets along which could be measured with reasonable certainty. No fossils were recovered from the section so that the tentative correlation of these beds with the Kananaskis and Misty Formations is based solely on lithology and stratigraphic position.

Plateau Mountain

The Misty Formation and part of the Kananaskis(?) cap Plateau Mountain (*see* Frontispiece) in southern Highwood Range and are well exposed there at a number of points on the rim of cirques (*see* Appendix A, Section 12; Fig. 3). On the northeast side of the mountain the group has a measured thickness of 59 feet. There the Misty Formation consists of fine-grained, dolomitic sandstone with minor dolomite and chert. It is in gradational contact with quartzose dolomite and sandstone of the Etherington Formation and is overlain with structural conformity by chert, chert breccia, and sandstone ascribed to the Kananaskis Formation. Highly fragmented gastropod and scaphopod remains were collected from this unit on the north wall of the cirque in which the section was measured[1]. By

[1]The writer was directed to this locality by W. J. Hennessey, Canadian Husky Oil Company Ltd.

lithic correlation these fossil-fragment beds appear to be equivalent to the thin Kananaskis Formation at the west end of Lake Minnewanka. A similar coquina occurs low in the same formation on Mount Ptolemy.

The upper contact of the Rocky Mountain Group is commonly exposed on the west flank of Plateau Mountain where cherty dolomite is disconformably overlain by black, chert-pebble conglomerate of basal Spray River Group (Norris, 1958a, p. 10). Exposures there are especially significant as, for the Canadian Cordillera, they are apparently the southeasternmost outcrops of Triassic rocks.

Savanna Creek

This section is exposed about 2 miles by road up Savanna Creek from its junction with Livingstone River (*see* Appendix A, Section 13; Norris, 1958b). It is accessible by car along the road leading to well sites at the south end of the Savanna Creek gas field. There the Rocky Mountain Group is 55 feet thick, and consists predominantly of interbedded grey, medium-grained, lustre-mottled sandstone and medium and dark grey chert and cherty sandstone. It is ascribed by lithic correlation to the Misty Formation. The lower contact of the Misty is drawn at the base of the continuously exposed sandstone and chert succession so that the underlying 16-foot covered interval is assigned to the Etherington Formation of the Rundle Group. Misty-type sandstones are interbedded with cherty dolomites in top Etherington strata and emphasize the gradational nature of the lower contact. Contorted, black, silty, pyritic shales ascribed to the basal Fernie Group are in immediate contact with Rocky Mountain strata.

Ten feet below the top of the Misty Formation abundant involute gastropods of the genus *Euphemites* occur in a lenticular zone up to a foot thick in the sandstone. It is of little value as an index fossil. It will be recalled that *Euphemites* is now known to occur within 25 feet of the base of the Misty Formation on Mount Broadwood, and within the Kananaskis Formation at Lake Minnewanka.

Riley Creek

Outcrops at the headwaters of Riley Creek are the most eastern exposures of the Rocky Mountain Group in northern Livingstone Range (*see* Appendix A, Section 14). There, in the immediate hanging-wall of the Livingstone thrust, the section is believed to be nearly complete and has a measured thickness of 37 feet. Fine-grained, grey sandstones predominate, the base being covered. The upper contact, however, is well exposed and the basal conglomeratic sandstone of the Fernie Group rests unconformably on the Rocky Mountain Group. No fossils were recovered and the succession is assigned to the Pennsylvanian Misty Formation by lithic correlation.

Oldman River and Racehorse Creek

The Misty Formation is well exposed on either flank of central Livingstone Range at the gap in Oldman River (*see* Appendix A, Sections 15, 16). East of the gap, the group was examined on the flank of a small anticline in the immediate

hanging-wall of the Livingstone thrust. There the Rocky Mountain succession, referred to as the Oldman River section, is 102 feet thick. West of the gap, on the other hand, on the south side of Racehorse Creek, the succession is 129 feet thick. There is a natural westward thickening of the group.

Grey, fine-grained sandstone, with minor interbedded chert and limestone are characteristic of both sections of the Rocky Mountain Group. Their lower contacts with dolomite of Etherington Formation appear gradational whereas their upper contacts with siltstone and shale of the Fernie Group are disconformable. The basal conglomerate of the Fernie is exposed only in the Oldman River section and forms a resistant capping to the Misty Formation (*see* Pl. III).

No fossils were recovered from either section, and the successions are assigned to the Pennsylvanian Misty Formation by lithic correlation.

Daisy Creek

The Misty Formation is exposed in a prominent flat-iron on the west flank of south-central Livingstone Range at the headwaters of Daisy Creek (*see* Appendix A, Section 17). Because of the uncertainty in measurement of the thickness of the covered interval (unit 11) near the top of the section, the overall thickness of the formation may be in error by as much as 20 per cent.

Characteristic of the more easterly successions, the Misty Formation there consists of fine-grained, grey sandstone with minor chert and limestone. It is in gradational contact with dolomites of the Etherington Formation. Low on the flank of the flat-iron, the basal, conglomeratic sandstone of the Fernie Group is exposed. A small strongly recessive, covered interval occurs between the base of the Fernie and the topmost exposed beds of the Misty (unit 13). At the Adanac section (20) recessive, brown mudstones occupy this interval.

No fossils were recovered from the Rocky Mountain Group there and the succession is assigned to the Pennsylvanian Misty Formation by lithic correlation.

Green Creek and Rock Creek

The Misty Formation is well exposed in the core and on the east flank of southern Livingstone Range (*see* Appendix A, Sections 18, 19). In the core of the range the formation outcrops on both flanks of a prominent syncline at the headwaters of Green Creek; on the east flank of the syncline it is 147 feet thick. On the east flank of the range, on the other hand, the formation is exposed at the headwaters of Rock Creek, in overturned succession, and is 143 feet thick. Both sections are unusually thick for this part of the Cordillera as indicated by irregularities in the direction of the isopachs along the flank of the basin (*see* Fig. 5).

In both sections the formation consists primarily of grey, calcareous or dolomitic, fine-grained sandstone, the Rock Creek section being somewhat more cherty. Strongly quartzose dolomites predominate in the upper third of the formation at Green Creek. At both localities the Misty Formation is in gradational

contact with the Etherington and is disconformably overlain by the Fernie Group. The basal, conglomeratic sandstone of the Fernie is exposed at both sections, the bed at Green Creek containing mid-cervical vertebrae of a Jurassic plesiosaur (W. Langston, pers. com., 1960.)

Adanac

This section is well exposed along the branch road from Adanac summit to an abandoned strip mine (*see* Appendix A, Section 20). There 48 feet of strata ascribed to the Rocky Mountain Group may be divided into two parts, each with a conglomerate at its base. The upper part, 28 feet thick, consists of interbedded dark grey sandstones and siltstones, with a basal 1.5-foot sandstone-pebble conglomerate resting on an erosion surface showing rounded indentations with an observed relief up to 3 inches. This part is overlain unconformably by the basal phosphatic-pebble conglomerate of the Jurassic Fernie Group. The lower part, 20 feet thick, consists of grey, fine- to coarse-grained sandstones with occasional thin partings of yellowish grey weathering calcareous mudstone, with a 1.3-foot bed of chert- and sandstone-pebble conglomerate at its base. Both units are tentatively ascribed to the Misty Formation. Beneath it 32 feet of interbedded quartzose, cherty dolomite and sandstone is exposed, with a prominent 7.5-foot bed of banded blue-green, pale red and brown mudstone beginning 3.4 feet below the top. Although apparently unfossiliferous, these strata are on lithic grounds reasonably assigned to the Mississippian Etherington Formation, the 7.5-foot mudstone bed being considered a tongue of the varicoloured Todhunter Member (*see* Fig. 4).

Type Todhunter strata were not recognized in Livingstone and Highwood Ranges, although equivalent beds may be present. The Todhunter at the type locality is made up of the transition beds between the Mississippian carbonate rocks and the Pennsylvanian sandstones and is characterized by its varicoloured appearance. It contains moreover, a late Chesterian fauna. In Livingstone and Highwood Ranges the transition beds are grey sandstone and dolomite with minor green and olive-grey mudstone partings at the top of the Chesterian Etherington Formation. If the varicoloured facies interfinger eastward with these beds the 7.5-foot mudstone unit at the Adanac section may be a tongue close to the eastern limit of the Todhunter.

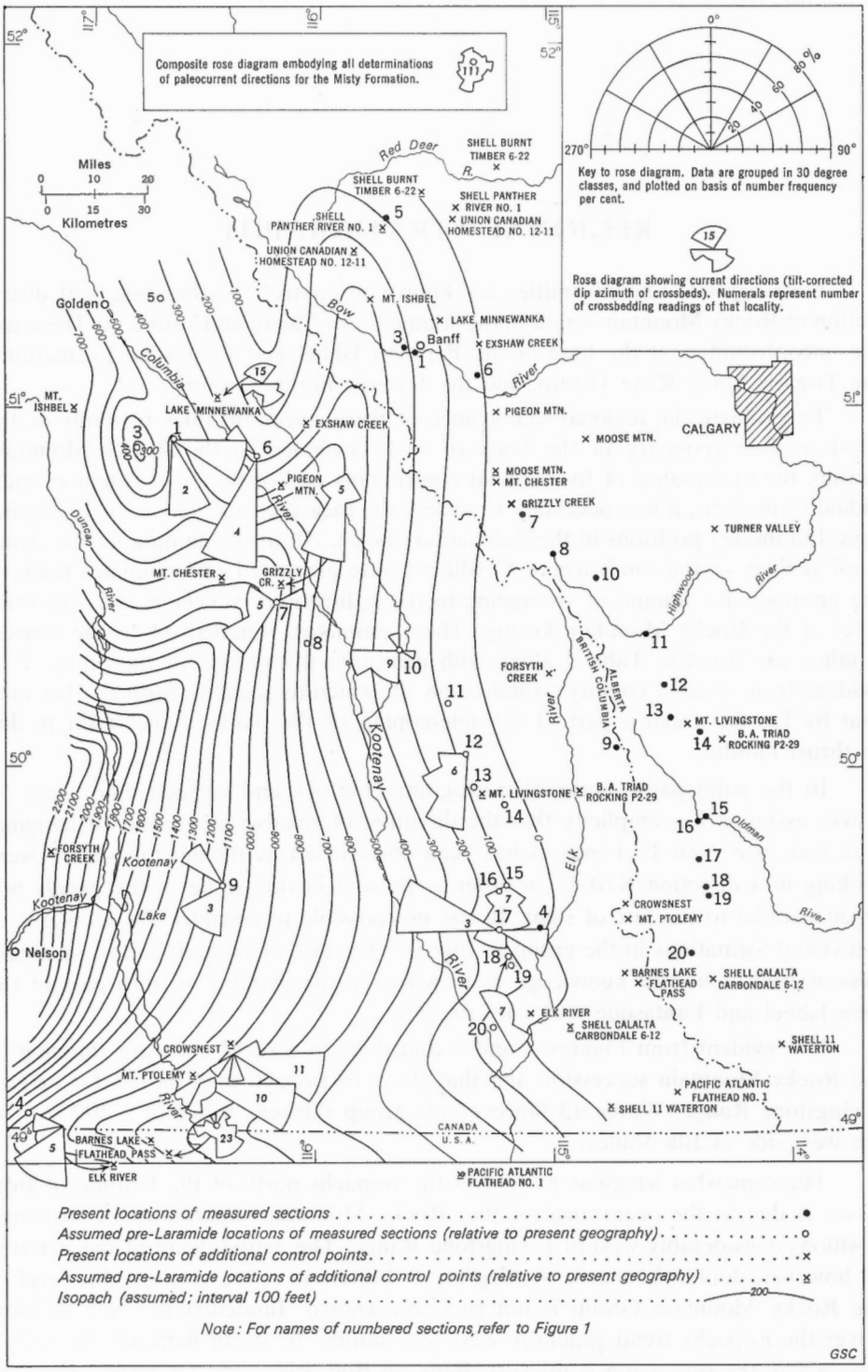

FIGURE 5. Schematic palinspastic isopach map of the Rocky Mountain Group in the southeastern Canadian Cordillera.

REGIONAL STRATIGRAPHY

Four regional unconformities are known to control the thickness and distribution of Rocky Mountain strata in the southeastern Canadian Cordillera. These are the unconformities at the base of the Permian Ishbel and Fantasque Formations, the Triassic Spray River Group, and the Jurassic Fernie Group.

To evaluate the regional significance of these unconformities in terms of the pre-Laramide geometry of the body of rocks included in the Rocky Mountain Group, the provenance of formational constituents and of the areal extent of individual formations, it was necessary to restore the measured sections to their original (pre-Laramide) positions in the sedimentary basin. All available data on the structural geology of the southeastern Cordillera were examined and estimates made of the approximate amount of shortening in the sedimentary veneer at the structural level of the Rocky Mountain Group. These estimates, rounded off to the nearest 5 miles, are listed in Table I along with measured thicknesses of the group. It is evident from even a cursory examination of structure sections through this area that by far the greatest part of the telescoping of the flank of the basin is due to thrust faulting.

In the palinspastic correlation diagram (Fig. 4) and isopach map (Fig. 5) it was assumed for simplicity that the direction of relative movement of hanging-wall beds was N80°E. Figure 4 has been constructed as though the viewer were looking in a direction N10°E. in order to prevent having some of the panels oriented parallel to the line of sight. It was not possible to consider the geometry of individual formations in the group in Figure 5 because of limited control on thickness as well as limited knowledge as to where in the extreme western part of the area Ishbel and Fantasque rocks are present.

It is evident from Figures 4 and 5 that there is a rapid eastward thinning of the Rocky Mountain succession and that the zero isopach may lie not far east of Livingstone Range. Westward however the group thickens to about 2,200 feet on the west side of Elk Valley.

The somewhat irregular pattern of the isopachs north of the latitude of Bow River is due to the occurrence of thin Rocky Mountain successions in structural positions considerably west of Livingstone Range. The actual detail of the patterns is, however, doubtful because the degree of shortening at the stratigraphic level of the Rocky Mountain Group is not precisely known. Immediately south of Bow River the isopachs trend generally west and outline the north flank of the basinal area where the succession is thickest. Between Bow River and Crowsnest Pass the isopachs trend southerly, swing gradually southwesterly and then abruptly south-

easterly along an east-northeasterly line about the latitude of Fernie and Crowsnest Pass. There is no suggestion that the thickest part of the pre-Laramide Rocky Mountain succession has been reached in the western part of the area.

A preliminary study of crossbedding in the Misty Formation at fifteen locations in the southeastern part of the Canadian Cordillera would suggest that transport of the sand was generally from northeast to southwest and that the provenance of the sand grains was Precambrian and possibly younger rocks in the general direction of the Canadian Shield. As the pattern of isopachs for the Rocky Mountain Group is not significantly different from that for the Misty Formation alone, the current directions have been plotted on Figure 5. It is apparent that the direction of transport of the sand for the most part is in the direction of thickening of the group. Notable exceptions occur however in the southeastern part of the area where crossbeds suggest a reversal in the direction of transport. The significance of these latter observations is not entirely understood, but they may indicate tectonic activity along an east-northeast-trending line about the latitude of Fernie in late Palaeozoic time.

By means of the correlation diagram (Fig. 4), the isopach map (Fig. 5), and reasonable assumptions about the rate of thinning of Kananaskis and Misty strata it is possible to speculate with some assurance on the pre-Laramide eastern limit of the various formations of the Rocky Mountain Group. These are portrayed schematically in Figure 6 together with the eastern pinchout of the Triassic Spray River Group. The traces of these limits are manifestly not linear but are curved and subparallel, suggesting that at least locally uplift and tilting in late Palaeozoic time was along axes nearly parallel with the margin of the basin.

Mature sandstones of the Misty Formation conformably overlie Etherington beds where the formation is thick. On the other hand they rest with local indentation on underlying rocks where the formation is thin; there moreover interbedded conglomerates are common and highly comminuted shell fragments indicate a high energy, near shore environment. It would appear therefore that differential sedimentation within the basin, punctuated by erosion intervals on the east flank, was responsible for thinning of the Misty Formation.

The contact of the Misty with dolomites of the Kananaskis Formation is apparently conformable and lithologically gradational in all sections examined. It represents the horizon of transition from beach sand to shallow water carbonate deposition which migrated eastward with the advance of the Pennsylvanian sea. The Misty sandstones in Livingstone and Highwood Ranges are therefore in part temporally and environmentally equivalent to Kananaskis rocks farther west.

Contact relations at the sub-Ishbel unconformity indicate uplift and erosion followed by an eastward marine transgression in the late Lower Permian. Deposits of cherty, phosphatic muds and silts, rich in sponge spicules and locally with remains of shark-like fishes, forming the Ishbel, spread over Kananaskis and older rocks. Dating of the Kananaskis Formation as early Middle Pennsylvanian and

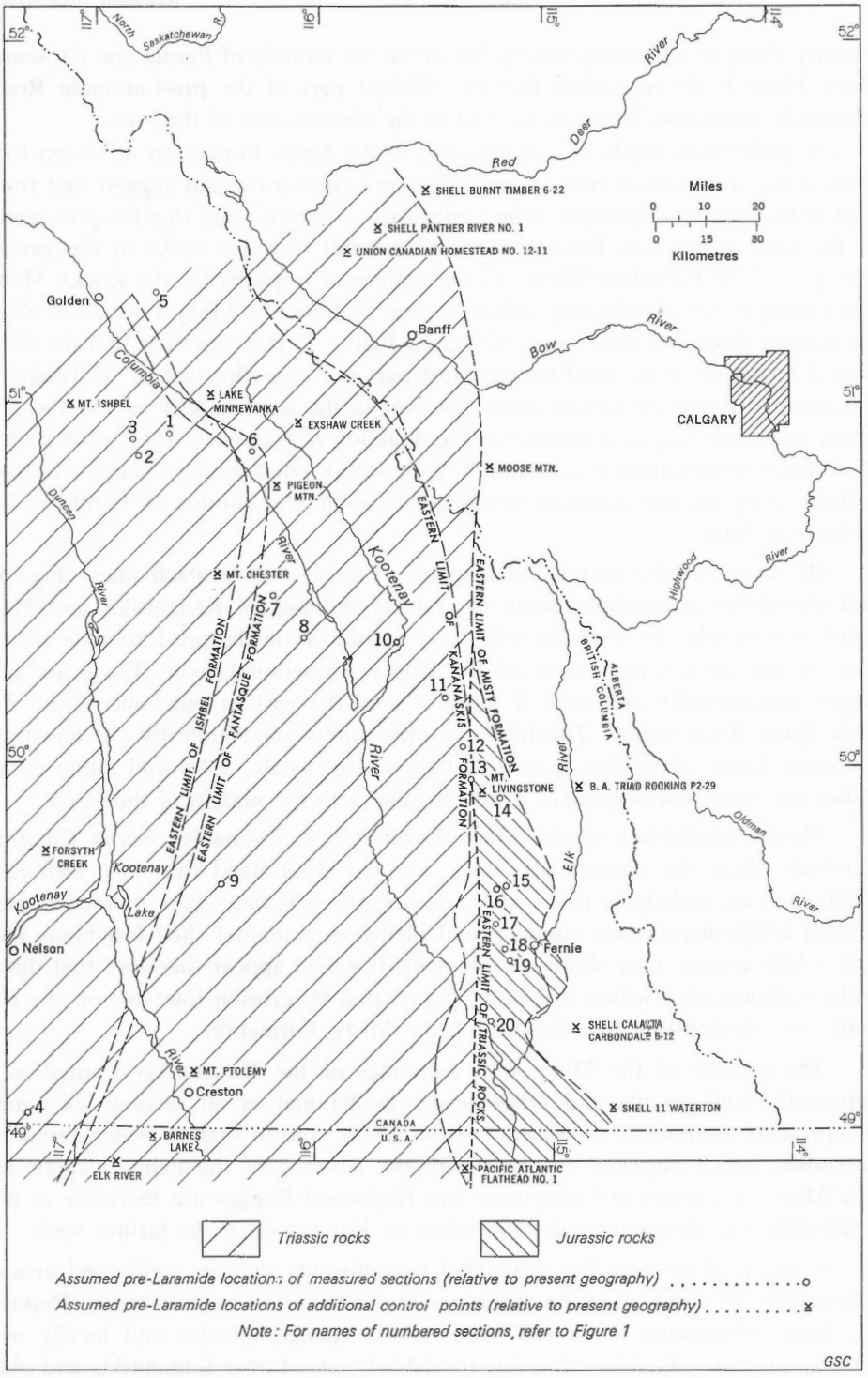

FIGURE 6. Schematic palinspastic diagram showing assumed (pre-Laramide) eastern limit of the Rocky Mountain formations and the area where they are overlain by Triassic and Jurassic rocks.

the Ishbel as old as late Lower Permian would suggest that the sub-Ishbel unconformity may represent an appreciable part of late Pennsylvanian and early Permian time.

