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W.H. FRITZ



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**Critical reader**

*S.L. Blusson*

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# FIFTEEN STRATIGRAPHIC SECTIONS FROM THE LOWER CAMBRIAN OF THE MACKENZIE MOUNTAINS, NORTHWESTERN CANADA


## *Abstract*

*This is the second of three closely related papers describing Lower Cambrian strata in the Mackenzie Mountains. Most of the strata are located in the middle carbonate belt, a belt flanked on the northeast by an inner detrital belt and on the southwest by an outer detrital belt. Two grand cycles (clastic-carbonate pairs) recognized earlier in the strata are divided into half-cycles and traced laterally into the present sections. Data from these sections, plus that from 10 previously described sections, are combined and interpreted in a facies distribution fence diagram.*

*Widespread quartzite and siltstone of the first (lowest clastic) half-cycle have been locally removed by erosion at the northwestern edge of the area, and an inter half-cycle unconformity may be present in the northeastern part of the area. Carbonates of the second half-cycle thicken and become lighter in colour as the seaward edge of the carbonate body is approached, indicating the existence of a platform at that time. Above the carbonate platform is a thin, highly coloured sheet of clastics belonging to the third half-cycle. This sheet can be traced over the platform edge where the clastics abruptly thicken, take on a sombre hue, and exhibit penecontemporaneous folds. This part of the third half-cycle is assigned to the slope. The fourth half-cycle is composed of wavy limestone and a subordinate amount of siltstone that represent shelf deposits. An earlier attempt to subdivide these strata by recognizing siltstone-limestone pairs (subcycles) is persued, and the oldest limestone and siltstone units can now be correlated with reasonable assurance, but the correlation of younger beds in the half-cycle remains tentative.*

*The fourth half-cycle closed with the deposition of dark shale and platy limestone over the shelf deposits during middle and late* **Bonnia-Olenellus** *Zone time. Deposition of these strata continued at an uneven rate throughout the rest of the Cambrian (Middle and Upper) and later. A sub-Upper Cambrian unconformity is present in the northwestern part of the area, and a sub-Ordovician unconformity at the nearby edge of the area cuts down as far as the first half-cycle.*

*This paper describes 333 lithologic units, 304 fossil localities, and locates 1571 geochemical samples that will be studied by others.*



## *Résumé*

*Ceci est la deuxième de trois communications décrivant les couches du Cambrien inférieur des Monts Mackenzie. La plupart des couches sont situées dans la zone médiane de roches carbonatées, laquelle est flanquée au nord-est par une zone interne de roches détritiques et au sud-est par une zone externe de roches détritiques. On avait déjà reconnu, dans ces couches, l'existence de deux grands cycles (roches clastiques-roches carbonatées); chaque cycle est lui-même divisé en demi-cycles et les coupes décrites ici retracent les passages latéraux de faciès résultant de ces alternances. La synthèse et l'interprétation des données de ces coupes et des 10 coupes stratigraphiques décrites dans une communication antérieure ont permis de construire un diagramme en coupes sériées représentant la répartition des faciès.*

*Le quartzite et l'aleurolite, largement répandus à l'origine, du premier demi-cycle (clastique inférieur) ont été enlevés par l'érosion le long de la bordure nord-ouest de la région étudiée; il est possible également qu'il y ait une discordance entre deux demi-cycles dans la partie nord-est de la région. Les roches carbonatées du deuxième demi-cycle deviennent plus épaisses et plus claires à mesure qu'on s'approche du bord de la masse de roches carbonatées situé du côté de l'intérieur du bassin; ceci indique qu'il y avait, au moment de leur formation, une plate-forme. Au-dessus de la plate-forme de roches carbonatées, on trouve une mince couverture, très colorée, de dépôts clastiques appartenant au troisième demi-cycle. On peut suivre cette couverture jusqu'au-delà du bord de la plate-forme; les sédiments clastiques deviennent alors brusquement plus épais, ils prennent une coloration sombre et forment des plis quasi contemporains de leur dépôt. On attribue cette partie du troisième demi-cycle au talus continental. Le quatrième demi-cycle est constitué d'une couche calcaire ondulée et d'aleurolite en quantité moindre, qui correspondent à des dépôts de plateau continental. On avait déjà essayé de subdiviser ces couches en y reconnaissant des couples aleurolite-calcaire (sous-cycles); cette tentative a été poursuivie et l'on peut maintenant faire la corrélation entre les unités lithologiques, de calcaire et d'aleurolite, les plus anciennes en étant raisonnablement sûr de ne pas se tromper. Mais, en ce qui concerne les couches plus récentes de ce demi-cycle, la corrélation est sujette à révision.*