Uplift and erosional truncation of Ishbel and older rocks was followed by a final Palaeozoic marine transgression in the Upper Permian. From the sea, rich in silica, was deposited the Fantasque Formation. The Fantasque overlaps Ishbel strata eastward and rests on the Kananaskis as in Cougar Canyon so that the dark phosphatic beds of the Ishbel are cut out a few miles to the east of Tunnel Mountain. Westward in Sundance Canyon on the other hand additional beds (units 3 to 9 inclusive in Section 2) appear at the pre-Fantasque unconformity and new formations may occur locally. Between Mount Procter and Barnes Lake the Fantasque is interpreted to overlap the Ishbel; it is in turn removed by pre-Triassic erosion. Despite this apparent rapid eastward bevelling of Ishbel rocks, the interval represented by the sub-Fantasque unconformity is very probably only part of Upper Permian time.

Sub-Triassic erosion is responsible for the absence of the Fantasque in Bare Range, Cougar Canyon, Beehive pass, Barnes Lake and sections to the east. Triassic strata therefore commonly rest on Kananaskis rocks in this area. Dating of the lower part of the Spray River Group at Beehive pass (Norris, 1958a, p. 10) as early Lower Triassic would suggest that the interval represented at the pre-Spray River unconformity there may include part of Upper Permian time.

In all but Livingstone and Blairmore Ranges, Triassic rocks rest on the Rocky Mountain Group. There however the Jurassic Fernie Group is in contact with thin Misty Formation. The Rocky Mountain Group is absent at the surface on Moose Mountain (Beach, 1943, p. 32) and in the subsurface in B.A. Triad Rocking P 2-29 well east of Livingstone Range primarily because of non-deposition and secondarily because of erosion at the aforementioned unconformities.

The late Palaeozoic stratigraphic succession of Etherington, Misty, Kananaskis, Ishbel, and Fantasque Formations in the southeastern Cordillera of Canada is in a general way representative of the stratigraphic succession from central Wyoming to Northwest Territories (*see* Table II).

From central Wyoming to southern Idaho, McKelvey, *et al.* (1959) have demonstrated the occurrence of intertonguing chert, phosphorite, and carbonate rock of the Permian Phosphoria and Park City Formations. These rest unconformably on sandstones and quartzites of the Weber, Tensleep, Casper, and Wells Formations, which are for the most part of Pennsylvanian age, although the Casper, Wells, and Tensleep may contain Permian beds in their upper parts. In southwestern Montana, Sloss and Moritz (1951, p. 2164) reported the Quadrant Formation to grade transitionally into varicoloured shales and limestones of the Amsden, a relatively thin formation that includes beds of both late Mississippian and early Pennsylvanian age. The Amsden moreover rests disconformably on the underlying limestone of the Madison Group. The Permian beds of this part of the American Cordillera are homotaxial with and very possibly are the same age and the lithic equivalent of the chert and phosphatic beds of the Fantasque and Ish-

Table II

Correlation of Upper Mississippian, Pennsylvanian, and Permian Rocks of Western North America

PERIOD / References		SOUTHEAST IDAHO McKelvey et al, 1959; Sloss and Moritz, 1951	SOUTHERN ROCKY MOUNTAINS McGugan and Rapson, 1962; Norris, this bulletin	PEACE RIVER Halbertsma and Staplin, 1960	LIARD PLATEAU Harker, 1961	OGILVIE MOUNTAINS Nelson, 1961; E. W. Bamber, personal communication, 1962	ELLESMERE ISLAND R. Thorsteinsson, personal communication, 1962
Overlying beds		TRIASSIC	TRIASSIC	TRIASSIC	LOWER CRETACEOUS	TRIASSIC	TRIASSIC
PERMIAN	Upper	Phosphoria Fm.: Retort Member; Rex Member	Fantasque Fm.	Belloy Formation	Fantasque Fm.		Assistance Fm.; Sabine Bay Fm.
	Lower	Phosphoria Fm.: Meade Peak Mbr.; Park City Formation	Limestone.; Ishbel Fm.			Tahkandit Formation	Belcher Channel Formation
PENNSYLVANIAN	Upper	Wells Formation	Rocky Mountain Group		Mattson Formation: Upper Mbr.	Calcarenite, shale	Limestone
	Middle		Kananaskis Formation	Taylor Flat Formation	Middle Mbr.	Calcarenite	Canyon Fiord Formation; Sandstone
	Lower		Misty Formation			Limestone, shale; Shale	
MISSISSIPPIAN	Upper	Brazer Formation	Rundle Group: Etherington Formation; Mount Head Formation	Kiskatinaw Fm.; Golata Formation; Debolt Formation	Mattson Formation: Lower Mbr.; Flett Formation	Limestone, shale	
Underlying beds		Lower Mississippian	Lower Mississippian				

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bel Formations respectively. The Pennsylvanian sandstones similarly are correlated in part with the Misty and Kananaskis Formations and the varicoloured shales and limestones of the Lower Amsden with the Chesterian Todhunter Member of the Etherington Formation. The remainder of the Etherington is equivalent to the Chesterian Big Snowy Group.

In the Jasper area, Mountjoy (1960, p. 91) reported the presence of a thin Rocky Mountain Group consisting of interbedded chert and sandstone that the writer suggests lithologically resembles the Fantasque Formation. It rests unconformably on Mississippian Rundle beds. Forbes and McGugan (1959) in the Wapiti Lake area, 80 miles northwest of Jasper, report a 50- to 100-foot 'Permo-Pennsylvanian' succession resting with possible disconformity on Mississippian

(Meramec and ?Chester) dolomites and limestones. They recognized a two-fold subdivision of the succession—an upper unit consisting of dolomitic sandstone and conglomerate and a lower one of cherty dolomite. The presence of Lower Permian *Schwagerina* in the lower unit would suggest it is the temporal equivalent of the Ishbel Formation. The upper unit may be a facies variation of the Fantasque. In both the Jasper and Wapiti Lakes areas, therefore, the Misty and Kananaskis Formations are apparently absent.

In the Peace River area Halbertsma and Staplin (1960) summarized their subsurface studies of Upper Mississippian and younger Palaeozoic rocks and correlated them with rocks of equivalent age in the southern Rocky Mountains. Using both spores and macrofossils, they correlated the shales and sandstones of the Golata and Kiskatinaw Formations with the Etherington Formation, the limestones and sandstones of the Taylor Flat Formation with the upper part of the 'Tunnel Mountain' Formation, and the sandstones and dolomites of the Belloy Formation with the Ishbel and Fantasque Formations.

Near Merrill Mountain, Yukon Territory, Kindle (1944, p. 6) reported a Carboniferous (?) and Permian succession exceeding 1,600 feet thick. Its lower part consists of grey to yellow sandstones containing a brachiopod fauna reported to be of Upper Carboniferous or Permian age, probably Permian. Higher in the succession is a 150-foot unit of grey to black chert with thin shale interbeds. It is overlain by some 30 feet of calcareous sandstone from loose blocks of which Kindle reported a Permian brachiopod assemblage.

In the extreme northeast Liard Plateau, Hage (1945, p. 8) reported a Carboniferous succession strikingly analogous to that in the mountains of southwestern Alberta. He divided it into two parts, "a lower calcareous unit composed predominantly of limestone with some interbedded shale, and an upper unit of sandstone with interbedded black shale capped by chert". Detailed stratigraphic and faunal studies by Harker (1961) have revealed that the limestone and shale unit contains Mississippian, Kinderhook/Osage to Chester faunas and is therefore homotaxial with the Banff Formation and Rundle Group. The overlying thick sandstone succession of the Mattson Formation apparently spans the Mississippian-Pennsylvanian boundary and is therefore in part lithically and temporally equivalent to the Misty Formation. Bedded cherts and sandstones capping the Liard Plateau succession were correlated by Hage (1945, p. 19) with the chert beds on Merrill Mountain. They were named the Fantasque Formation by Harker (1961, p. 8) who assumed a Permian age for the unit.

The Permo-Carboniferous succession in northern Yukon Territory and the Arctic Islands is readily correlated with that in Liard Plateau and elsewhere in the eastern Cordillera. Where these systems are represented the basic rock succession is much the same, with Upper Mississippian limestone and shale being overlain by Pennsylvanian and Permian clastic and carbonate rocks and these in turn by chert. The chert, although not always present, is very common at the top of the Palaeozoic succession from Greenland to the Arctic Islands to continental North America. It may well be at least in part regolithic and hence locally younger than Permian.

REFERENCES

Allan, J. A.
1913: Transcontinental Excursion C-1 (12th Internat. Geol. Cong.); *Geol. Surv. Can.*, Guide Book No. 8, pt. 2, pp. 167-201.

Allan, J. A. and Carr, J. L.
1947: Geology of Highwood-Elbow area, Alberta; *Res. Council Alberta,* Rept. 49.

Beales, F. W.
1950: The late Palaeozoic formations of southwestern Alberta; *Geol. Surv. Can.*, Paper 50-27.

Beach, H. H.
1943: Moose Mountain and Morley map-areas; *Geol. Surv. Can.*, Mem. 236.

Crickmay, C. H.
1955: The Minnewanka section of the Mississippian; published by the author, Calgary, Alberta, Canada.
1960: The Pennsylvanian age of the Pennsylvanian of Alberta; *Alta. Soc. Petrol. Geol.*, Frontiers of Exploration in Canada, Reprint.

Douglas, R. J. W. and Harker, P.
1958: Mississippian succession in Mount Head area, Alberta; *Am. Assoc. Petrol. Geol.*, Jurassic and Carboniferous of western Canada, pp. 177-189.

Dowling, D. B.
1907: Report on the Cascade Coal Basin, Alberta; *Geol. Surv. Can.*, Pub. No. 949, 37 pp.

Forbes, C. L. and McGugan A.
1959: A lower Permian fusulinid fauna from Wapiti Lake, B.C.; *J. Alta. Soc. Petrol. Geol.*, vol. 7, No. 2, pp. 33-42.

Gardner, L. S., *et al.*
1946: Stratigraphic sections of upper Palaeozoic and Mesozoic rocks in south-central Montana; *Montana Bur. Mines Geol.*, Mem. 24.

Hage, C. O.
1945: Geological reconnaissance along lower Liard River, Northwest Territories, Yukon, and British Columbia; *Geol. Surv. Can.*, Paper 45-22.

Halbertsma, H. L. and Staplin, F. L.
1960: The Mississippian-Pennsylvanian boundary from the Peace River area to the Williston Basin; *J. Alta. Soc. Petrol. Geol.*, vol. 8, No. 12, pp. 363-373.

Harker, P.
1961: Summary account of Carboniferous and Permian formations, southern District of Mackenzie; *Geol. Surv. Can.*, Paper 61-1.

Henderson, G. G. L. and Dahlstrom, C. D. A.
1959: First-Order Nappe in Canadian Rockies; *Bull. Am. Assoc. Petrol. Geol.*, vol. 43, No. 3, pp. 641-653.

Hunt, C. W.
1959: Developments at Panther River, 1956 to 1959; *J. Alta. Soc. Petrol. Geol.*, vol. 7, No. 7, pp. 159-162.

Kindle, E. D.
1944: Geological reconnaissance along Fort Nelson, Liard, and Beaver Rivers, northeastern British Columbia and southeastern Yukon; *Geol. Surv. Can.*, Paper 44-16.

Laudon, L. R. and Chronic, B. J., Jr.
1949: Palaeozoic stratigraphy along Alaska Highway in northeastern British Columbia; *Bull. Am. Assoc. Petrol. Geol.*, vol. 33, pt. 1, pp. 189-222.

McConnell, R. G.
1887: Report on the geologic structure of a portion of the Rocky Mountains; *Geol. Surv. Can.*, Ann. Rept. 2, 1886, pt. D.

McGugan A. and Rapson, J. E.
1960: Stratigraphy of the Norquay Formation, Rocky Mountain Group, Banff area, Alberta; *J. Alta. Soc. Petrol. Geol.*, vol. 8, No. 1, pp. 1-12; Corrections, ibid., vol. 8, No. 2, p. 79, 1960
1961: Stratigraphy of the Rocky Mountain Group (Permo-Carboniferous), Banff area, Alberta; *J. Alta. Soc. Petrol. Geol.*, vol. 9, No. 3, pp. 73-106.

McKelvey, V. E., *et al.*
1959: The Phosphoria, Park City and Shedhorn Formations in the western phosphate field; *U.S. Geol. Surv.*, Prof. Paper 313-A.

Mountjoy, E. W.
1960: Structure and stratigraphy of the Miette and adjacent areas, eastern Jasper National Park, Alberta; Toronto, Ont., Univ. Toronto, PhD. Dissertation.

Norris, D. K.
1957: The Rocky Mountain succession at Beehive pass, Alberta; *J. Alta. Soc. Petrol. Geol.*, vol. 5, No. 10, pp. 248-254.
1958a: Beehive Mountain, Alberta and British Columbia; *Geol. Surv. Can.*, Paper 58-5.
1958b: Livingstone River, Alberta; *Geol. Surv. Can.*, Map 5-1958.

Price, R. A.
1958: Structure and stratigraphy of the Flathead North map-area (east-half), British Columbia and Alberta; Princeton, Univ. Princeton, PhD. Dissertion.

Raasch, G. O.
1954: Carboniferous section at Highwood Pass with correlations to Banff and Mount Head; Canadian Stratigraphic Service, Ltd., Calgary, Alberta, 1954.
1956: The Permian Rocky Mountain Group in Alberta; *Alta. Soc. Petrol. Geol.*, Sixth Ann. Field Conf. and Guide Book, pp. 114-119.
1958: Upper Palaeozoic section at Highwood Pass, Alberta; *Am. Assoc. Petrol. Geol.*, Jurassic and Carboniferous of Western Canada, pp. 190-215.

de Schmid, H. S.
1916: Investigation of a reported discovery of phosphate in Alberta; *Canada Dept. Mines*, Mines Branch, Bull. 12.

Shimer, H. W.
1926: Upper Palaeozoic faunas of the Lake Minnewanka section, near Banff, Alberta, *Geol. Surv. Can.*, Bull. 42, Geological Series, No. 45, pp. 1-84.

Sloss, L. L. and Moritz, C. A.
1951: Palaeozoic stratigraphy of southwestern Montana; *Bull. Am. Assoc. Petrol. Geol.*, vol. 35, No. 10, pp. 2135-2169.

Telfer, L.
1933: Phosphate in the Canadian Rockies; *Trans. Can. Inst. Min. Met.*, vol. 36, pp. 566-605.

Warren, P. S.
1927: Banff area, Alberta; *Geol. Surv. Can.*, Mem. 153, pp. 1-93.
1928: The Palaeozoics of the Crowsnest Pass, Alberta; *Trans. Roy. Soc. Can.*, Ser. 3, sec. IV, vol. 22, pp. 109-120.
1947: Age and subdivisions of the Rocky Mountain Formation at Banff, Alberta; *Bull. Geol. Soc. Amer.*, Abs., vol. 58, No. 12, pt. 2, p. 1238.
1956: Age and subdivisions of the Rocky Mountain Formation in the Canadian Rockies; *J. Alta. Soc. Petrol. Geol.*, vol. 4, No. 11, pp. 243-248.

96293—4

APPENDIX A

In this preliminary study of the stratigraphy of the Rocky Mountain Group, twenty sections were chosen to interpret the sedimentary succession in various parts of the late Palaeozoic sedimentary basin in the southeastern Canadian Cordillera. A number of subsidiary exposures were examined to assure the continuity of rock-units throughout the area.

The formations of the Rocky Mountain Group are characteristically not resistant to weathering. Mostly they occupy covered intervals on the western slopes of the ranges and good sections are few and far between. Formational contacts are designated as conformable, unconformable, or disconformable on the basis of regional considerations. Where such contacts are exposed and have been examined, beds above and below are always structurally conformable.

The thickness of individual units in the sections that follow were measured by means of a 1-foot scale, 5-foot staff, or a 100-foot tape and hand level, as conditions warranted, so that the overall accuracy in thickness of the formations is probably within 10 per cent. Rock types are field identifications modified in some instances as a consequence of thin section study. Many rocks were found exceedingly difficult to describe and name without the support of laboratory techniques.

96293—4½

Unit		Thickness (feet) Unit	From base

TUNNEL MOUNTAIN (Section 1)

This section, which is on the south end of Tunnel Mountain near Banff, Alberta, begins at water's edge on Bow River immediately upstream from its confluence with Spray River. It was first designated as the type section by Beales (1950, p. 39), whose description is herein presented, the modifications in petrography and changes in unit thicknesses and nomenclature being the sole responsibility of the writer. The upper contact of the group with Triassic Spray River strata is concealed but the lower (redefined) contact with Mississippian Rundle Group is exposed.

Unit		Thickness (feet) Unit	From base
	ROCKY MOUNTAIN GROUP		
	Fantasque Formation (supplementary type section)		
	Contact unconformable		
51	Pebble-conglomerate, medium grey to medium dark grey, light brownish grey weathering, with chalky weathering, black subrounded, medium dark grey, phosphatic (?) pebbles up to 1½ inches; massive, matrix a fine- to medium-grained, calcareous, quartz sandstone, with quartz grains up to 0.2 mm, some strongly etched	1.3	11.1
50	Covered	1.2	9.8
49	Chert, massive, dark grey weathering; white siliceous seams throughout. This uppermost bed exposed forms the east wall of the gorge at Bow Falls; it varies in thickness from 7 to 11 feet, presumably because of erosion; with discontinuous pods of dark grey, fine-grained, quartz sandstone. Lower surface of unit gently undulating with maximum observed amplitude of 0.5 foot; to north along strike this bed grades into a massive breccia-conglomerate	8.6	8.6
	Thickness of Fantasque Formation	11 feet	
	Ishbel Formation (supplementary type section)		
	Contact unconformable		
48	Dolomite, strongly quartzose, medium light grey, fine-grained, light brownish grey weathering, with weathered relief, light grey, silty stringers and irregularly shaped nodules; quartz grains generally less than 0.2 mm and with strongly altered rims; top 1 foot or so is the phosphate bed described by deSchmid (1916, p. 24)	8.0	84.8
47	Siltstone, dark brownish grey, slightly calcareous, shaly weathering, recessive, with nodules and lenses of dark grey chert at lower contact, cutting as much as 0.5 foot into underlying unit	18.5	76.8

Unit		Thickness (feet) Unit	From base
46	Sandstone, light to dark grey, very fine grained to fine-grained, almost a chert in places, lower part laminated with light grey and with thin silty layers weathered into relief; upper 0.1 foot very coarse grained, dark grey sandstone with grains of light grey sandstone, dark grey chert and clear quartz	0.5	58.3
45	Interbedded dolomite (65%) and siltstone (35%), as in 51-foot unit below, with minor irregular lenses of dark grey chert	3.4	57.8
44	Chert, dolomitic, dark grey, weathers bluish grey, massive	1.1	54.4
43	Mudstone, silty, slightly dolomitic, dark brown, earthy weathering, recessive	0.4	53.3
42	Chert, dark bluish grey, also with abundant fish fragments and 'bone-like' fragments on upper bedding surface	0.6	52.9
41	Siltstone, argillaceous, shaly, brownish grey weathering	0.2	52.3
40	Siltstone, strongly quartzose, chert lines and fills small fissures and cavities; quartz grains subangular to subrounded, many with strongly altered rims; abundant fragmental fish bone (?) remains (Beales' 1-foot bed at 565 feet, p. 41)	1.1	52.1
39	Interbedded dolomite (60%) and siltstone (35%): dolomite, strongly silty (could be in part a dolomitic siltstone), medium dark grey, micro-grained, dark grey, in beds 1 foot to 2.5 feet thick, weathers light grey to buff; some beds with white chert 'nodules' individually and in clusters as in unit 38 below, *and* siltstone, argillaceous, calcareous, in beds from 0.1 to 1.0 foot and also as very thin earthy partings; weathers medium brownish grey and in part platy, and with scattered white chert nodules as in the dolomite of the unit; abundant highly fragmented fish bone (?) fragments locally concentrated in top 5 feet; beds locally mildly sheared and contorted, especially in lower third of unit	51.0	51.0
	Thickness of the Ishbel Formation	85 feet	

Kananaskis Formation (supplementary type section)

Contact unconformable

38	Siltstone, strongly quartzose, medium grey, with subangular to subrounded quartz grains, many with strongly etched rims; abundant white chert as small rounded ¼- to ½-inch nodules, often grouped in clusters up to 6 inches in diameter; locally stained with rust, minor pockets of medium grey chert; occasional thin, rusty brown weathering siltstone partings less than 1 inch thick; in beds 1 foot to 3 feet thick; top of unit corresponds to top of Beales' 5.5-foot unit, p. 41	11.3	134.9
37	Dolomite, strongly quartzose, light grey, fine-grained; subangular to subrounded quartz grains up to 0.4 mm, mostly about 0.2 mm and many with strongly etched rims; 0.5 foot ± conglomeratic zone 1.5 feet above base; in beds about 2 feet thick; weathers medium to light grey	7.8	123.6
36	Dolomite, silty, dark grey, with occasional, very thin partings of brown weathering siltstone	2.2	115.8
35	Sandstone, slightly dolomitic, light grey, fine-grained, weathers light grey to buff, massive (partings 2 to 3 feet apart); some darker interbeds of very fine grained sandstone. At 23 feet above base is 0.5 foot of very coarse grained, in part conglomeratic, sandstone with sparse chert pebbles up to 1.5 inches long set in cherty matrix. Occasional beds contain scattered, dark grey chert pebbles up to 1 inch	35.5	113.6

Unit		Thickness (feet) Unit	From base
34	Mostly covered, small outcrops of sandstone, dolomitic, light grey, very fine grained	4.6	78.1
33	Sandstone, non-calcareous, medium light grey, very fine grained, quartzose, massive, weathers, light grey; forms resistant ridge	1.1	73.5
32	Chert, medium light grey, weathers light grey, massive, with abundant *Ascopora alani* Fritz, sparse gastropods up to 0.5 inch diameter observed	1.0±	72.4
31	Sandstone, dolomitic, very fine grained, light to medium grey, with sparse dark grey chert nodules; in beds 0.5 to 1.0 foot; weathers light grey to buff, partly covered; with thin interbeds of siltstone, dolomitic, light to medium grey, (argillaceous?), thin-bedded, weathers, recessive. Base of this unit believed to correspond to base of 8-foot covered interval in Beales' section, p. 42	9.9	71.4
30	Dolomite, medium- to fine-grained, compact, grey; buff weathering; numerous irregular light and dark grey chert nodules and stringers, occasional thin, earthy, brown siltstone partings, less than 1 inch thick and occasional angular black chert fragments up to 1 inch long especially in lowest 0.5 foot	1.7	61.5
29	Chert, massive, very light grey, buff-grey, and pinkish, translucent	4.0	59.8
28	Dolomite, quartzose, with augen, medium-grained, greyish brown; buff weathering; sandy (particularly in middle of bed); chert nodules throughout; grades southward into a very coarse grained, medium crossbedded, quartz and chert sandstone. Section here transferred to river bank	5.6	55.8
27	Dolomite, fine- to medium-grained, grey; translucent chert in nodules and bands, many of the nodules showing unchertified centres; chert bands show relict bedding	6.0	50.2
26	Dolomite, sandy; with dolomitic sandstone layers; upper 2 feet carry bedded chert nodules; middle 2 feet contain limonite segregations probably after pyrite; lower 2 feet more sandy	6.0	44.2
25	Chert and dolomite, massive; upper 30 inches ± sandy dolomite overlies about 3 feet of massive, highly fractured chert; chert, grey, weathering buff and red in places; forms dip-wall at confluence of Bow and Spray Rivers; lower 4 feet ± of massive dolomite, fine- to medium-grained, with chert nodules and lenses; no fossils evident	9.5	38.2
24	Dolomite and massive chert; chert, grey; buff weathering; lower 1 foot of bed contains irregularly bedded chert nodules	3.0	28.7
23	Dolomite, hard, silicified, possibly sandy	1.0	25.7
22	Dolomite, cherty, with quartzitic layers; chert in thin beds and lenses, constitutes about 25% at top of bed but less in lower half	4.0	24.7
21	Sandstone, light grey, very fine grained, massive, pale buff weathering with round, light grey chert nodules near top	4.2	20.7
20	Chert, massive, buff, red-brown, and grey; weathering buff with shaly, recessive parting in middle at water's edge	2.5	16.5
19	Dolomite, granular, possibly sandy, finer grained towards the base; very cherty, chert comprising about 30% of rock in 3-inch to 1-inch irregular beds and scattered nodules, with thin, olive-grey, recessive siltstone partings; unit mildly recessive. The base of this bed would appear to be the base of Warren's (1956) Norquay Mountain Member	14.0	14.0
	Thickness of Kananaskis Formation	135 feet	

Unit		Thickness (feet) Unit	From base
	Misty Formation (type section)		
	Contact conformable		
18	Quartzite, massive, compact	7.0	299.2
17	Sandstone, shaly, greenish buff weathering, thin-bedded; with shaly partings; 3-inch bed of greenish, shaly dirt band at top	1.5	292.2
16	Sandstone, shaly; with numerous limonite segregations, probably after pyrite	1.8	290.7
15	Sandstone, buff weathering, with 3- to 4-inch, irregular chert band at top	1.0	288.9
14	Sandstone, thin-bedded; speckled with dark flecks, possibly limonite, throughout	2.5	287.9
13	Sandstone, more massive, greenish buff, buff weathering; thin dirt band, possible dolomitic, at base	1.5	285.4
12	Sandstone, thin-bedded; with silty, shaly partings; beds a few inches thick; more shaly in middle and more massive towards base; limonite (probably after pyrite) relatively common throughout	8.5	283.9
11	Quartzite, medium-grained, greyish, pinkish, and greenish buff; weathering brown; laminated in places; speckled with dark grains that appear to be limonite; two bands of recrystallized chert near base	102.5	275.4
10	Sandstone, thin-bedded, buff-grey, brown weathering; thin beds of recrystallized chert at top and base	9.0	172.9
9	Sandstone, medium-grained, pale grey-brown; weathering buff, dolomitic in places; limonite segregations common; 18-inch irregular bed of brown and white, quartzitic, partly recrystallized chert in middle of unit	38.0	163.9
8	Covered	22.0	125.9
7	Sandstone, massive, quartzitic; becomes pale, finer grained, and more dolomitic towards base; buff-grey and greenish buff; weathering pale buff; speckled with dark grains, scattered limonite segregations, thin irregular beds of white and red recrystallized chert near top, middle, and base; laminated and cross-bedded in middle; lower beds tend to weather back	43.0	103.9
6	Dolomite, medium-grained, pale grey, tinted with pink, white weathering; finely laminated in top few inches; 6-inch, irregular cherty band in middle; lower part appears sandy	4.0	60.9
5	Dolomite, fine- to medium-grained, pale buff weathering; very cherty; top half of bed in places contains 50% chert; appears sandy	4.0	56.9
4	Sandstone, dolomitic; occasional chert nodules and bands about 3 feet from base	8.0	52.9
3	Dolomite, fine- to medium-grained, pale buff; paler buff weathering; cherty at top and base; upper 18 inches contains irregular beds of white, recrystallized chert; at base, 6 to 10 inches of recrystallized chert, weathers porous; basal 2 feet sandy	7.5	44.9
2	Sandstone, slightly dolomitic, light grey, fine-grained, platy weathering, strongly recessive and argillaceous in top 6 inches	1.4	37.4
1	Sandstone, thin-bedded, platy, fine-grained, well laminated in places; dolomitic in top 2 feet and in lower half of unit; well-jointed; irregular stringers up to 0.5 foot of salmon pink and light grey chert in lower ½ of unit	36.0	36.0
	Thickness of Misty Formation	299 feet	
	Total thickness of Rocky Mountain Group	530 feet	

Unit		Thickness (feet) Unit	From base
	RUNDLE GROUP		
	Etherington Formation		
	Contact conformable		
	Dolomite, very cherty, medium light grey, well-laminated; 'worm tracks' in middle; about 50% grey granular chert in irregular beds, top few inches massive; chert, white, recrystallized in places	7.0	

SUNDANCE CANYON (Section 2)

The following section of the upper part of the Rocky Mountain Group was measured along the trail on either side of Sundance Canyon 3 miles southwest of Banff. A paved road leads to the carpark at the mouth of the Canyon and the beginning of the section. The Fantasque Formation and nearly the whole of the Ishbel are exposed in almost continuous outcrops. Section begins on north side of canyon.

	ROCKY MOUNTAIN GROUP		
	Fantasque Formation		
	Contact unconformable		
13	Chert, medium grey, in beds 2 to 6 feet thick, very resistant, strongly fractured, the fractures being recemented with milky quartz. Top of unit forms dip-slope and forms top of exposed section	43.5	63.6
12	Covered	1.5	20.1
11	Chert, variably medium light grey and medium grey, locally colour laminated, massive, highly fractured with fractures locally stained moderate yellowish brown; chert commonly contains finely divided dark mineral; very resistant	18.6	18.6
	Thickness of Fantasque Formation	64 feet	
	Ishbel Formation		
	Contact unconformable		
10	Limestone, slightly quartzose, medium grey, coarsely crystalline, massive, brittle, highly fractured, rusty weathering on open fractures, fragmentary plant (?) remains on fresh surfaces. Section continued on south side of canyon.	2.4	93.8
9	Sandstone, light grey, fine-grained, massive, light grey weathering; dark grey chert stringer up to 0.5 foot thick beginning about 1 foot below top of unit. Top of this unit commonly stripped from overlying, overhanging bed	4.2	91.4
8	Sandstone, phosphatic (?), medium dark grey with patches of dark grey, very fine grained, massive; this is presumably the bed from which specimens of *Lissoprion ferrieri* Hay have been recovered	1.6	87.2
7	Sandstone, calcareous, medium light grey, very fine grained, well-bedded, in beds or sheets 0.4 foot to 1.5 feet thick, brittle, light grey weathering, locally with a yellowish grey tint. Occasional thin partings of highly sheared, black, rusty weathering sandy siltstone up to 0.1 foot thick, including one at very top of unit	4.4	85.6

Unit		Thickness (feet) Unit	From base
6	Siltstone, black, highly sheared; pinching and swelling along strike	0.1	81.2
5	Siltstone, slightly dolomitic, medium light grey, pale yellowish grey weathering, in somewhat irregular beds 0.5 foot to 3 feet thick, with stringers and nodules of medium grey chert up to 0.6 foot thick and 5 feet long observed; very fractured with lowest 5 feet intensely fractured; moderately resistant	13.5	81.1
4	Dolomite, strongly quartzose, medium light grey, in somewhat irregular beds ½ foot to 1½ feet thick, moderately resistant	7.1	67.6
3	Sandstone, calcareous, yellowish grey, fine-grained, highly sheared and fractured, very light grey weathering; highly weathered and commonly covered with soil. Thickness range 0.5 foot to 3 feet observed	1.0±	60.5
2	Siltstone, slightly dolomitic, medium grey, in beds 0.5 foot to 2 feet thick; medium light grey weathering, locally tinted with pale rusty brown, commonly strongly chertified. Occasional interbeds up to 1.5 feet thick of medium grey chert, weathering light grey. Sparse thin interbeds of strongly weathered, sandy siltstone, and sheared, quartzose dolomite up to 0.05 foot; moderately resistant	19.5	59.5
1	Siltstone, biogenic, slightly silty, black, in beds 0.3 to 1.0 foot thick, highly fractured, locally with fractures filled with milky quartz, locally stained with rust, mildly recessive; occasional black, highly weathered interbeds of siltstone up to 0.2 foot observed; base covered	40±	40
	Thickness of exposed Ishbel Formation	94 feet	
	Total thickness of exposed Rocky Mountain Group	158 feet	

MOUNT NORQUAY (Section 3)

The following section was measured on the south slope of Mount Norquay along Trans-Canada Highway 2 miles west of Banff, in a new cut along the north side of the road. The section is about 85 per cent exposed. The upper contact with Triassic Spray River Group is concealed whereas the lower contact with Mississippian Etherington Formation is exposed.

	SPRAY RIVER GROUP		
	Covered interval to faulted repetition of west-dipping, dark grey chert of top of Norquay Mountain Member. Presumed Spray River strata in this covered interval and therefore Spray River-Rocky Mountain contact concealed	50.0±	—
	ROCKY MOUNTAIN GROUP		
	Fantasque Formation		
	Contact unconformable		
17	Chert, dark grey, finely crystalline, biogenic (bone fragments) in beds 0.2 foot to 1.5 feet with thin interbeds 0.1 to 0.4 foot thick of brown, earthy to shaly weathering siltstone	10.7	10.7
	Thickness of Fantasque Formation	11 feet	

Unit		Thickness (feet) Unit	From base
	Ishbel Formation		
	Contact unconformable		
16	Covered	11.4	51.8
15	Siltstone, dark grey, biogenic and interbedded brown, earthy siltstone as in 10.7-foot unit above; bone fragments evident on weathered surface of the chert	9.8	40.4
14	Covered	8.4	30.6
13	Siltstone, strongly dolomitic, medium grey, in beds 0.5 foot to 2 feet thick; locally with coarser phases from 7 feet below top; with interbeds 0.1 foot to 1.5 feet thick of brown, earthy to shaly siltstone	22.2	22.2
	Thickness of Ishbel Formation	52 feet	
	Kananaskis Formation		
	Contact unconformable		
12	Sandstone, strongly dolomitic, medium light grey, very fine grained, in beds 1 foot to 3 feet thick; locally highly fractured; siliceous cement (may be a quartzose chert); lower contact planar	22.4	108.2
11	Dolomite, strongly quartzose, medium light grey, massive, highly fractured	3.8	85.8
10	Sandstone, strongly dolomitic, light grey, medium- to coarse-grained; in beds 0.5 foot to 2.5 feet thick; locally conglomeratic from 13 feet below top; also conglomeratic in lowest 0.5 foot and appears gradational (reworking) into underlying unit; pebbles up to 1.5 inches long of light grey chert or very fine grained quartz sandstone	26.4	82.0
9	Dolomite, quartzose, medium grey, finely crystalline, well-bedded, in beds 0.1 foot to 2 feet thick; locally highly brecciated as in 0.5-foot interval beginning 3 feet below top; interstices filled with white carbonate	5.4	55.6
8	Chert, light grey, commonly with 1- to 2-inch bands of medium grey chert, well-bedded, in beds 0.5 foot to 2 feet thick, yellowish grey weathering in lowest 1 foot; light grey weathering above	9.9	50.2
7	Dolomite, quartzose, medium light grey, fine-grained, in beds 0.3 to 0.5 foot in lowest 2 feet; 1- to 2-foot beds above	6.4	40.3
6	Chert, medium light grey, massive, locally highly fractured	4.1	33.9
5	Sandstone, strongly dolomitic, fine-grained, light grey, pale yellowish orange weathering, in beds 0.5 foot to 2 feet thick; conglomeratic in top 0.5 foot	13.3	29.8
4	Quartzite, dolomitic, light grey, very fine grained, massive, brittle, locally highly fractured; with abundant yellowish brown weathering 0.2- to 0.8-foot nodules of chert which weather free of the dolomite	12.4	16.5
3	Chert, light grey, massive, rusty, red weathering and forming a prominent marker	4.1	4.1
	Thickness of Kananaskis Formation	108 feet	
	Misty Formation		
	Contact conformable		
2	Sandstone, dolomitic, light grey, fine-grained in beds 0.3 foot to 2.5 feet thick, well-bedded, light grey weathering; locally strongly dolomitic; chert nodules with irregular outline but up to 0.5 foot long and chert fragments in pockets within lowest 0.8 foot of unit	30.4	51.7

Unit		Thickness (feet) Unit	From base
1	Sandstone, locally strongly dolomitic, light grey, fine-grained, in beds 0.5 foot to 3 feet thick; with occasional stringers of medium light grey chert and angular fragments of this chert locally scattered along bedding planes	21.3	21.3
	Thickness of Misty Formation	52 feet	
	Total thickness of Rocky Mountain Group	223 feet	
	RUNDLE GROUP		
	Etherington Formation		
	Contact conformable		
	Dolomite, cherty, medium light grey, fine-grained, in beds 0.2 foot to 1.5 feet thick, well-bedded, with scattered nodules and blebs of medium grey chert up to 0.3 foot observed, especially on the yellowish brown weathering bedding surfaces. Upper contact well exposed and planar	15.6	
	Siltstone, sandy, strongly dolomitic, light grey, in two beds about 2.5 feet thick, highly fractured	4.7	

MOUNT PROCTER (Section 4)

The following summary section of the Rocky Mountain Group was measured by G. B. Leech and the writer on the east side of Mount Procter, about 4 miles due north of Fernie, British Columbia. The (overturned) section occurs along the ridge that divides the headwaters of Bean and Dock Creeks. Although the group is only about 35 per cent exposed, the outcrops are commonly fossiliferous and all four formations are positively identifiable. The section is accessible from the British Columbia highway 3 via the Hartley Creek road and to some extent by game trails following the high ground that overlooks Dock Creek from the south.