*Le quatrième demi-cycle s'est terminé par le dépôt, sur les sédiments du plateau continental, d'un schiste foncé et d'un calcaire se débitant en plaquettes; ce dépôt s'est effectué au milieu et à la fin de la période de dépôt de la Zone à* **Bonnia-Olenellus**. *Ces couches ont continué de se déposer, à un rythme irrégulier, pendant tout le reste du Cambrien (moyen et supérieur) et plus tard. Dans la partie nord-ouest de la région étudiée il y a une discordance sous le Cambrien supérieur; non loin de là, au bord de la région étudiée, une discordance sous l'Ordovicien ampute la série stratigraphique jusqu'au premier demi-cycle.*

*Dans cette communication, on donne la description de 333 unités lithologiques et de 304 sites fossilifères; on y donne également les emplacements de 1571 prises d'échantillons géochimiques, échantillons qui seront étudiés par d'autres spécialistes.*

# FIFTEEN STRATIGRAPHIC SECTIONS FROM THE LOWER CAMBRIAN OF THE MACKENZIE MOUNTAINS, NORTHWESTERN CANADA

## INTRODUCTION

This is the second of three papers designed to present a number of lower Cambrian reference sections from the Mackenzie Mountains. Data in the three papers are intended for immediate use by companies currently searching for stratiform lead-zinc deposits in the area. The information will eventually be used by the writer in the construction of a Lower Cambrian depositional model and to document paleontological studies.

Figures 1 to 3 contain 15 stratigraphic sections that summarize the present stratigraphy and correlations. Lithologic units and fossil localities have been given numbers on the sections that correspond with those accompanying written descriptions of the units and localities in the appendix. In all, 333 stratigraphic units and 304 fossil localities are described.

Figure 4 is a fence diagram that emphasizes facies distribution, and was made by reducing and replotting data pertaining to grand cycles and depositional belts that are shown on Figures 1 to 3. Data from 10 previously described sections (Fritz, 1976b) have also been integrated with the present information, so that Figure 4 summarizes facies information from all of the 25 stratigraphic sections studied thus far. Definitions of depositional belts and grand cycles and an explanation of the use of these concepts in the Mackenzie Mountains have been given earlier (Fritz, 1975, p. 533-538; 1976a, p. 8-11; 1976b, p. 1, 2).

Geochemical samples were collected at 20-foot intervals from 10 of the present sections. The collecting horizon of each outcrop sampled is marked by a short horizontal line (–) located next to the appropriate section. A similar line crossed by a vertical line (+) indicates a float sample. A second sample was collected along with the first at numerous 100-foot intervals. The second sample was taken approximately 20 feet along strike from the first and is plotted next to the first at the same horizon on the section. The 1571 samples plotted on the sections, plus 79 samples plotted on sections not shown, were delivered to I.R. Jonasson of the Geological Survey of Canada in September, 1975 for study.

## PREVIOUS WORK AND ACKNOWLEDGMENTS

Previous work on the Lower Cambrian in the Mackenzie Mountains has been cited in the first paper of this series (Fritz, 1976b, p. 1). Since then F.F. Krause and A.E. Oldershaw have published two abstracts on the subject (1976, 1977).

Field data on the sections were collected in 1974 (section 23) and 1975 (remaining sections). Section 14 is reconstructed from information supplied by K.B. McHale, who kindly hosted the writer in his camp in 1975 and gave directions that permitted a traverse over the best outcrops. Other geologists who provided guidance and assistance in the field are A. Kulan, P. Tegart, R. Darney, and A.G. Harman. Work in 1975 was greatly facilitated by D.J. Tempelman-Kluit, who provided twice-daily radio contact and organized aircraft for weekly camp moves. Assistance in measuring sections in 1975 was given by J. Harper, who was particularly helpful in gathering geochemical samples. Assistance in drafting Figures 1 to 4 was rendered by J. Gagnon, J. Harper, and L.M. Spence.