	SPRAY RIVER GROUP		
	Siltstone, dark grey, platy weathering		
	ROCKY MOUNTAIN GROUP		
	Fantasque Formation		
	Contact unconformable		
8	Chert, pale blue-grey and light grey, massive, resistant, highly fractured and locally recemented with milky quartz; upper 10 feet contains pockets of unchertified grey sandstone up to 0.5 foot maximum dimension observed, and is white weathering	35	1,200
7	Chert, blue-black locally variegated with medium grey, massive, locally brecciated	15	1,165
	Thickness of Fantasque Formation, about 50 feet		
	Ishbel Formation		
	Contact unconformable		
6	Siltstone, strongly dolomitic, fossiliferous, locally with phosphatic (?) nodules; greyish black, with thin interbeds of black chert up to 0.3 foot thick scattered throughout; unit weathers brownish grey and locally into plates up to 0.05 foot thick; contains abundant *Crurithyris* sp.?	240	1,150
	Thickness of Ishbel Formation, about 240 feet		

Unit		Thickness (feet) Unit	From base
	Kananaskis Formation		
	Contact unconformable		
5	Dolomite, strongly quartzose, fossiliferous, medium grey, fine-grained, with occasional nodules of grey chert; outcrops sporadically as 1- to 2-foot hard beds; pale yellowish brown weathering; fossils recovered from lowest 40 feet of unit; scattered *Hustedia* sp.; *Punctospirifer* sp. cf. *P. cristata* Schlotheim and *Waagenoconcha* sp.	210	910
	Thickness of Kananaskis Formation, about 210 feet		
	Misty Formation		
	Contact conformable		
4	Sandstone, non-calcareous, pale yellowish grey, fine-grained, fine- to medium-crossbedded; weathering into sheets and blocks 0.5 foot to 2 feet thick; upper third of unit not exposed; lower two-thirds moderately well exposed, but commonly slumped....	628	700
3	Sandstone, strongly dolomitic, fossiliferous, yellowish grey to light grey, fine-grained, light yellowish grey and brownish grey weathering; mostly covered; contains *Orbiculoidea* sp.	19.5	72
2	Sandstone, strongly dolomitic, fossiliferous, medium light grey, cherty, very fine grained, in two units each about 6 feet thick, weathering to mottled yellowish grey and medium grey, wavy overlapping plates 0.05 to 0.3 foot thick; sparse *Orbiculoidea* sp.	13.5	52.5
1	Dolomite, strongly quartzose, cherty, fossiliferous, light grey, fine-grained, massive, weathering into plates and sheets 0.3 foot to 2 feet thick; scattered blebs of medium grey, light grey weathering chert, especially in the lowest 10 feet of unit; top of unit partly covered; contains abundant *Composita subtilita* Hall?.....	39	39
	Thickness of Misty Formation, about 700 feet		
	Total thickness of Rocky Mountain Group, about 1,200 feet		
	RUNDLE GROUP		
	Etherington Formation		
	Contact conformable		
	Dolomite, strongly quartzose, fossiliferous, light grey, fine-grained, massive, weathering into light yellowish grey blocks 0.1 foot to 3 feet thick; abundant *Spirifer curvilateralis* Easten and *Composita* sp. within 5 feet of top of unit		

BARE RANGE (Section 5)

This section was measured in Bare Range, 30 miles north of Banff and within Banff National Park. There the Rocky Mountain Group is about 95 per cent exposed. The section is reached by means of the fire road from Lake Minnewanka to Panther River and a short walk along game trails above the north shore of the river. The contact relations of the base of the formation are best exposed about 1,000 feet above the valley floor in a pronounced draw. The sandstone succession and its upper contact are exposed about 500 feet lower. Thickness measurements have been compensated for offsetting of strata by vertical tear faults and for thickening by flat thrusts.

Unit		Thickness (feet) Unit	From base
	SPRAY RIVER GROUP		
	Siltstone, dark grey, splintery to platy weathering.		
	ROCKY MOUNTAIN GROUP		
	Kananaskis Formation		
	Contact unconformable		
24	Sandstone, strongly calcareous, medium light grey, medium-grained, with scattered stringers and nodules of dark grey chert, thickness variable, occasional oval cavities lined with white chert	4	45.4
23	Chert, light grey, highly fractured, with scattered lenses of medium grey, fine-grained sandstone	4.4	41.4
22	Dolomite, argillaceous, light grey, pale yellowish brown weathering, in beds 0.2 to 0.6 foot thick	3.2	37
21	Sandstone, light grey, fine-grained, with occasional subangular quartz clasts up to 1 mm, massive, scattered angular fragments of chert and stringers of chert breccia	11.1	33.8
20	Dolomite, medium light grey, finely crystalline, with stringers and nodules of light grey chert; in beds 0.5 foot to 2.0 feet thick; silty layers weathered in relief, occasional shaly interbeds up to 0.3 foot thick; occasional fine-grained, grey sandstone interbeds up to 0.4 foot	22.7	22.7
	Thickness of Kananaskis Formation	45 feet	
	Misty Formation		
	Contact conformable		
19	Sandstone, light grey, fine-grained, massive, buff weathering (as in unit 17 below)	7.7	271.7
18	Sandstone, pyritic, medium light grey, fine-grained, massive, weathering into plates about 0.1 foot thick, recessive. Section offset by horizontal fault (thrust) with 7-foot stratigraphic separation	9.9	264
17	Sandstone, light grey, fine-grained, very pale orange weathering, massive	15.4	254.1
16	Sandstone, light grey, fine-grained, weathering into plates 0.05 to 0.1 foot, strongly stained with iron oxide	2.1	238.7
15	Sandstone, light olive-grey, fine-grained, massive, very pale orange weathering, and with occasional thin (less than 0.3 foot) shaly partings of the same material	26.8	236.6
14	Sandstone and chert (about 50% of each); sandstone as in unit 13 and containing indeterminate, silicified fragments of brachiopods, gastropods and bryozoa; chert, mauve, in nodules and stringers	3.9	209.8
13	Sandstone, light grey, fine-grained, very pale orange weathering, massive, locally laminated with medium light grey	23.1	205.9
12	Chert, medium greenish grey, locally tinted purple, with lenses of sandstone as in unit 11, containing nodules of chert up to 6 inches diameter; unit capped by 1.1 feet of chert breccia	6.3	182.8
11	Sandstone, very light grey, fine-grained, massive, very pale orange weathering, with very coarse grained 1-foot interbed beginning 10 feet above base, also 21 feet to 26 feet above base	28.8	176.5
10	Covered	7.1	147.7
9	Siltstone, light grey, massive, weathering into plates about 0.05 foot thick	0.9	140.6

Unit		Thickness (feet) Unit	From base
8	Dolomite, biogenic, slightly quartzose, pale greyish pink, streaked with pink, very fine grained; scattered nodules and stringers of light grey chert; subangular to subrounded quartz clasts up to 0.2 mm, some with strongly etched rims; thin concentrations of clasts relief weathered; very pale orange weathering; in beds 1 foot to 3 feet thick; abundant crinoid columnals and other biogenic debris	22	139.7
7	Sandstone, pyritic, very light grey, fine-grained, with silty and sandy laminae, relief weathered; with occasional interbeds of shaly weathering, olive-grey, very fine grained sandstone, 0.5 foot to 1.5 feet thick	11.7	117.7
6	Interbedded dolomite and sandstone (50% of each); dolomite, medium light grey, finely crystalline, in beds 0.3 to 0.6 foot thick; and sandstone as in unit 5	2.9	106
5	Sandstone, dolomitic, light grey, fine-grained in beds 1 foot to 3 feet thick, with thin, coarse-grained layers, relief weathered, revealing fine laminations and cross-laminations; very pale orange weathering; scattered rounded nodules and stringers of, and vugs lined with, light grey chert, locally tinted with pink; occasional thin partings (less than 0.2 foot thick) of shaly weathering, calcareous siltstone	58.3	103.1
4	Sandstone, dolomitic, light grey, fine-grained, medium light grey weathering; in beds 1 foot to 3 feet thick, with scattered nodules and irregular small blebs of light grey chert; occasional interbeds of shaly weathering, calcareous, very pale orange, siltstone, from 0.1 to 0.3 foot thick	16.8	44.8
3	Interbedded olive-grey, platy weathering siltstone and very fine grained sandstone, as in unit 2; in beds 0.3 to 0.6 foot thick; about 50% of each	1.8	28.0
2	Sandstone, dolomitic, light grey, very fine grained, with scattered fragments and irregular, small blebs of light grey, yellowish grey weathering chert; massive, locally brecciated; silty layers relief weathered	25.1	26.2
1	Sandstone, strongly calcareous, very pale orange, shot through and commonly completely replaced by light grey chert; undulatory lower surface	1.1	1.1
	Thickness of Misty Formation	272 feet	
	Total thickness of Rocky Mountain Group	317 feet	
	RUNDLE GROUP		
	Etherington Formation		
	Todhunter Member		
	Contact unconformable?		
13	Sandstone, strongly dolomitic, very pale orange, in lower half grading upward to medium grey; fine- to medium-grained; highly fractured, in beds 0.5 to 1.0 foot thick, with thin shaly interbeds of strongly argillaceous, fine-grained sandstone; stringers and thin interbeds of very light grey, vuggy chert, scattered through the unit, and discrete nodules and stringers up to 0.3 foot thick and 1 foot to 2 feet long of blue-grey chert. Upper surface definitely a cut surface—undulatory, with amplitude of about 2 feet in places, generally 0.5 foot. Traced down the gully, this bed grades into a strongly quartzose dolomite, with abundant silicified fragments of corals, brachiopods (more like spirifers than productids) and crinoid columnals	10.6	52.5

Unit		Thickness (feet) Unit	From base
12	Sandstone, silty, strongly dolomitic, yellowish grey, very fine grained, massive, very pale orange weathering	1.2	41.9
11	Sandstone, silty, greenish grey, streaked with dark greenish grey, very fine grained, massive, pale yellowish brown weathering, with the silty parts relief weathered; stringers and thin interbeds of vuggy, very light grey chert up to 0.2 foot thick towards top of unit	4	40.7
10	Covered; 300 feet down gully about 2.5 feet exposed of sandstone, strongly calcareous, variegated light and medium grey and very pale orange; coarse-grained, in wavy beds 0.05 to 0.1 foot thick	4.3	36.7
9	Dolomite, slightly calcareous, strongly quartzose, light grey, finely crystalline, massive	8.1	32.4
8	Covered—probably greyish green mudstone	2.3	24.3
7	Siltstone, greyish red mottled with pale olive; pale olive in the lowest 1 foot; massive, highly fractured	5.1	22.0
6	Mudstone, silty, greyish red, flaky weathering, bed pinches out up gully into overlying rock type	3	16.9
5	Dolomite, medium grey, finely crystalline, massive, highly fractured; strongly mottled with greyish red on the weathered surface	2.2	13.9
4	Mudstone, pale olive in lower half, greyish red above; flaky weathering	1.2	11.7
3	Limestone, argillaceous, medium grey, forming a bed of subrounded pale yellowish orange weathering nodules up to 0.5 foot maximum dimension set in matrix of pale olive mudstone locally tinted with greyish red	1.2	10.5
2	Mudstone, pale olive as in unit 1	1.6	9.3
1	Interbedded sandstone and mudstone; sandstone, strongly dolomitic, yellowish grey, medium-grained, very pale orange weathering; in wavy beds 0.2 to 0.6 foot thick and mudstone, olive-grey and blue-green locally tinted with greyish red, recessive, flaky to earthy weathering, highly sheared; in beds 0.1 to 0.5 foot thick, about 50% of each	7.7	7.7
	Thickness of Todhunter Member	53 feet	
	Etherington Formation (lower part)		
	Contact conformable		
	Dolomite, calcareous, medium grey, finely crystalline, massive, upper surface very porous weathering	9.3	

COUGAR CANYON (Section 6)

Section was measured on the northwest side of Cougar Canyon opposite Canmore, 10 miles along strike to the southeast of Shimer's classic section on Lake Minnewanka; it begins at the mouth of the Canyon. Triassic Spray River strata are not exposed above the breccia-conglomerate capping the Rocky Mountain succession and an 18-foot covered interval rests between the base of the sandstones and top Rundle strata.

Unit		Thickness (feet) Unit	From base
	ROCKY MOUNTAIN GROUP		
	Fantasque Formation		
6	Chert, massive, very light grey, brittle; locally conglomeratic and gradational into unit below	1.2	10.7
5	Breccia-conglomerate, massive, loosely consolidated on the weathered surface; subrounded chert? cobbles up to 0.3 foot observed in very coarse grained, medium light grey chert and quartz matrix	9.5	9.5
	Thickness of the Fantasque Formation	11 feet	
	Kananaskis Formation		
	Contact unconformable		
4	Dolomite, strongly quartzose, conglomeratic, light grey, finely crystalline, massive, yellowish grey weathering; locally contains angular, dark grey chert fragments up to 1 inch maximum dimension	35	65.3
3	Siltstone, strongly dolomitic, cherty, medium dark grey, to dark grey, with abundant nodules of dark grey chert; in beds ½ foot to 3 feet thick, locally shaly weathering	26	30.3
2	Sandstone, dolomitic, medium grey to medium dark grey, fine-grained, massive, dense, olive-grey weathering	4.3	4.3
	Thickness of Kananaskis Formation	65 feet	
	Misty Formation		
	Contact conformable		
1	Sandstone, pale yellowish grey, medium-grained, massive, weathering into sheets and blocks ½ inch to 2 inches thick, yellowish grey weathering, locally tinged with pale red; locally medium crossbedded with foreset beds suggesting source to north or northeast; occasional earthy, olive-grey, strongly calcareous partings, up to 6 inches thick, especially in lowest 25 feet	192	192
	Thickness of Misty Formation	192 feet	
	Total thickness of Rocky Mountain Group	268 feet	
	RUNDLE GROUP		
	Etherington Formation		
	Todhunter Member		
	Contact conformable?		
5	Covered; abundant float of sandstone, greyish pink, coarse-grained; pale red weathering, in blocks 2 to 6 inches thick, perpendicular to bedding	18.4	51.0
4	Dolomite, quartzose, pale olive-grey, finely crystalline, massive, yellowish grey weathering, with tinges of pink; scattered subangular to subrounded quartz grains; local stringers up to 3 inches thick of very coarse grained, strongly calcareous, very light grey quartz sandstone as observed in a 3-inch bed beginning 4.2 feet above base. Beginning 9 feet above base are prominent, light grey chert nodules and stringers up to 0.4 foot thick; prominent relief weathering of silty laminae in top 15 feet of unit; occasional parting of strongly calcareous, olive-grey, earthy to shaly weathering siltstone up to 1 inch thick	23.5	32.6

Unit		Thickness (feet) Unit	From base
3	Sandstone, strongly calcareous, pale yellowish grey, very coarse grained, porous weathering, recessive	0.6	9.1
2	Sandstone, strongly calcareous, pale yellowish grey, fine-grained finely laminated and cross-laminated on the weathered surface, brittle; weathering into plates ½ inch to 6 inches thick; variably moderate orange-pink. Beginning 2.3 feet above base is 0.3-foot± bed of strongly weathered, brecciated chert with interstices filled with light grey carbonate	8.5	8.5
	Thickness of Todhunter Member	51 feet	
	Etherington Formation (lower part)		
	Contact conformable		
1	Dolomite, cherty, quartzose, light olive-grey, finely crystalline, yellowish grey weathering, in beds ½ foot to 3 feet thick; abundant irregular blebs of light grey chert up to 18 inches long, 2 inches thick; scattered subangular to subrounded quartz grains up to 0.5 mm; no fossils evident; locally the quartz silt particles concentrated to give the rock a laminated appearance on the weathered surface; occasional parting of strongly calcareous, earthy to shaly weathering, olive-grey siltstone up to ½ inch thick, especially in top 10 feet of the unit	35.6	

KING CREEK (Section 7)

Section was measured along the north wall of the canyon in which King Creek is incised, beginning at the northeast footing of the bridge that crosses the creek about 35 miles south of Seebee, Alberta. Rocky Mountain strata outcrop on both walls of the canyon but in general the section is more continuously exposed on the north side. Triassic Spray River strata in contact with the Rocky Mountain Group are not exposed. The lower contact of the group is sharp and well exposed.

	SPRAY RIVER GROUP		
	Siltstone, slightly calcareous, medium brown, laminated with light brown, massive, weathering into plates ⅛ to 1 inch thick. Covered, approximately	220	
	ROCKY MOUNTAIN GROUP		
	Kananaskis Formation		
	Contact unconformable		
40	Sandstone, conglomeratic, medium grey, very fine grained, forming bed with gently undulatory upper and lower surfaces; locally a chert and (?) quartzite pebble conglomerate with subangular to subrounded rock fragments up to 10 cm observed; interstices filled with an irregular network of dark grey cherty sandstone..	0.6	80.1
39	Sandstone, medium grey, very fine grained, dense, in beds 6 inches to 3 feet thick, with scattered nodules and blebs of light, medium, and dark grey chert up to 1 foot long observed and with occasional brown, flaky weathering, soft, silty mudstone partings up to 0.3 foot thick; individual beds have wavy irregular surfaces. Geodetic Survey of Canada BM 1391-D in lower third of unit	19.3	79.5

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Unit		Thickness (feet) Unit	From base
38	Sandstone, argillaceous, olive-grey, faintly laminated with light grey, fine-grained in beds ½ inch to 3 inches thick, interbedded with nodules and layers of black chert up to 0.2 foot thick, and with many partings of brown, flaky weathering, soft, siltstone up to 0.1 foot thick; unit mildly contorted and is exposed at the northeast footing of King Creek bridge	5.1	60.2
37	Sandstone, medium grey, fine-grained in beds 0.2 foot to 1.6 feet thick with prominent nodules and stringers of black chert; black chert grains less than 1 mm diameter scattered through the sandstone matrix; lowest 0.3 foot a chert pebble-conglomerate with subangular to subrounded pebbles of black chert up to 0.5 inch observed	2.7	55.1
36	Sandstone, dolomitic, light grey, fine-grained in beds 0.5 foot to 1.5 feet thick with scattered rounded, black chert pebbles up to 0.5 inch observed in top 1.5 feet; pale yellowish brown weathering	7.2	52.4
35	Siltstone, dark yellowish brown, shaly weathering in top 2.5 feet, more massive and resistant below	3.8	45.2
34	Sandstone, medium grey, fine-grained, in beds 1.0 foot to 2.5 feet thick, pale yellowish brown weathering above, pinkish weathering towards the base, resistant	14.4	41.4
33	Sandstone, conglomeratic, with light grey, platy, fine-grained sandstone fragments unsorted and with random orientation; occasional subrounded light grey chert pebbles up to 0.5 inch observed, in medium light grey, fine-grained quartz sandstone matrix	0.5	27.0
32	Chert, very light grey, faintly mottled with patches of medium grey; scattered angular fragments of medium grey chert up to 2 cm observed	1.1	26.5
31	Sandstone, variably cherty, light grey, fine-grained; profuse with subrounded quartz grains floating in the fine-grained matrix and giving the fresh surface a speckled appearance; local pockets of fine-grained, medium grey sandstone	5.4	25.4
30	Sandstone, yellowish grey, locally pale yellowish grey, fine-grained, in beds 1.0 foot to 2.5 feet thick, locally highly fractured and recessive, pale yellowish orange weathering	16.1	20
29	Sandstone, dolomitic, conglomeratic, medium light grey, fine-grained, massive; 1-inch to 3-inch, dark grey chert band at the top with profuse, angular, dark grey, chert fragments up to 0.2 foot observed, unsorted and randomly oriented	3.9	3.9
	Thickness of Kananaskis Formation	80 feet	
	Misty Formation		
	Contact conformable		
28	Sandstone, dolomitic, yellowish grey, fine-grained, in beds 1.0 foot to 3.0 feet thick, with stringers of light grey chert up to 0.2 foot thick	28.4	823.8
27	Quartzite, conglomeratic, light grey, massive; spotted with angular to subrounded pebbles up to 5 mm of very light grey and medium grey chert	2.1	795.4
26	Sandstone, dolomitic, very light grey, very fine grained in beds 0.4 foot to 2.5 feet thick, with irregular upper and lower surfaces; prominent light grey nodules and stringers of chert up to 0.5 foot thick	19.8	793.3

Unit		Thickness (feet) Unit	From base
25	Chert, conglomeratic highly fractured and recemented mass of pale pink, light grey and medium grey, angular chert fragments up to 3 cm observed; lower surface very irregular, with amplitude up to 1.5 feet	4.6	773.5
24	Sandstone, light grey, very fine grained, in beds and with chert nodules and stringers as in unit 26; resistant	29.3	768.9
23	Sandstone, light grey, fine-grained; in beds 0.2 foot to 3.0 feet thick, highly fractured, recessive	10.1	739.6
22	Covered in gullies on both sides of creek	16	729.5
21	Sandstone, yellowish grey, fine-grained, locally very fine grained, pale brown weathering, in beds 0.4 foot to 1.5 feet thick, highly fractured, resistant; textural lamination due to thin laminae of coarse quartz grains up to 2 mm; locally weathering with a pinkish tint, and locally medium crossbedded	115.7	713.5
20	Sandstone, strongly calcareous, medium light grey, medium-grained, massive, locally relief weathered with slightly fine grained phases standing out, partly covered in gully	14.9	597.8
19	Sandstone, slightly limonitic, light grey, fine-grained in beds 0.5 foot to 2.5 feet thick with irregular upper and lower surfaces; yellowish grey weathering, locally pinkish, highly fractured, especially in upper $\frac{3}{4}$. Sharp, narrow gully 87 feet below top with beds locally covered and highly fractured where exposed—possible minor bedding-plane slippage. Locally, coarsely cross-bedded and laminated with coarser quartz clasts standing out in relief. Sparse stringers of very light grey chert, especially in the lower third of unit	183.8	582.9
18	Siltstone, medium light grey, green and rusty brown weathering, shaly, recessive	0.6	399.1
17	Sandstone, light grey, fine-grained, massive, with scattered stringers up to 0.1 foot thick of very light grey chert; highly fractured; moderately resistant	27.4	398.5
16	Sandstone, yellowish grey, fine-grained, in beds 0.1 to 1.0 foot thick, recessive and locally covered; very pale orange weathering, locally with a tint of red; becomes gradually argillaceous downwards, especially noticeable in the lower 15 feet	61.5	371.1
15	Covered	24.3	309.6
14	Sandstone, dolomitic, slightly limonitic, very light grey, fine-grained with thin (less than 2 mm) stringers of coarse quartz clasts up to 1 mm and weathered out, massive, highly fractured..	29.6	285.3
13	Covered	3.3	255.7
12	Sandstone, slightly limonitic, pale yellowish grey, fine-grained, with occasional subangular to subrounded clasts of quartz up to 1 mm scattered through the matrix and giving the fresh surface a speckled appearance; pale yellowish orange weathering; forms a resistant rib	5.9	252.4
11	Sandstone, yellowish grey, fine-grained, massive, with crinoid columnals (?) and light grey subrounded quartz (?) clasts, scattered through the matrix; recessive but completely exposed..	12.3	246.5
10	Sandstone, dolomitic, light grey, fine-grained, pale yellowish brown weathering; massive, resistant, highly fractured	33.5	234.2
9	Covered; highly fractured, light grey, fine-grained, sandstone showing through locally, especially in the lower 10 feet	35.1	200.7
8	Sandstone, yellowish grey, finely laminated (textural) with medium light grey, coarse-grained, pale yellowish orange weathering; in beds 0.5 foot to 1.5 feet thick; highly fractured	33.0	165.6
7	Covered; beds above and below undulatory so that thickness may be in error by some 5 feet	12	132.6

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Unit		Thickness (feet) Unit	From base
6	Sandstone, dolomitic, pale yellowish grey, fine-grained in beds 0.5 foot to 1.5 feet thick, resistant, strongly fractured	28.3	120.6
5	Covered	3.2	92.3
4	Limestone, strongly quartzose, light grey, medium crystalline, medium light grey weathering, massive, resistant	23.4	89.1
3	Sandstone, strongly dolomitic, medium light grey, fine-grained, with abundant thin (less than 3 mm) stringers of medium-grained clasts relief weathered; unit slightly recessive, top few feet locally covered	30.6	65.7
2	Limestone, strongly quartzose, medium light grey, medium crystalline, massive, with occasional irregular blebs of creamy buff weathering, medium grey, slightly calcareous chert	4.9	35.1
1	Sandstone, dolomitic, medium light grey, fine-grained, in beds 0.5 foot to 2.0 feet thick, fractured, very pale orange weathering, lower contact planar and showing no evidence of an erosional break	30.2	30.2
	Thickness of Misty Formation	824 feet	
	Total thickness of Rocky Mountain Group	904 feet	

RUNDLE GROUP

Etherington Formation

Contact conformable

Limestone, biogenic, medium dark grey, finely crystalline, 0.5 foot to 2.0 feet thick with scattered silicified brachiopods and solitary caninoid-type corals; prominent, rounded, scattered, black nodules of chert.

STORM CREEK (Section 8)

Partial section was measured on the south wall of the cirque at the head of Storm Creek, east of the summit of Highwood Pass and about 45 miles south of Seebee, Alberta, along the Kananaskis road. Only the interval spanning the contact between Rocky Mountain strata and the Etherington Formation is described in detail and the reader is referred to Raasch (1958, pp. 204-205) for a description of the larger part of the Rocky Mountain succession.

ROCKY MOUNTAIN GROUP

	Unit 6 corresponds to Raasch's unit 12. Above it rests the larger part of the sandstone succession of the Misty Formation, and 54 feet of sandstone and chert tentatively assigned to the Kananaskis Formation. Total thickness of the Rocky Mountain succession above unit 6 is, according to Raasch:.	503	581
	Misty Formation (in part)		
6	Siltstone, dark grey, shaly weathering, recessive	1.8	78
5	Sandstone, strongly dolomitic, very pale grey, coarse-grained, massive, greyish orange weathering, with scattered dusky brown, rounded, phosphate (?) pebbles up to 0.5 cm observed 3 to 4 feet below top, laminated and cross-laminated. This is a distinctive unit and may be of value in detailed lithostratigraphic studies; compare with unit 11 of the Misty Formation in Section 5, Bare Range	12.4	76.2

Unit		Thickness (feet) Unit	From base
4	Chert, light bluish grey, with irregular pockets of very light grey, fine-grained, quartz sandstone	0.9	63.8
3	Sandstone, strongly dolomitic, very pale orange, medium-grained, massive, locally weathering into plates 0.05 foot thick, medium light grey weathering, mildly recessive, and grading laterally and vertically into more resistant, pale yellowish orange weathering. platy, coarse-grained, porous weathering sandstone, with syringopora-type moulds filled with very light grey carbonate; local pockets of medium light grey chert	19.9	62.9
2	Sandstone, strongly dolomitic, yellowish grey, fine-grained, in beds 1 foot to 3 feet thick, greyish orange weathering, locally weathering into wavy plates about 0.1 foot thick, porous weathering with cavities up to 0.3 foot diameter lined with druses of light grey chert and poorly preserved brachiopods evident on upper, stripped surface; subangular quartz grains with strongly etched rims	42.9	43.0
1	Sandstone, medium grey, medium-grained, with secondary blebs of moderate orange-pink chert; shows organic structures on upper surface, possibly worm casts and burrows; quartz grains subangular, many with strongly etched rims showing replacement by chert	0.1	0.1
	Thickness of Misty Formation	527 feet	
	Total thickness of Rocky Mountain Group	581 feet	
	RUNDLE GROUP		
	Etherington Formation		
	Todhunter Member		
	Contact conformable		
20	Siltstone, pale red, weathering into plates up to 0.05 foot thick, recessive	1.8	116.0
19	Chert, medium and dark grey, and greyish green, locally pink	1.9	114.2
18	Sandstone, as in unit 16	3.1	112.3
17	Chert, strongly quartzose, medium and dark grey, locally jasperized and with stringers of very pale orange sandstone as in unit 16 up to 0.4 foot thick; quartz clasts subangular up to 0.3 mm observed; many with strongly etched rims	1.4	109.2
16	Sandstone, strongly dolomitic, very pale orange, medium-grained, massive, sugary, weathering into irregularly overlapping, wavy plates; scattered blebs of jasperized, light grey chert, subangular to subrounded quartz grains up to 0.3 mm	8.3	107.8
15	Chert, light grey, highly fractured, locally jasperized	0.7	99.5
14	Sandstone, strongly dolomitic, pale red, locally streaked with light grey, very fine grained, in beds 0.3 foot to 1.2 feet thick; quartz grains generally less than 0.1 mm, occasionally up to 0.2 mm, many with strongly etched rims	8.7	98.8
13	Sandstone, strongly dolomitic, very light grey, fine-grained, very pale orange weathering, with prominent stringers up to 0.4 foot thick of locally jasperized, light grey chert; many vugs up to 0.2 foot lined with jasperized chert, subangular grains up to 0.2 mm, many with strongly etched rims	14.6	90.1
12	Dolomite, silty, light olive-grey, very fine grained, yellowish grey weathering; silty streaks relief weathered; sparse quartz clasts up to 0.1 mm, some with moderately etched rims	2.7	75.5
11	Chert, light grey, vuggy	0.4	72.8
10	Sandstone as in unit 8	17.3	72.4

Unit		Thickness (feet) Unit	From base
9	Sandstone, dolomitic, light grey, medium-grained, weathering into wavy plates 0.1 foot±	4.1	55.1
8	Sandstone, strongly dolomitic, light grey, very pale orange weathering, with 0.2-foot pale red siltstone parting 15 feet above base; unit generally in beds 0.3 foot to 1.5 feet thick, locally weathering into plates 0.1 to 0.2 foot thick; immediately above the pale red siltstone partings are local pockets of silicified crinoid columnals and other unidentifiable biogenic fragments	16.7	51.0
7	Dolomite, slightly silty, light olive-grey, greyish orange weathering, massive, streaked and spotted with nodules and blebs of medium grey chert, locally jasperized, red jasperized fenestrate bryozoans in top 2 feet along strip surfaces	7.6	34.3
6	Chert, medium to dark grey, locally spotted with red	0.9	26.7
5	Siltstone, pale greenish grey, buff weathering, with light grey chert stringer through the middle	1.7	25.8
4	Quartzite, light grey, very fine grained, laminated with very light grey, yellowish grey weathering in lowest 0.5 foot, grey above..	2.4	24.1
3	Siltstone, greyish green, platy weathering, recessive	0.2	21.7
2	Dolomite, silty, medium grey, very fine grained, brownish yellowish grey weathering, with scattered blebs and stringers and geodes lined with red jasperized chert	3.1	21.5
1	Dolomite, strongly silty, very light grey, very fine grained, in beds 0.5 foot to 1.5 feet thick, with sparse, red jasperized chert especially in the top 3 feet, coarser clasts locally relief weathered; greyish orange weathering; quartz clasts with strongly etched rims	18.4	18.4
	Thickness of Todhunter Member	116 feet	
	Etherington Formation (lower part)		
	Contact conformable		
	Dolomite, silty, light grey, very pale orange weathering, with the coarser clasts commonly segregated and relief weathered and showing strongly etched rims; scattered nodules and blebs of medium grey chert; in beds 0.3 foot to 1.5 feet thick	21.7	

BEEHIVE PASS (Section 9)

The following composite section has been published in part elsewhere (Norris, 1957). As indicated in the text, additional stratigraphic and faunal data have warranted the redefinition of the Todhunter as a member of the Etherington Formation of the Rundle Group. The Kananaskis Formation of the Rocky Mountain Group is better exposed on the south side of Beehive pass and is included here to replace beds 1, 2, and 3 of the published section (op. cit.). The sandstones of the Misty Formation are about 75 per cent exposed on the north side of the pass; they were measured by E. W. Mountjoy. The section is accessible by road and trail either from the northwest branch of Oldman River in Alberta or from Elk River valley in British Columbia.

Unit		Thickness (feet) Unit	From base
	SPRAY RIVER GROUP		
	Sulphur Mountain Formation		
	Mudstone, black to dark yellowish brown, partly covered		
	ROCKY MOUNTAIN GROUP		
	Kananaskis Formation		
	Contact unconformable		
20	Dolomite, cherty, strongly quartzose, light grey, finely crystalline, massive, with irregular network of very light grey and light grey chert, locally making up as much as 50% of the mass, pale yellowish brown weathering and forming resistant capping to the Rocky Mountain Group	8.7	47.4
19	Sandstone, conglomeratic, light grey, fine-grained matrix, massive, with scattered subangular to subrounded fragments of dark grey siltstone and medium light to pale red chert up to 2 cm long observed	1.6	38.7
18	Dolomite, quartzose, very light grey, yellowish grey weathering with quartzose layers relief weathered; weathers into sheets and blocks 0.1 to 1.0 foot thick	6.7	37.1
17	Dolomite, quartzose, cherty, light grey, finely crystalline, with nodules of medium light grey and pale red chert which weather pale yellowish brown in the very light grey weathering dolomite; massive, weathering into sheets and blocks 1 foot to 3 feet thick. Some chert nodules highly fractured and with the fractures infilled with black filamentous bitumen (?)	11.1	30.4
16	Sandstone, strongly dolomitic, light grey, very fine grained, massive, with scattered blebs and nodules of medium light grey and pale red chert and abundant silicified *Plagioglypta* sp. and involute gastropods (*Bellerophon* sp.?) in lowest 3 feet of unit. Weathers into medium light grey plates 0.1 to 0.3 foot thick in top 1 foot of unit	14.5	19.3
15	Dolomite, quartzose, cherty, light grey, finely crystalline, massive, with scattered angular rounded inclusions of medium and dark grey chert, up to 0.3 foot observed	4.8	4.8
	Thickness of Kananaskis Formation	47 feet	
	Misty Formation		
	Contact conformable		
14	Sandstone, dolomitic, light grey and very light grey, fine-grained, with minor chert blebs; partly covered	115	1,032
13	Covered	34	917
12	Sandstone, slightly calcareous, very light grey, fine-grained, with scattered grains of hematite; medium- to coarse-grained in lowest 20 feet	130	883
11	Covered	50	753
10	Sandstone, very slightly calcareous, yellowish grey, medium-grained; with occasional interbeds of greyish yellow, coarse-grained sandstone; partly covered	100	703
9	Sandstone, very pale orange, medium- to coarse-grained	75	603
8	Sandstone, very slightly calcareous, yellowish grey, fine-grained, medium- to thick-bedded	215	528

Unit		Thickness (feet) Unit	From base
7	Limestone, quartzose, very pale orange, medium-grained, very porous	4	313
6	Sandstone, yellowish grey, fine-grained	93	309
5	Sandstone, dolomitic, greyish orange, fine-grained, with thin stringers of chert, causing relief on weathered surface	50	216
4	Sandstone, medium grey, fine-grained, numerous vugs lined with white chert; occasional interbeds of greyish orange, fine-grained sandstone; partly covered	70	166
3	Sandstone, very slightly calcareous, light grey, fine-grained, containing abundant *Dictyoclostus* cf. *D. portlockianus* Norwood and Pratten; in places bed consists entirely of silicified shell fragments	2	96
2	Sandstone, very slightly calcareous, pale orange, fine- to medium-grained	90	94
1	Sandstone, slightly calcareous, yellowish grey, fine-grained, medium-bedded, with scattered blebs of medium grey chert; platy weathering	4	4
	Thickness of Misty Formation, approximately	1,032 feet	
	Total thickness of Rocky Mountain Group	1,079 feet	
	RUNDLE GROUP		
	Etherington Formation		
	Todhunter Member (type section)		
	Contact conformable		
14	Dolomite, quartzose, mottled pale red and yellowish grey, medium-grained, medium-bedded, containing scattered silicified *Composita* sp., *Spirifer increbescens* Hall, and *Spirifer* sp.; dispersed milky, angular quartz grains up to 3 mm	6	88
13	Sandstone, slightly calcareous, very pale orange, medium-grained, thin- to thick-bedded, with scattered clear quartz grains up to 1 mm; contains *Spirifer* sp. and *Composita* sp.	8	82
12	Dolomite, very pale orange, fine-grained, with stringers of light grey chert, containing *Archimedes* sp., *Spirifer* sp., *Composita* sp., and undetermined fenestrate bryozoa	3.5	74
11	Sandstone, slightly calcareous, yellowish grey, fine-grained, medium-bedded	3	70.5
10	Siltstone, slightly calcareous, quartzose, interbedded greyish red and greyish orange-pink; thin-bedded to shaly	12	67.5
9	Sandstone, strongly calcareous, yellowish grey, fine-grained, medium-bedded, poorly cemented	7	55.5
8	Dolomite, medium grey, fine-grained, medium-bedded, with abundant stringers and blebs of light and dark grey chert, occasional silicified *Spirifer increbescens* Hall, and coarse solitary coral fragments, possibly *Caninia* sp.	4	48.5
7	Dolomite, slightly quartzose, yellowish grey, fine-grained, with scattered nodules of medium grey chert	2.5	44.5
6	Sandstone, dolomitic, light olive-grey, fine-grained, thick-bedded, with stringers of medium grey chert, and vugs lined with white chert	8	42
5	Sandstone, dolomitic, yellowish grey, fine-grained, thick-bedded	7	34
4	Dolomite, sandy, light olive-grey and medium light grey, fine-grained, medium-bedded, with blebs and stringers of medium grey chert; sandy phases relief weathered	12	27
3	Sandstone, dolomitic, yellowish grey, very fine grained, thin-bedded; interbedded with greenish grey, very fine grained, porcellaneous, thin-bedded sandstone	8	15

Unit		Thickness (feet) Unit	From base
2	Dolomite, argillaceous, siliceous, medium grey, fine-grained, thin-bedded to shaly	7	7
	Thickness of Todhunter Member	88 feet	
	Etherington Formation (lower part)		
	Contact conformable		
1	Dolomite, calcareous, siliceous, medium light grey, fine-grained, medium- to thick-bedded, with stringers and blebs of light grey chert, and vugs lined with white chert; occasional shaly intervals; a few thin beds of yellowish grey, calcareous, siliceous dolomite containing silicified *Spirifer leidyi* Norwood and Pratten	28	

PICKLEJAR CREEK (Section 10)

The section was measured near the headwaters of the northeast fork of Picklejar Creek, on the west flank of Highwood Range. It is accessible via the Kananaskis trail to Picklejar Creek, and game trails that follow the creek high on the north bank. The section is about 95 per cent exposed. The upper contact with Triassic Spray River Group is concealed although strata of unit 43 are believed to represent the uppermost beds of the Rocky Mountain Group in that area. The lower contact with Mississippian Etherington Formation is exposed.