## GRAND CYCLES

### *Grand cycle A, lower half-cycle (A1)*

An earlier precedent (Fritz, 1976a, p. 11) is followed here in assigning Blusson's (1971) map-units 12, 13, and the lower part of the Sekwi Formation to this half-cycle. The dark siltstone and very fine grained sandstone of map-unit 13 was measured at all sections where exposures are present. The light coloured quartzite of map-unit 12 was not measured in full because at most sections it is either not exposed or it was found to be extensively faulted. For this reason the choice of the base of map-unit 12 as the base of grand cycle A is somewhat arbitrary and may be subject to change by future workers.

At least part of map-unit 12 and all of map-unit 13 underlies the Sekwi Formation at sections 11, 13, 21-24, and map-unit 13 underlies the Sekwi at sections 15 and 20. Correlation from nearby section 7 (Fritz, 1976b) indicates that at section 25 the Sekwi should be immediately underlain in the subsurface by the equivalent of map-unit 13 (upper part of Blusson's map-unit 10, 1971, p. 9). At section 12 the Sekwi is probably underlain by map-units 12 and 13, although the true stratigraphic relationship is obscured by a fault (covered) that may juxtapose map-unit 12 against lower Sekwi strata. Since thick bedded dolomite assigned to the Sekwi Formation at section 14 is reported (oral communication, K.B. McHale) to rest on thin bedded dolomite with collapse structures, the writer has speculated (Fig. 1) that at least map-units 12 and 13 have been removed by erosion and that the Sekwi was deposited on older strata. No strata older than the Sekwi Formation outcrop in the immediate vicinity of section 19.

In sections 16-18 (Fig. 2) an unconformity has been questionably placed between the Sekwi Formation and an underlying unnamed quartzite. Since the unnamed quartzite is thought to represent the lateral equivalent of map-unit 12, and perhaps part of map-unit 13, pre-Sekwi erosion is not believed to have cut deeply into the local section. However, examination of the pre-Sekwi quartzite suggests that deeper erosion might be found to the north and northeast. This is suggested by the quartzite's immature, poorly sorted, medium and coarse grains and by cross-beds that are over-steepened (Pl. 2, Figs. 3, 4) in the south and southwest direction of paleocurrent flow. A lack of reverse cross-bedding and burrowing suggests a fluvial rather than marine environment. The nearby paleorelief indicated by the quartzite is thought to have been lowered by erosion before Sekwi deposition, as deposition of the basal Sekwi beds was nearly synchronous over the whole study area, the beds are of similar lithology, and they are almost totally lacking in medium and coarse grained clastics.

At least some thickness of the lower Sekwi Formation has been assigned to the upper part of this half-cycle in sections 11-13 and 15-25. The Sekwi part of the half-cycle consists mainly of limy siltstone that often contains scattered limestone nodules (Pl. 4, fig. 2). The top of the half-cycle is located at the approximate horizon where limestone (above) predominates over siltstone (below). This criterion is not followed at section 11 where 218 feet of limestone (units 1, 2) is considered to represent a tongue extending into the limy siltstone. Here the top of the half-cycle is placed above the overlying siltstone. The top of the half-cycle was traced northeastward (Fig. 2) from the middle carbonate belt in sections 18-20 into the inner detrital belt in sections 16 and 17, but this same boundary could not be traced from the middle carbonate belt southwestward (Fig. 3) into folded slope siltstone and penecontemporaneously brecciated slope limestone of the outer detrital belt in sections 24 and 25.

It has been mentioned earlier that the Sekwi Formation at section 14 is thought to be underlain by an unconformity. Here carbonate assigned to the overlying half-cycle (A2) is considered to rest directly on strata older than those assigned to map-units 12 and 13. The lack of limy siltstone in the basal part of the Sekwi is attributed to nondeposition above a local high or removal during a brief uplift.

At section 15 approximately 100 feet of limy siltstone at the base of the Sekwi Formation has been assigned to the half-cycle. The remainder of the half-cycle (A1), the next two half-cycles (A2, B1), and part of the following half-cycle (B2) have their equivalents in the overlying soft shale and interbedded limestone breccia beds (unit 2) and in the platy limestone beds (units 3-5), all of which have been assigned to the outer detrital belt. No criterion could be found to locate half-cycle boundaries within outer detrital belt strata in section 15.