ROCKY MOUNTAIN GROUP

Kananaskis Formation

	Contact unconformable		
43	Sandstone, strongly dolomitic, cherty, medium light grey, very fine grained, with scattered blebs of medium and very light grey chert; sand tubes relief weathered in lowest 0.5 foot; scattered vugs and cavities up to 0.1 foot diameter filled with light grey carbonate; lower contact slightly undulatory, but fused to underlying beds. Top recessive and covered	3.4	56.5
42	Chert, light grey streaked with medium light grey, massive, weathering into sheets 0.2 to 0.5 foot thick	2.7	53.1
41	Chert, mottled light grey, and medium light grey, with cavities up to 0.5 inch maximum dimension lined with small, clear quartz crystals; weathering into plates and sheets 0.3 to 0.5 foot thick..	4.5	50.4
40	Chert, light grey, with irregular pockets and stringers of medium light grey, medium-grained sandstone, containing angular fragments of the chert; weathers into plates 0.2 to 0.5 foot thick....	2.7	45.9
39	Dolomite, quartzose, very light grey, very fine grained, pale yellowish grey weathering; weathering into plates and blocks 0.2 to 0.3 foot thick; upper contact undulatory with amplitude 0.3 foot observed	1.1	43.2
38	Covered	3.5	42.1
37	Dolomite, quartzose, light grey, massive, light olive-grey weathering; cross-laminated sandy phases relief weathered; beds contorted, thickness approximate	3.5	38.6
36	Sandstone, very slightly calcareous, yellowish grey, fine-grained, massive, weathering into sheets and blocks 0.5 foot to 2 feet thick, locally into plates 0.05 to 0.1 foot thick; mildly contorted	8.7	35.1

Unit		Thickness (feet) Unit	From base
35	Dolomite, strongly quartzose, cherty, light grey, massive; with relief weathered light grey chert nodules of irregular outline, up to 0.5 foot maximum dimension observed; mildly contorted.....	2	26.4
34	Sandstone, strongly dolomitic, light yellowish grey, fine-grained, massive, greyish orange weathering; surface strongly relief weathered.....	5.1	24.4
33	Dolomite, cherty, light grey, very finely crystalline, massive, light grey chert blebs and abundant small silicified shell fragments scattered through the unit; resistant.....	5.6	19.3
32	Sandstone, light grey, very fine grained, greyish orange weathering; weathering into plates 0.1 to 1.0 foot thick.....	3.1	13.7
31	Sandstone, light olive-grey, very fine grained, massive, weathering into pale yellowish brown wavy overlapping plates 0.05 to 0.3 foot thick.....	4.4	10.6
30	Sandstone, light bluish grey, fine-grained, massive, dark yellowish orange weathering, resistant.....	0.7	6.2
29	Siltstone, non-calcareous, light bluish grey, strongly recessive, weathering into earthy plates up to 0.05 foot thick.....	1.3	5.5
28	Sandstone, strongly dolomitic, pale yellowish grey, very fine grained, massive, locally spheroidally weathered.....	1.1	4.2
27	Sandstone, very slightly dolomitic, medium light grey, fine-grained, dark yellowish orange weathering, massive, weathering into earthy plates up to 0.1 foot thick in basal 0.5 foot and top 0.5 foot.....	2	3.1
26	Sandstone, strongly dolomitic, medium light grey, very fine grained, massive, weathering into plates and spheroidally weathered blocks, recessive.....	1.1	1.1
	Exposed thickness of Kananaskis Formation.....	56 feet	
	Misty Formation		
	Contact conformable		
25	Sandstone, dolomitic, yellowish grey, fine-grained, massive, brownish grey weathering; weathering into sheets and blocks 0.5 foot to 2.0 foot thick; locally medium crossbedded with cross-laminations relief weathered, top of unit forms stripped surface..	18.6	126.4
24	Dolomite, strongly quartzose, biogenic, very light grey, medium-grained; in two beds, a lower one 2.8 feet thick and an upper one 1.3 feet thick with a platy weathered interval between; medium crossbeds; containing abundant *Brachythyris* sp.?, *Spirifer* sp. and crinoid columnals; occasional stringers of medium light grey chert and with some biogenic lenses up to 1 foot thick; scattered dark, subrounded quartz and chert clasts up to 5 mm observed.....	4.8	107.8
23	Sandstone, strongly dolomitic, very light grey, medium-grained, light olive-grey weathering; weathering into plates 0.1 to 0.5 foot thick, slightly recessive; highly fragmented, silicified *Brachythyris* sp.? and *Spirifer* sp.; brachiopod fragments relief weathered; scattered prominent, dark, subrounded quartz and chert clasts up to 5 mm observed.....	4.6	103
22	Dolomite, strongly quartzose, very light grey, fine-grained, massive, with lenses of silicified *Spirifer* sp., pale yellowish brown weathering; top foot is a slightly dolomitic sandstone with abundant shell fragments; surface strongly relief weathered.....	6.4	98.4

Unit		Thickness (feet) Unit	From base
21	Dolomite, quartzose, cherty, very light grey, fine-grained, massive, with irregular blebs and stringers of medium light grey chert up to 0.3 foot observed; occasional relief weathered silicified *Spirifer* sp., commonly highly fragmented; pale yellowish brown weathering	3.1	92
20	Sandstone, slightly dolomitic, yellowish grey, fine-grained; in beds 1 foot to 3 feet thick, resistant, pale yellowish brown weathering	11.8	88.9
19	Covered	5	77.1
18	Dolomite, strongly quartzose, cherty, light grey, very finely crystalline, pale yellowish brown weathering, with bands and lacy blebs of light grey chert; resistant massive bed with upper surface stripped	2.3	72.1
17	Sandstone, slightly dolomitic to strongly dolomitic, yellowish grey, fine-grained, pale yellowish brown weathering; medium crossbedded, resistant, silicified *Spirifer matheri* Dunbar and Condra?, and crinoid columnals relief weathered on upper surface	11.0	69.8
16	Dolomite, strongly quartzose, cherty, yellowish grey, pale yellowish brown weathering; very slightly recessive	1.6	58.8
15	Sandstone, strongly dolomitic, very light grey, very fine grained, massive, yellowish brown weathering; locally honeycombed on the weathered surface; medium crossbedded, locally weathering into plates 0.1 to 0.2 foot thick and there recessive, so unit weathers back	13.5	57.2
14	Dolomite, slightly quartzose, light grey, very finely crystalline; yellowish grey weathering, recessive; unit occurs as two highly fractured beds 0.7 and 0.4 foot thick	1.1	43.7
13	Chert, medium light grey, as two resistant beds of about equal thickness	1.7	42.6
12	Covered	2.6	40.9
11	Sandstone, slightly dolomitic, light grey, fine-grained, resistant, massive, occasional chert nodules up to 0.1 foot thick observed	1.7	38.3
10	Sandstone, strongly dolomitic, yellowish grey, very fine grained, pale yellowish brown weathering, in wavy beds 1 foot to 2 feet thick, occasional medium grey chert nodules up to 0.1 foot thick	7.4	36.6
9	Chert, light grey	0.4	29.2
8	Sandstone, strongly dolomitic, yellowish grey, fine-grained; finely cross-laminated in beds 0.5 to 1.0 foot thick, variably weathering into plates 0.05 to 1.0 foot thick; moderately resistant	12.4	28.8
7	Dolomite, strongly quartzose, light grey, in beds 0.5 to 1.0 foot thick; greyish orange weathering, slightly recessive	2.7	16.4
6	Sandstone, slightly dolomitic, light grey, very fine grained, pale yellowish brown weathering, massive	0.9	13.7
5	Sandstone, very slightly dolomitic, medium grey variegated with yellowish grey, very fine grained, massive	2.6	12.8
4	Sandstone, dolomitic, pyritic, greyish orange, very fine grained, in beds 0.5 to 1.0 foot thick; pale yellowish brown weathering, resistant	5.4	10.2
3	Sandstone, slightly dolomitic, strongly limonitic, greyish orange, very fine grained, massive, weathering into overlapping plates up to 0.5 foot thick and with pyritic concretions weathered to give the rock a spotted appearance; moderate yellowish brown weathering; covered interval immediately below this unit is probably lithologically the same	2.1	4.8
2	Covered	1.0	2.7
1	Sandstone, dolomitic, yellowish grey, fine-grained, pale yellowish brown weathering, moderately resistant, medium crossbedded	1.7	1.7
	Thickness of Misty Formation	126 feet	
	Total thickness of Rocky Mountain Group	182 feet	

Unit		Thickness (feet) Unit	From base
	RUNDLE GROUP		
	Etherington Formation		
	Contact unconformable?		
	Dolomite, strongly quartzose, cherty, light grey, very finely crystalline, in resistant beds 1 foot to 3 feet thick; sandy and silty layers finely cross-laminated and relief weathered; irregular blebs and stringers of medium light grey chert common; upper surface of unit irregular with relief up to 6 inches observed and with base of overlying unit interfingering with it	—	

CATARACT CREEK (Section 11)

Section is exposed on the west bank of Cataract Creek about one-quarter mile above its junction with Highwood River. There the total strata assigned to the Rocky Mountain Group is 77 feet, of which the lower 72 is considered equivalent to the Misty Formation and the remainder to the Kananaskis Formation. The top of the formation is covered so that contact relations with the Triassic Spray River Group? are not evident. The lower contact however is well exposed, and reveals a gradation from cherts and sandstones of the Rocky Mountain Group into the underlying cherty dolomites of the Etherington Formation.

	Covered (Triassic Spray River Group?)		
	ROCKY MOUNTAIN GROUP		
	Kananaskis Formation (?)		
7	Chert, calcareous, medium and dark grey, massive, weathering into sheets 1 foot to 2 feet thick, highly fractured and recemented with calcite; thickened by thrust faulting so that in measuring some allowance has been made for it; chert is highly fractured with white carbonate filling the cracks	4.4	4.7
6	Covered. Section transferred to top of embankment	0.3	0.3
	Misty Formation		
	Contact conformable		
5	Sandstone, strongly calcareous, medium grey, fine-grained, massive	1.4	72.4
4	Chert, medium and dark grey, massive, brecciated, with the cavities and fractures filled with grey carbonate; highly sheared in top 3 feet	17.5	71.0
3	Sandstone, calcareous, medium grey, pinkish weathering, fine-grained, massive; weathering into wavy plates 1 inch to 6 inches thick	7.5	53.5
2	Chert, medium and light grey, white weathering, massive, brecciated. Section here transferred to the north side of east-west, right-hand tear fault of stratigraphic separation 11.5 feet at this point	26.9	46.0

Unit		Thickness (feet) Unit	From base
1	Sandstone, very slightly calcareous, light grey, fine-grained, massive, speckled with fine grains of a dark mineral, weathering into sheets and blocks 6 inches to 2½ feet thick	19.1	19.1
	Thickness of Misty Formation	72 feet	
	Total thickness of Rocky Mountain Group	77 feet	

RUNDLE GROUP

Etherington Formation (type section)

Contact unconformable?

Dolomite, cherty, light and medium grey, finely crystalline, in beds 6 to 12 inches thick, with very thin partings of light green, argillaceous, fine-grained, pale brown weathering sandstone; stringers of light grey chert up to 2 inches thick and 12 inches long are common 14.4

PLATEAU MOUNTAIN (Section 12)

Section was measured on the east flank of Plateau Mountain at the head of the cirque in which Husky Northern Target Plateau No. 1 well was drilled. It is most accessible via the private road leading from the Kananaskis trail to well sites on top of Plateau Mountain. Although the section is well exposed at a number of points on the rim of the cirque, care must be exercised as the uppermost chert bed capping the mountain is differentially eroded and locally absent.

ROCKY MOUNTAIN GROUP

Kananaskis Formation (?)

9	Chert, breccia-conglomerate, and sandstone; basal 2 feet dark grey, breccia-conglomerate with subrounded to subangular chert pebbles in sandy matrix with phosphatic grains. Middle 2 feet of unit a highly fractured, medium dark grey, medium-grained sandstone; top 3 feet exposed a dark grey, massive, quartzose chert that weathers into wavy sheets 1 inch to 3 inches thick; shell fragment zone containing scaphopod and gastropod remains developed locally in middle of unit on north wall of cirque[1]	7	7
	Exposed thickness of Kananaskis Formation (?)	7	

Misty Formation

Contact conformable

8	Sandstone, slightly dolomitic, light grey, fine-grained, massive, pale yellowish brown weathering; in sheets and blocks ½ foot to 1½ feet thick; local brown, argillaceous quartzite; pebble zones about middle of unit	5.5	51.6
7	Chert, quartzose, medium dark grey, massive, slightly recessive (more so in top 6 inches), weathering into wavy plates 1 inch to 3 inches thick, slightly undulatory upper and lower surfaces; 'cancellophycid' type markings on some weathered surfaces	2.3	46.1

[1] W. J. Hennessey, Canadian Husky Oil Company Ltd., pers. com. 1960.

Unit		Thickness (feet) Unit	From base
6	Sandstone, strongly dolomitic, limonitic, medium light grey, fine-grained, massive, weathering into sheets and blocks ½ foot to 1½ feet thick; 1-foot bed of strongly quartzose dolomite, beginning 1½ feet above base	5.8	43.8
5	Dolomite, silty, dark grey, very fine grained, pale brownish grey weathering, massive, with prominent lacy blebs and stringers of dark grey chert; unit progressively more sandy towards top, upper contact arbitrary and gradational	4.9	38.0
4	Sandstone, strongly calcareous, medium light grey, fine-grained; pale yellowish grey weathering, massive, locally highly fractured; at 0 to 2½ feet from base and at 12 to 15 feet above base unit is a strongly quartzose, porous weathering dolomite	20.7	33.1
3	Dolomite, argillaceous, dark grey, massive, with textural laminations on the weathered surface; bottom contact sharp; upper contact strongly undulatory but gradational as revealed by sandstone concentrations in unit above	1.0±	12.4
2	Sandstone, dolomitic, medium light grey, fine-grained, massive, locally medium-crossbedded the latter being deformed by penecontemporaneous slumping; weathers into sheets and blocks 1 foot to 2 feet thick	8.0	11.4
1	Sandstone, strongly calcareous, medium light grey, fine-grained, massive, pale brown weathering, lustre mottled; both contacts sharp, the upper one being slightly indented and undulatory	3.4	3.4
	Thickness of Misty Formation	52 feet	
	Thickness of Rocky Mountain Group	59 feet	
	RUNDLE GROUP		
	Etherington Formation		
	Contact unconformable ?		
	Dolomite, quartzose, light grey, fine-grained, massive with medium grey chert nodules and blebs up to 2 inches thick; weathers to a mottled pale brown and light grey	9.2	

SAVANNA CREEK (Section 13)

Section was measured about 2 miles upstream from the junction of Savanna Creek with Livingstone River. It is accessible via the Kananaskis forestry road and a subsidiary road leading to well sites on the southern extremity of the Savanna Creek gas field. The section is about 85 per cent exposed and detailed examination was made of rocks in both walls of the defile in which the creek is incised. The upper contact of the Rocky Mountain Group is clearly evident whereas the lower one is arbitrarily drawn at the top of a 16-foot covered interval.

	FERNIE GROUP		
	Shale, black, strongly silty, with pyritic concretions; some thin beds are canary yellow weathering, others slightly rusty brown weathering; shales highly contorted and slickensided	12	
	Shale, black, slightly silty, overlain by a distinct pyritic clay layer ½ inch thick	3	
	Shale, contorted, black, silty, with lenticular black limestone and occasional small pyrite nodules	25	

Unit		Thickness (feet) Unit	From base
	ROCKY MOUNTAIN GROUP		
	Misty Formation		
	Contact unconformable		
14	Sandstone, calcareous, medium grey, medium-grained, lustre mottled with scattered angular pebbles of black chert	1	55
13	Chert, medium grey, massive, with cavities less than 3 inches maximum diameter, lined with light grey carbonate	2.5	54
12	Sandstone, calcareous, light grey, medium-grained, in beds 2 to 6 inches thick; occasional 1- to 2-inch stringers of medium light grey chert; top 2 to 3 inches of bed is a pebble-conglomerate with fragmentary gastropod remains. Lenticular fossil bed 4 to 5 feet above base containing abundant *Euphemites* sp.	12	51.5
11	Quartzite, cherty, medium light grey, fine-grained, in beds 6 to 12 inches thick, with lacy network of medium light grey chert in equal proportions to the quartzite	6	39.5
10	Chert, medium light grey, with abundant subangular to subrounded quartz clasts up to 0.2 mm, many with strongly etched rims	2	33.5
9	Sandstone, slightly calcareous, medium light grey, fine-grained, in beds 6 to 12 inches thick, grains subangular to subrounded, partly forming an interlocking mosaic	3.5	31.5
8	Chert, very light grey, faintly mottled with light grey	1.5	28
7	Chert, medium light grey, with sparse subangular quartz clasts up to 0.1 mm, some with mildly etched rims, highly fractured	4.0	26.5
6	Quartzite, light grey, fine-grained, interlocking mosaic of grains less than 0.05 to 0.2 mm, some strongly etched, lustre mottled; in beds 6 to 12 inches thick	2	22.5
5	Chert, very light grey, faintly mottled with light grey, scattered subangular quartz clasts up to 0.2 mm, some strongly etched; mottling due to fine patches of coarsely recrystallized chert	1	20.5
4	Chert, quartzose, medium grey, massive, highly fractured; fractures filled with white calcite (suggesting post-depositional mineralization); scattered, strongly etched, subangular quartz clasts up to 0.2 mm observed	5	19.5
3	Quartzite, dark grey, medium-grained, flaggy to blocky, some grains interlocking and forming a mosaic, lustre mottled, grains less than 0.05 to 0.2 mm, subangular to subrounded with etched rims; occasional small vugs filled with white carbonate	3	14.5
2	Sandstone, strongly calcareous, cherty, medium grey, fine-grained (0.05 to 0.2 mm, subangular with etched rims), with irregular vugs and stringers filled with white calcite, lustre mottled, brecciated; sparse crinoid columnals irregularly chertified along fractures	1.5	11.5
1	Quartzite, medium light grey, fine- to medium-grained (interlocking quartz grains 0.1 to 0.3 mm) lustre mottled, blocky, with 1- to 2-inch irregular interbeds of black chert	10	10
	Thickness of Misty Formation	55 feet	
	Total thickness of Rocky Mountain Group	55 feet	
	RUNDLE GROUP		
	Etherington Formation		
	Contact unconformable?		
	Covered	16	
	Quartzite, yellowish grey, medium-grained, in beds 6 to 18 inches thick	4.5	

Unit		Thickness (feet) Unit	From base
	Dolomite, very light grey, fine-grained, in beds 6 to 18 inches thick, with interspersed nodules of medium light grey chert, and vugs up to 3 cm filled with milky quartz	1	
	Dolomite, silty, light grey, fine-grained, in beds 6 to 18 inches thick, silty, with abundant remains of fenestrate bryozoa evident on the weathered surface	2	

RILEY CREEK (Section 14)

Section was measured on the east flank of northern Livingstone Range, Alberta, at the headwaters of Riley Creek. It occurs on the east face of the unnamed mountain, 2½ miles on a bearing S40°E from the peak of Mount Livingstone. The section is accessible via the Kananaskis road and trails leading to the headwaters of either Mean or Ridge Creek. The upper contact of the Rocky Mountain succession with the Fernie Group is exposed whereas the basal contact is not. It is believed however that the measured thickness is very near the true value.

FERNIE GROUP

	Sandstone, conglomeratic, calcareous, medium grey, medium-grained, blocky, fetid; with prominent greyish black phosphate (?) pebbles in upper 3 inches up to 3 mm maximum dimension observed; pale yellowish brown weathering	3	

ROCKY MOUNTAIN GROUP

Misty Formation

	Contact unconformable		
7	Sandstone, slightly calcareous, medium light grey, fine-grained, blocky, pale yellowish brown weathering	3	37
6	Limestone, cherty, medium light grey, fine-crystalline	1	34
5	Sandstone, dolomitic, medium light grey, fine-grained, flaggy to blocky, medium crossbedded, pale yellowish brown weathering; occasional 1- to 2-inch stringers of black chert	6	33
4	Sandstone, very slightly calcareous, medium light grey, fine-grained, flaggy to blocky; dark yellowish brown weathering	3	27
3	Sandstone, calcareous, light grey with irregular patches of medium grey, fine-grained, flaggy to blocky weathering, very pale orange weathering	2	24
2	Sandstone, very slightly calcareous, medium light grey, fine-grained, blocky, pale yellowish brown weathering	21	22
1	Sandstone, slightly calcareous, medium light grey, fine-grained; occasional irregular interbeds of light and dark grey chert less than 1 foot thick; lowest beds exposed in core of small anticline immediately above Livingstone thrust; exposed thickness	1	1
	Thickness of exposed Misty Formation	37 feet	
	Thickness of exposed Rocky Mountain Group	37 feet	

Unit		Thickness (feet) Unit	From base

OLDMAN RIVER (Section 15)

The section was measured on the south bank of Oldman River on the west flank of a small anticline exposing Palaeozoic strata about a mile east of the Gap in Livingstone Range. There the section as well as both contacts is completely exposed. It is accessible by car either from the Kananaskis forestry road through the Gap or from Lundbreck on Alberta highway 3.

	FERNIE GROUP		
	Sandstone, strongly calcareous, conglomeratic, dark grey, fine-grained, massive, fetid, with subangular to rounded, black, phosphate pebbles up to ½ inch locally concentrated on the lower 3 inches. Abundant pelecypod remains and *Turbo* visible in top surface	2.1	
	ROCKY MOUNTAIN GROUP		
	Misty Formation		
	Contact unconformable		
13	Sandstone, calcareous, argillaceous, dark grey, massive, light grey weathering, locally coarse-grained and locally strongly argillaceous, upper surface slightly undulatory with amplitude 0 to 4 inches	9.3	102.2
12	Sandstone, calcareous, medium grey, medium-grained, massive, weathering into sheets and blocks from 3 to 24 inches thick; locally developed pockets of recrystallized grains of white carbonate up to ¼ inch maximum dimension giving the fresh surface a mottled appearance. Lithologically grades laterally and vertically into unit above	3.1	92.9
11	Limestone, quartzose, black, massive, with slightly undulatory upper and lower surfaces, weathering into wavy, angular, overlapping plates up to 6 inches thick, 3 feet long	1.5	89.8
10	Sandstone, argillaceous, dolomitic, medium grey, with slight tinge of pink and purple, fine-grained, wavy plates 1 inch to 2 inches thick at base, and sheets 1 foot to 3 feet above; some bedding surfaces strongly stained with limonite around vugs up to 2 inches diameter; weathers into pale greyish purple and yellowish grey plates less than ¼ inch in the top 2 feet of the formation	13.6	88.3
9	Sandstone, calcareous, medium grey, coarse-grained, massive, weathering into wavy blocks 6 inches to 2 feet thick. Grades laterally and vertically into overlying rocks	5.0	74.7
8	Chert, banded white and medium grey with undulatory lower surface and grading into overlying unit	0.4	69.7
7	Sandstone, locally calcareous, medium grey, medium-grained, massive, weathering into sheets 6 to 12 inches thick. At 3½ to 4 feet above base abundant blebs of medium and light grey chert up to 3 inches maximum dimension. Occasional bedding planes show concentrations of recrystallized white carbonate in grains up to ¼ inch diameter	12.9	69.3
6	Chert, light grey, and white, massive, with wavy stringers of medium grey, fine-grained sandstone up to 3 inches thick and 3 to 4 feet long; wavy upper surface of amplitude up to 4 inches..	2.6	56.4

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Unit		Thickness (feet) Unit	From base
5	Sandstone, medium grey, locally streaked with white, fine-grained, one massive bed in lower 3 feet, upper 3 feet weathering into wavy plates and blocks 3 to 15 inches thick	6.0	53.8
4	Chert, white, massive, weathering into wavy and nodular plates 1 inch to 3 inches thick, with abundant stringers and patches of medium grey, fine-grained sandstone commonly with rather diffuse boundaries	5.7	47.8
3	Sandstone, very slightly calcareous, medium-grained, massive, with abundant nodules and stringers of dark grey chert, some nodules with cavities filled with liesegang rings of white chert; nodules and stringers up to 3 inches thick, 3 to 4 feet long. Sandstone weathers with very finely pitted surface	2.7	42.1
2	Sandstone, conglomeratic, calcareous, medium grey, in two massive beds of about equal thickness with slightly wavy upper and lower surfaces, the undulations being filled with pinching and swelling, medium grey, massive, chert and chert pebble-conglomerate; within the sandstone are subrounded pebbles (less than ½ inch diameter) of light grey sandstone	2.1	39.4
1	Sandstone, slightly calcareous, medium grey, medium-grained, massive, weathering into plates and blocks 2 to 12 inches thick, coarsely crossbedded with lower surface a cut and fill on the underlying unit. Lower 0 to 10 inches coarse-grained, conglomeratic sandstone, with medium and light grey chert pebbles, subangular to subrounded up to 2 inches diameter; surface of blocks pitted and relief weathered; occasional vugs of ragged outline completely filled with very coarsely crystalline, white limy dolomite; sparse, thin (less than ¼ inch) partings of strongly calcareous, yellowish grey mudstone	37.3	37.3
	Thickness of Misty Formation	102 feet	
	Thickness of Rocky Mountain Group	102 feet	
	RUNDLE GROUP		
	Etherington Formation		
	Contact unconformable?		
	Dolomite, argillaceous, medium and light grey, finely crystalline, massive, weathering into wavy and ragged plates 1 inch to 6 inches thick; sparse medium grey chert nodules and stringers; upper 0 to 2 inches conglomeratic with angular pebbles of medium and light grey chert.		

RACEHORSE CREEK (Section 16)

Section of the Misty Formation of the Rocky Mountain Group was measured on the west flank of central Livingstone Range. It is exposed in roadcuts on the south side of Racehorse Creek immediately above its junction with Oldman River. Outcrops are good. The lower contact of the Misty Formation is exposed and the upper may be defined within narrow limits where the resistant beds of the Misty give way to the recessive rocks of the Fernie Group. The section is accessible by car via the Kananaskis road and the branch road through the Gap in Livingstone Range.

Unit		Thickness (feet) Unit	From base
	FERNIE GROUP		
	Siltstone, slightly calcareous, brownish black, massive, weathering into plates 0.01 to 0.1 foot thick	2.5	
	Covered	78	
	ROCKY MOUNTAIN GROUP		
	Misty Formation		
	Contact unconformable		
19	Limestone, variably quartzose, medium light grey, very fine grained, locally very coarsely crystalline, massive, occasional vugs up to 0.1 foot observed; locally stained with pale red on the weathered surface. Top surface is stripped	0.5	129.1
18	Covered	2.5	128.6
17	Limestone, strongly quartzose, medium light grey, very fine grained, massive, yellowish grey weathering; resistant; top is prominent stripped surface	4.1	126.1
16	Covered	14.5	122.0
15	Limestone, variably strongly quartzitic, light grey, massive, with rounded, clear quartz clasts floating in carbonate matrix. Bedding surfaces weather to a pale red	4.6	107.5
14	Sandstone, moderately calcareous, medium light grey, fine-grained, weathering into sheets and plates 0.1 to 1.0 foot, pale yellowish brown weathering	3.7	102.9
13	Sandstone, strongly calcareous, medium light grey, fine-grained, in beds 1 foot to 2 feet thick; dark mineral grains scattered through the clear quartz grain matrix	4.2	99.2
12	Sandstone, slightly calcareous, variegated medium grey, and medium light grey, fine-grained, massive, locally deeply weathered and greyish orange	1.8	95.0
11	Covered	18.0	93.2
10	Sandstone, strongly calcareous, light grey, fine-grained, massive, with scattered blebs of light grey chert; top 0.5 foot conglomeratic, with angular, light grey quartzite fragments up to 3 cm maximum dimension, relief weathered	1.9	75.2
9	Sandstone, dolomitic, variegated light and dark grey, fine-grained, in beds ½ foot to 2 feet thick	4.8	73.3
8	Sandstone, strongly calcareous, medium light grey, very fine grained, massive, brecciated, locally with cavities filled with pyrobitumen (?); unit weathers yellowish grey on upper surface	9.1	68.5
7	Chert, medium light grey, massive, with pockets of medium grey, light grey weathering sandstone; locally a chert breccia. Occasional pockets of coarse-grained, light grey sandstone with scattered pieces of white carbonate and cavities filled with pyrobitumen (?)	7.4	59.4
6	Covered	9.5	52.0
5	Sandstone, very slightly calcareous, light grey, fine-grained, in beds 1 foot to 3 feet thick, weathering greyish orange, locally tinted with pale red, bedding surface porous weathering and commonly honeycombed; some beds contain dark mineral along with the quartz	19.9	42.5
4	Covered	3.7	22.6
3	Sandstone, strongly calcareous, mottled medium light grey and light olive-grey on weathered surface, fine-grained; in beds 1 foot to 2½ feet thick; blebs of light grey chert relief weathered on bedding surfaces; weathers greyish orange tinged with pale red	4.2	18.9

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Unit		Thickness (feet) Unit	From base
2	Covered	2.1	14.7
1	Sandstone, strongly calcareous, medium light grey, medium-grained, massive; with rounded quartz grains floating in calcareous matrix; greyish orange weathering; on some bedding surfaces, elongate cavities weathered out and stained rusty brown	12.6	12.6
	Thickness of Misty Formation	129 feet	
	Total thickness of Rocky Mountain Group	129 feet	

RUNDLE GROUP

Etherington Formation

Contact unconformable?

Limestone, conglomeratic, very light grey, very coarsely crystalline, massive, with angular fragments of very light grey quartzite, up to 2 cm maximum dimension observed locally on the weathered surface	4.1	
Covered	0.9	
Dolomite, medium light grey, fine-grained, massive, pale olive-grey weathering	0.9	
Covered	2.8	
Dolomite, very strongly quartzose, fine-grained, massive, pale yellowish grey weathering	1.4	
Covered	5.5	
Dolomite, calcareous, medium light grey, very finely crystalline, in beds 0.1 to 1.0 foot thick, yellowish grey weathering.		

DAISY CREEK (Section 17)

Section of the Misty Formation of the Rocky Mountain Group was measured on the west flank of southern Livingstone Range at the headwaters of Daisy Creek. There the formation forms a prominent flat-iron. The middle and lower parts of the Misty as well as its upper and lower contacts are exposed. The section is accessible from Blairmore via the road leading to the abandoned site of Texaco Livingstone E3-20 well.

FERNIE GROUP

Sandstone, conglomeratic, slightly calcareous, dark grey, medium-grained, massive, with scattered subrounded, black, phosphatic (?), medium-grained sandstone pebbles up to 2 cm long observed	1.3	

ROCKY MOUNTAIN GROUP

Misty Formation

Contact unconformable

13	Covered	3.5	100.0
12	Sandstone, calcareous, medium dark grey, fine-grained, massive; base covered	1.0	96.5
11	Covered interval estimated to tie in section with unit 10 forming a prominent stripped surface on west flank of hill	20.0	95.5

Unit		Thickness (feet) Unit	From base
10	Sandstone, strongly calcareous, cherty, medium light grey, fine-grained, in beds 0.3 to 1.0 foot thick, resistant, greyish orange weathering; stringers and blebs of light grey chert relief weathered on bedding surfaces. Weathered surfaces commonly honeycombed	13.0	75.5
9	Chert, very light grey, laminated with medium grey, in thin beds 0.1 to 0.2 foot thick; forms stripped surface of south end of hill..	5.4	62.5
8	Sandstone, very slightly calcareous, medium light grey, fine-grained, in beds 0.3 to 1.0 foot; vuggy, especially towards top of unit where relief-weathered vugs are filled or lined with very light grey, strongly quartzose dolomite	10.2	57.1
7	Chert, medium dark grey, highly fractured and recemented with light grey quartz, weathering into wavy overlapping plates up to 2½ inches thick; local cavities filled with white, very coarsely crystalline carbonate or white quartz; thin stringers of light olive-grey, fine-grained quartz sandstone up to 0.1 foot observed in lowest foot of unit	4.0	46.9
6	Sandstone, limonitic, calcareous, light grey, fine-grained, in beds 1 foot to 2 feet thick, brittle; locally carbonaceous material around grains; silica cemented cracks, locally relief weathered..	5.1	42.9
5	Lithology as in unit 3, including sandstone lenses	1.4	37.8
4	Sandstone, very slightly calcareous, light grey, fine-grained, in beds 0.5 foot to 2 feet thick, brittle, pale yellowish brown weathering	12.8	36.4
3	Limestone, very light grey, commonly laminated with medium grey or pale yellowish brown, very coarsely crystalline, massive, forming prominent marker bed on hillside; locally with very irregular stringers up to 6 inches thick; of strongly calcareous, fine-grained sandstone, light grey, weathering to a pale yellowish brown, in places making 50% of the unit	3.9	23.6
2	Sandstone, strongly calcareous, light grey, fine- to medium-grained, pale yellowish brown weathering, in beds 1 foot to 3 feet thick, locally weathering into wavy, overlapping plates up to 1 inch; locally highly fractured, coarser segregations relief weathered. Occasional stains of moderate reddish brown up to 2 inches diameter observed from iron pyrite. Sandstone breccia interbeds up to 2 feet thick seen locally along strike	4.7	19.7
1	Sandstone, strongly calcareous, yellowish grey, pale yellowish orange weathering; in beds 0.5 to 1.0 foot thick, highly fractured, variably recessive; locally brecciated in zone up to 1 foot thick at top of unit	15.0	15.0
	Thickness of Misty Formation, approximately	100 feet	
	Total thickness of Rocky Mountain Group, approximately	100 feet	

RUNDLE GROUP

Etherington Formation

Contact unconformable?

	Dolomite, quartzose, light grey, fine-grained, massive, with undulatory lower surface with amplitude up to 1 foot observed	12.7
	Limestone, conglomeratic; limestone, quartzose, medium light grey, finely crystalline, with angular fragments of medium light grey, chert and very light grey, fine-grained quartz sandstone up to 2 inches maximum dimension observed; locally moderately well bedded; two prominent earthy, brown weathering interbeds	18.5

Unit		Thickness (feet) Unit	From base
	Dolomite, slightly calcareous, light grey, finely crystalline, in beds 0.5 foot to 1.5 feet thick, resistant, containing sparse brachiopods approximately 20 feet below top of unit. Occasional nodules, stringers and blebs of dark grey, brown weathering chert.		

GREEN CREEK (Section 18)

Section was measured on the east flank of Green Creek syncline in the core of Livingstone Range. It is accessible on foot from either the east or west flank of the Range; abandoned truck trails may be of considerable value in reducing the amount of foot-work. The section may be reached easily and examined in some detail in a day's work. The Rocky Mountain Group is about 75 per cent exposed, with most of the covered intervals occurring in the upper half of the section. Both contacts are visible.