***Grand cycle A, upper half-cycle (A2)***

Carbonates deposited mainly in the middle carbonate belt and belonging to the **Nevadella** Zone constitute this half-cycle. In a typical section the basal limestone in the half-cycle is in thin wavy beds that weather medium to medium dark grey. This limestone grades upwards into thicker bedded, medium to light grey weathering limestone or into light orange weathering dolomite. "Floating" quartz sand is locally abundant in the dolomite.

At section 11 strata assigned to this and younger half-cycles have been eroded before the deposition of a thick bedded carbonate map-unit which Blusson (1974) assigned to the Ordovician-Devonian. It has been mentioned earlier that at section 15 this and some other half-cycles could not be identified in the outer detrital belt strata there. The half-cycle is only weakly developed at sections 16 and 17 where all three of the lower half-cycles (A1, A2, B1) are in the inner detrital belt. Here thick bedded intervals of limy, very fine grained sandstone serve to locate half-cycle A2.

Section 20 is one of the few sections within the middle carbonate belt where the clastics of the overlying half-cycle (B1) fail to clearly mark the top of half-cycle A2. At section 20 the writer expected to find the top boundary at the top of a thick bedded to massive limestone unit (Fig. 2, unit 9; Pl. 4, fig. 3). Overlying the unit, however, is a succession of medium and thick bedded limestone (Fig. 2, units 10, 11, lower half of 12) that is believed to represent a local carbonate buildup that has laterally displaced clastics of half-cycle B1. Two factors may have favoured the growth of a carbonate "buildup" in this position. The first is a sinking rate that was approximately twice that elsewhere over the carbonate platform during half-cycle B1 time. The second is a platform-edge position where deep channels may have allowed clastics to bypass the buildup at its margins while shallow waters over the buildup remained relatively clear for near-optimum limestone growth.

Sections 24 and 25 are also believed to have occupied positions close to the platform edge at the close of half-cycle A2 deposition. Here, at section 24, upper segment, unit 9, a thick bedded to massive limestone succession is present (Pl. 7, fig. 3; Fritz, 1976a, Pl. 1, fig. 3) in the uppermost part of the half-cycle that is almost identical to the massive limestone (unit 9) of the same age at section 20. During this time optimum limestone growth is believed to have taken place along a narrow northwest trending band that included the upper segment of section 24. One and one half miles landward (northeast) of this band (section 24, lower segment, unit 8) fine grained limestone was being deposited in medium beds that display cross-bedding and cut and fill structures. Five and one half miles seaward (southwest) of the massive limestone, at unit 2 in section 25, is an outcrop of coeval strata consisting of dark, platy limestone (Pl. 7, fig. 5; Fritz, 1976a, Pl. 2, fig. 4) believed to have been deposited under deep slope or basin conditions. If the above correlations are correct, then the band of optimum limestone deposition (unit 9) has a width of far less than five and one half miles, and the outer edge of the platform lies between the upper segment of section 24 and the lower segment of section 25.

***Grand cycle B, lower half-cycle (B1)***

Strata assigned to this half-cycle are composed of light brown quartzite, of brown, maroon, light green shale and siltstone, and of orange weathering, finely laminated dolomite. Interbeds of trilobite hash, abundant ripple marks and mudcracks, **Scolithos** in the quartzite, and the bright weathering colours suggest that the unit was deposited under shallow waters that were at least partly marine. It is believed that this half-cycle represents a clastic sheet that migrated rapidly across the carbonate platform and also formed a thick, unstable slope against the platform's outer margin (Fritz, 1976a, p. 19; 1976b, p. 2).

The boundary between the **Nevadella** Zone and the **Bonnia-Olenellus** Zone can definitely be located within the half-cycle in sections 2, 3, and 8 (Fritz, 1976b, p. 2) and in sections 13 and 23 (Figs. 1, 3). Fossil collections in other sections are not spaced closely enough to locate the boundary within the half-cycle. However, the ages of these other collections are consistent with the concept that the boundary lies within the half-cycle, as no **Nevadella** Zone fossils have been collected above it and no **Bonnia-Olenellus** Zone fossils have been found below.