	FERNIE GROUP		
	Mudstone, strongly silty, dark grey, massive, weathering into chips and plates, recessive	29	
	Sandstone, strongly calcareous, conglomeratic, medium light grey to medium dark grey, coarse-grained, fetid, massive; medium light grey in lowest 2 feet, weathering to a light grey with pale yellowish grey patches which are texturally controlled; uppermost 1½ feet medium dark grey with subrounded phosphatic (?) and chert pebbles up to 2 inches maximum diameter observed and which are especially evident on the top stripped surface along with turbinate gastropods, pelecypods, and vertebrate remains	3.4	
	ROCKY MOUNTAIN GROUP		
	Misty Formation		
	Contact unconformable		
19	Dolomite, strongly quartzose, calcareous, medium light grey, in beds 1 inch to 10 inches thick, yellowish grey weathering; fresh surface mottled with fine patches of light grey carbonate; becomes medium light grey towards the base where also textural laminations are relief weathered	0.6	147.4
18	Covered	2.2	146.8
17	Dolomite as in unit 19	0.6	144.6
16	Covered	3.3	144.0
15	Dolomite as in unit 19	3.3	140.7
14	Covered	4.8	137.4
13	Dolomite as in unit 19	0.6	132.6
12	Covered	3.8	132.0
11	Dolomite as in unit 19	2.2	128.2
10	Covered	2.7	126.0
9	Dolomite as in unit 19	2.8	123.3
8	Covered	2.3	120.5
7	Dolomite as in unit 19	18.2	118.2
6	Dolomite as in unit 19, grading downward into a fine-grained, strongly calcareous sandstone	3.5	100.0

Unit		Thickness (feet) Unit	From base
5	Limestone, quartzose, medium grey, fine-grained, in beds 1 inch to 3 inches thick, light olive-grey weathering	5.5	96.5
4	Sandstone, strongly calcareous, medium grey mottled with very light grey, medium-grained, mottling due to light grey concentrations of carbonate; in beds 6 to 12 inches thick, porous weathering	3.0	91.0
3	Sandstone, slightly calcareous, light grey, fine- to medium-grained, in beds 6 to 12 inches thick, lustre mottled, light olive-grey weathering, locally tinted with pink; base of unit arbitrary	14.6	88.0
2	Sandstone, strongly calcareous, medium light grey, fine- to medium-grained, medium crossbedded; prominent light grey chert nodules and stringers, in beds 6 to 12 inches thick, weathers light grey to pinkish grey and porous	22.6	73.4
1	Sandstone, strongly calcareous, medium grey to medium light grey, fine- to medium-grained, medium crossbedded, lustre mottled, in beds 6 inches to 3 feet thick, weathers light grey to pinkish grey and with a honeycombed surface	50.8	50.8
	Thickness of the Misty Formation	147 feet	
	Thickness of Rocky Mountain Group	147 feet	
	RUNDLE GROUP		
	Etherington Formation		
	Contact unconformable?		
	Sandstone, strongly quartzose, light olive-grey, fine- to medium-grained, with prominent very light grey chert stringers up to 3 inches thick pinching and swelling along strike; in beds 6 to 12 inches thick, yellowish grey weathering; upper surface shows minor indentation by the basal sandstone unit of the Rocky Mountain Group	1.8	

ROCK CREEK (Section 19)

Section was measured in southern Livingstone Range at the headwaters of the south fork of Rock Creek. It is readily accessible via the pipe-line road across southern Livingstone Range. The section immediately underlies the Fernie Group where the type section of Warren's Rock Creek Member is exposed. The upper contact of the (overturned) Rocky Mountain succession is evident whereas the basal contact is inferred.

	FERNIE GROUP		
	Sandstone, calcareous, medium dark grey, coarse-grained, with subangular to subrounded black phosphate (?) and light grey chert pebbles in lowest 6 inches	1.3	

Unit		Thickness (feet) Unit	From base
	ROCKY MOUNTAIN GROUP		
	Misty Formation		
	Contact unconformable		
7	Sandstone, variably argillaceous, slightly calcareous, variegated light and medium grey, fine-grained, in beds 3 to 18 inches thick, weathers to a variegated greyish orange and medium light grey; at 20 to 25 feet from base, unit is slightly recessive and weathers into wavy beds less than 2 inches thick	36.3	142.7
6	Sandstone, calcareous, variegated medium and light grey, fine- to medium-grained; yellowish grey weathering; unit consists of two massive beds, the upper one approximately 3 feet thick, the lower one 7 feet thick; slightly recessive interval between weathering into plates 1 inch to 3 inches thick	13.1	106.4
5	Sandstone, conglomeratic, medium grey, coarse-grained, brown weathering, containing subangular to angular fragments of medium and dark grey chert up to 3 cm maximum dimension..	1.5	93.3
4	Chert, medium dark grey, weathering into plates ½ to 1 inch thick..	1.7	91.8
3	Sandstone, slightly calcareous, light grey to yellowish grey, fine-grained, with nodules and stringers of white and medium grey chert up to 8 inches long and ½ inch to 2 inches thick; sparse angular pebbles of medium grey chert up to 1 inch diameter in top 3 inches of unit	27.5	90.1
2	Sandstone, slightly calcareous, medium light grey, banded with yellowish grey weathering, white chert; fine-grained, massive, with the chert bands slightly more calcareous and ranging from ½ inch to 2 inches thick; sandstone has sugary texture	11.1	62.6
1	Sandstone, calcareous, light grey, fine-grained, with sugary texture; in beds up to 5 feet thick; interbeds up to 6 inches thick of intraformational conglomerate of angular sandstone fragments	51.5	51.5
	Exposed thickness of Rocky Mountain Group	143 feet	
	RUNDLE GROUP		
	Etherington Formation		
	Contact unconformable?		
	Covered	7	
	Sandstone, strongly dolomitic, light grey, fine-grained, massive, weathering into ragged plates 1 inch to 2 inches thick, honeycombed weathering	3.5	

ADANAC (Section 20)

Section was measured on the east flank of Hastings Ridge along a branch road leading to Adanac strip mine (abandoned) from the Webb Creek road. There 48 feet of strata assigned to the Rocky Mountain Group are completely exposed as is the upper and possibly the lower contact.

	FERNIE GROUP		
	Sandstone, dark brownish grey, non-calcareous, quartzose with scattered black phosphate pebbles; coarse-grained, weathers brownish grey, and has petroliferous odour	1.5	—

Unit		Thickness (feet) Unit	From base
	ROCKY MOUNTAIN GROUP		
	Misty Formation		
	Contact unconformable		
12	Mudstone, silty, dark brown, earthy weathering	1.1	47.5
11	Sandstone, calcareous, medium grey, fine-grained, in wavy beds 2 to 12 inches thick, brown weathering; textural lamination of thin, medium light grey, silty layers up to 2 mm thick observed	4.1	46.4
10	Siltstone, calcareous, dark bluish grey, massive, ripple-marked; 2-foot platy weathering interval beginning 3 feet below top of unit; unit is stripped back along this softer bed in road-cut	11.2	42.3
9	Siltstone, calcareous, medium grey, massive, weathers into platy to flaggy pieces, brown weathering	6.7	31.1
8	Sandstone, conglomeratic, medium grey, medium-grained, massive, contains numerous, small angular pebbles up to ½ inch long of black chert, with sparse very light grey sandstone fragments; quartz grains subrounded, some with strongly etched rims, weathers into blocks and slabs ½ inch to 8 inches thick	3.1	24.4
7	Conglomerate, calcareous, quartzose, coarse-grained, sandstone matrix; subangular pebbles of very light grey quartz sandstone, quartzose dolomite and chert up to 2 inches long; unit is set in cut and fill surface with rounded undulations up to 3 inches amplitude	1.5	21.3
6	Sandstone, dolomitic, medium grey, fine- to medium-grained, massive to blocky, weathers grey-brown and has petroliferous odour; subangular to subrounded quartz grains up to 0.2 mm, some with etched rims	7.6	19.8
5	Mudstone, arenaceous, calcareous, earthy, yellowish brown weathering	0.5	12.2
4	Sandstone, dolomitic, light grey, medium-grained, in beds 1 foot to 2½ feet thick, grey-brown weathering, with pyrite grains and limonite staining scattered over bedding surfaces	5.1	11.7
3	Sandstone, dolomitic, yellowish grey, medium- to coarse-grained, massive, colour-laminated, weathers dark grey-brown	4.9	6.6
2	Dolomite, strongly quartzose, yellowish grey, coarse-grained, massive, highly fractured, with slightly wavy upper and lower surfaces; subangular quartz grains up to 0.2 mm, porous weathering	0.4	1.7
1	Conglomerate, with medium light grey sandstone matrix, and angular pebbles of light blue-grey chert and light grey sandstone up to 2 inches maximum dimension; intensely brecciated	1.3	1.3
	Thickness of Misty Formation	48 feet	
	Total thickness of Rocky Mountain Group	48 feet	
	RUNDLE GROUP (?)		
	Etherington Formation		
	Contact unconformable?		
	Dolomite, quartzose, very light grey, fine-grained, massive, with scattered, medium grey chert fragments up to 3 inches maximum dimension; quartz grains up to 0.2 mm, subangular to subrounded, with etched rims; undulatory upper surface with relief of up to 6 inches; stringers of light blue-grey chert 2 to 4 inches thick	1.3	

Unit	Thickness (feet) Unit	From base
Dolomite, biogenic, slightly calcareous, slightly quartzose, yellowish grey, very fine grained, with thin lacy bands of dark and light grey chert 2 to 4 inches thick, sparse silicified crinoid columnals, occasional angular quartz fragments up to $\frac{1}{2}$ mm, porous weathering	2.1	
Mudstone, silty, non-calcareous, banded blue-green to grey-green, maroon and brown, with lower foot of arenaceous, non-calcareous, greenish brown, soft platy shale	7.5	
Sandstone, non-calcareous, quartzose, light bluish grey, fine-grained, massive but shaly in part, weathers reddish brown, quartz and minor chert grains, subangular to subrounded up to 0.2 mm with some etching of rims	3.9	
Dolomite, strongly quartzose, very light grey, in wavy beds 6 to 12 inches thick, fine-grained, with abundant subangular quartz grains up to 0.2 mm; thin partings of green shale less than 1 inch thick towards base; sandstone is brown weathering	6.9	
Dolomite, strongly quartzose, yellowish grey, massive, lustre mottled, blocky weathering, weathers brown; subangular to subrounded quartz grains up to 0.3 mm, many with strongly etched rims; base not exposed	10.8	

APPENDIX B

Fossil Determinations

GSC loc. 26664 long. 114°29′ lat. 50°08′
Savanna Creek, Livingstone River map-area, Alberta; unit 12, Misty Formation, section 13.
Euphemites carbonarius var. *arenarius* Shimer (P. Harker)

GSC loc. 28869≡39325 long. 114°43′ lat. 50°04′
Beehive Mountain map-area, Alberta and British Columbia; north side Beehive pass; unit 14, Todhunter Member, Etherington Formation, section 9.
Composita sp.; *Spirifer* sp.
large coarse spirifer, possibly *S. increbescens* Hall (P. Harker)

GSC loc. 28870≡39328 long. 114°43′ lat. 50°04′
Beehive Mountain map-area, Alberta and British Columbia; north side Beehive pass; unit 3, Misty Formation, section 9.
Dictyoclostus cf. *D. portlockianus* Norwood and Pratten
Probably Pennsylvanian age (P. Harker)

GSC loc. 28874 long. 114°43′ lat. 50°03′
Beehive Mountain map-area, Alberta and British Columbia; south side Beehive pass, 60 feet above base of Rocky Mountain Group.
Orbiculoidea arenaria Shimer (P. Harker)

GSC loc. 39315 long. 114°57′ lat. 49°18′
Southeast flank Mount Broadwood, British Columbia.
Euphemites sp.; *Dictyoclostus* cf. *D. portlockianus* Norwood and Pratten; *Orthotetes* sp.; "*Meekella*" sp.; fauna probably Pennsylvanian age (P. Harker)

GSC loc. 39316 long. 114°57′ lat. 49°18′
Southeast flank Mount Broadwood, British Columbia; 84 to 93 feet below top of Etherington Formation.
Spirifer leidyi Norwood and Pratten (P. Harker)

GSC loc. 39317 long. 114°57′ lat. 49°18′
Southeast flank Mount Broadwood, British Columbia; 170 to 185 feet below top of Etherington Formation.
Spirifer sp.; fenestrate and tubular bryozoa (P. Harker)

GSC loc. 39319 long. 115°06′ lat. 50°41′
Headwaters of Storm Creek, Alberta, south wall of cirque; Etherington Formation, 165 to 175 feet below base of Todhunter Member, section 8.
Linoproductus cf. *L. ovatus* Hall, small form; *Echinoconchus* sp.; *Archimedes* sp. ?; bryozoa (P. Harker)

GSC loc. 39320 long. 115°08′ lat. 50°43′
King Creek, Alberta; topmost unit of Etherington Formation, section 7.
Solitary corals, caninoid type (E. W. Bamber)

GSC loc. 39321 long. 115°06′ lat. 50°41′
Headwaters of Storm Creek, Alberta, south wall of cirque; unit 7, Todhunter Member, Etherington Formation, section 8.
Fenestrate bryozoa indet. (P. Harker)

GSC 39323 long. 115°06′ lat. 50°41′
Headwaters Storm Creek, Alberta, south wall of cirque; unit 5, Misty Formation, section 8.
Spirifer matheri Dunbar and Condra; *Composita* sp.; bryozoa indet. (E. W. Bamber)

GSC loc. 39324≡28869 long. 114°43′ lat. 50°04′
Beehive Mountain map-area, Alberta and British Columbia; north side Beehive pass; unit 14, Todhunter Member, Etherington Formation, section 9.
Spirifer increbescens Hall; *Spirifer* sp.
Mississippian, Chesterian age (P. Harker)

GSC loc. 39326 long. 114°43′ lat. 50°04′
Beehive Mountain map-area, Alberta and British Columbia; north side Beehive pass; unit 8, Todhunter Member, Etherington Formation, section 9.
Spirifer increbescens Hall; coarse coral fragments indet., possibly *Caninia* sp. (P. Harker)

GSC loc. 39330 long. 115°06′ lat. 50°41′
Headwaters of Storm Creek, Alberta, south wall of cirque; Etherington Formation, 125 feet below base of Todhunter Member, section 8.
Spirifer leidyi Norwood and Pratten; well-preserved fenestrate and tubular bryozoa (P. Harker)

GSC loc. 39331 long. 115°33′ lat. 51°10′
South end of Tunnel Mountain near Banff, Alberta; 60 feet below top of Etherington Formation, section 1.
Spirifer leidyi Norwood and Pratten; *Composita* sp.; *Eumetria* sp. (small species); fragments of coarse spirifer, possibly *S. increbescens* Hall; small productid indet. (P. Harker)

GSC loc. 39333 long. 114°43′ lat. 50°04′
Beehive Mountain map-area, Alberta and British Columbia; north side Beehive pass; unit 12, Todhunter Member, Etherington Formation, section 9.
Spirifer sp.; *Composita* sp.; fenestrate bryozoa, *Archimedes* sp.
Mississippian, probably Chesterian age (P. Harker)

GSC loc. 39333 long. 114°43′ lat. 50°04′
Beehive Mountain map-area, Alberta and British Columbia; north side Beehive pass; unit 13 Todhunter Member, Etherington Formation, section 9.
Spirifer sp.; *Composita* sp. (P. Harker)

GSC loc. 39334 long. 115°33′ lat. 51°10′
South end of Tunnel Mountain near Banff, Alberta; unit 32, section 1.
Small cylindrical bryozoa (P. Harker)

GSC loc. 39337 long. 115°44′ lat. 51°33′
Southwest face of Bare Range, Alberta; Misty Formation, unit 14, section 5.
Silicified belerophontid gastropods (E. W. Bamber)

GSC loc. 47789 long. 115°03′ lat. 49°33′
East face of Mount Procter, British Columbia; Ishbel Formation, unit 6, section 4.
Crurithyris sp. ?; *Crurithyris* ranges from Devonian to Permian (E. W. Bamber)

GSC loc. 47790 long. 114°41′ lat. 49°36′
Northwest-trending ridge from Mount Ptolemy, British Columbia; Kananaskis Formation, 125 feet below top.
Rhynchopora sp.?; *Dielasma* sp.; *Orbiculoidea* sp.
Dielasma and *Rhynchopora* range from Mississippian to Permian (E. W. Bamber)

GSC loc. 47791 long. 115°03′ lat. 49°33′
East face of Mount Procter, British Columbia; topmost bed of Etherington Formation, section 4.
Spirifer curvilateralis Easten; *Composita* sp. cf. C. *subquadrata* (Hall)
This fauna is probably late Chesterian, but may be early Pennsylvanian (E. W. Bamber)

GSC loc. 47792 long. 114°41′ lat. 49°36′
Northwest-trending ridge from Mount Ptolemy, British Columbia; base of Kananaskis Formation.
Plagioglypta sp.; unidentified pelecypod remains
Plagioglypta ranges from Devonian to Cretaceous, but is commonly found in the Kananaskis Formation of the southern Canadian Rockies (E. W. Bamber)

GSC loc. 47794 long. 115°03′ lat. 49°33′
East face of Mount Procter, British Columbia; throughout 39-foot bed, unit 4 of Misty Formation, section 4.
Composita subtilita Hall?
These appear to be juvenile forms and cannot be definitely identified. Mississippian or early Pennsylvanian (E. W. Bamber)

GSC loc. 47795 long. 115°03′ lat. 49°33′

East face of Mount Procter, British Columbia; unit 4, Misty Formation, 39 to 52 feet above base of formation, section 4.

Orbiculoidea sp.; not diagnostic of age (E. W. Bamber)

GSC loc. 47796 long. 115°03′ lat. 49°33′

East face of Mount Procter, British Columbia; throughout lowest 40 feet of unit 5, the Kananaskis Formation, section 4.

Hustedia sp.; *Punctospirifer* sp. cf. *P. cristata* Schlotheim; *Waagenoconcha* sp.; undetermined chonetid brachiopod. The presence of *Waagenoconcha* indicates that this collection is Middle to Upper Pennsylvanian or Permian. *Hustedia* ranges through the Pennsylvanian and Permian, and *Punctospirifer* from Mississippian to Permian (E. W. Bamber)

GSC loc. 47797 long. 114°30′ lat. 50°15′

East face of Plateau Mountain, Beehive Mountain map-area, Alberta and British Columbia; unit 9, Kananaskis Formation(?), section 12.

Scaphopods indet. (E. W. Bamber)

GSC loc. 47798 long. 114°48′ lat. 50°32′

Headwaters of Picklejar Creek, Highwood Range, Alberta; unit 24, Misty Formation, section 10.

Brachythyris sp.?; *Spirifer* sp.; specimens are poorly preserved and their age is unknown (E. W. Bamber)

GSC loc. 47799 long. 114°48′ lat. 50°32′

Headwaters of Picklejar Creek, Highwood Range, Alberta; upper surface of unit 17, Misty Formation, section 10.

? *Spirifer occiduus* Sadlick

Spirifer occiduus is of Early or Middle Pennsylvanian age, and in the southern Canadian Rockies it has been found low in the Rocky Mountain Group. (E. W. Bamber)

GSC loc. 47800 long. 114°43′ lat. 50°03′

Beehive Mountain map-area, Alberta and British Columbia; south side of Beehive pass, 5 to 8 feet above base of Kananaskis Formation.

Plagioglypta sp.; *Bellerophon* sp.?; these two genera are long ranging but are commonly found associated in the Kananaskis Formation of the southern Canadian Rockies (E. W. Bamber)

GSC loc. 48911 long. 114°48′ lat. 50°32′

Headwaters of Picklejar Creek, Highwood Range, Alberta; unit 22, Misty Formation, section 10.

Spirifer sp.; poorly preserved, age unknown (E. W. Bamber)

GSC loc. 48912 long. 114°48′ lat. 50°32′

Headwaters of Picklejar Creek, Highwood Range, Alberta; unit 21, Misty Formation, section 10.

Spirifer sp.; poorly preserved, age unknown (E. W. Bamber)

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