Sections 13-15 are located near the platform-slope boundary where the lithology of the half-cycle changes rapidly from that described above to the more uniform shales and dark limestones of the outer detrital belt. Section 13 (Fig. 1, units 7-10) is believed to have been deposited over the platform as it contains mudcracks and strata that are maroon, purple and light green in colour. Even the coarser sand fraction (Pl. 1, figs. 3, 4) is concentrated at one position within the half-cycle as it is in other sections deposited over the platform. Here, as in the other sections mentioned, deposition is believed to have kept pace with subsidence, and only the greater thickness (twice normal) suggests that the platform edge is nearby.

At section 14 the half-cycle has passed from a platform facies into a thick slope facies of uniform silty shale that contains an irregular sub-unit of penecontemporaneous limestone breccia (Pl. 1, figs. 5, 6). The base of the half-cycle (base of unit 3) is at the shale contact with the underlying thick dolomite succession assigned to half-cycle A2. No correlations within half-cycle B1 are attempted as the shale contains neither highly coloured beds nor the quartzite sub-unit. A sub-Ordovician unconformity truncates the shale succession (Blusson, 1974) precluding an inspection of a "normal" upper boundary of half-cycle B1. The coarser shale (silty shale) at section 14 as contrasted to that in section 15 suggests that section 14 occupied a higher position on the slope during half-cycle B1 time.

Sections 19 and 20 are also believed to have been deposited high on the slope during half-cycle B1 time. It was mentioned earlier that at section 20, units 10, 11, and the lower part of 12 are thought to represent a local carbonate buildup. Equivalent strata at nearby section 19 are composed of shale that closely resembles that at section 14. Here sparse interbeds of limestone are present, and at one level the interbeds contain small archaeocyathid-bearing mounds. No penecontemporaneous limestone breccia was seen.

Sections 24 and 25 help to define the platform-slope boundary in a third area. During the first third of half-cycle B1 section 24 was located on the outer edge of the platform. At the lower segment of section 24 (unit 9), fine grained limestone in thin, brightly coloured beds was being deposited landward of a carbonate bank (upper segment, unit 9) that was formed earlier during half-cycle A2 time. During the middle third of half-cycle B1 a sudden influx of sand covered the carbonates at both segments, and the sand in turn was succeeded by silt deposited during the closing third of the half-cycle.

Five and one half miles to the southwest, at units 3-7 in section 25 (and at units 6-11 in nearby section 7), all of the half-cycle was deposited on the slope. Penecontemporaneously folded siltstone and some sandstone interbeds (Pl. 7, fig. 6) are the predominant lithologies. Some medium (section 25, unit 3) and large (section 7, units 7, 9) archaeocyathid-bearing limestone mounds are present.

***Grand cycle B, upper half-cycle (B2)***

The base of this half-cycle is marked by relatively clean limestone (B2a) that forms cliffs above the recessive clastics of half-cycle B1. Although the limestone is commonly thin bedded, at numerous outcrops these beds pass laterally into limestone mounds. The greatest abundance of archaeocyathids within the Sekwi Formation is in and around these mounds.

The top of the half-cycle and of the Sekwi Formation is placed at the top of the highest middle carbonate bed (Fritz, 1976b, p. 2). In most sections this is the top of a wavy, thin bedded limestone succession, but in sections 4, 7, 16, 17, 24, and 25 a thick dolomite succession extends to, or nearly to the top of the half-cycle. At a typical section the half-cycle is overlain by a recessive dark siltstone and shale unit that contains limestone in dark platy interbeds. An unconformity indicating erosion into the half-cycle at sections 4, 12 and possibly 16, precludes inspection of a "normal" upper contact at these sites.

In the previous paper (1976b, Figs. 1 to 3) intervals containing carbonates and clastics in half-cycle B2 were tentatively correlated between sections in an attempt to subdivide the half-cycle into clastic-carbonate pairs or subcycles. A similar and likewise tentative attempt is made in Figures 1 to 4 of the present paper. It can now be speculated that secondary half-cycles B2a and B2b of this and the previous paper are indeed a single, continuous unit because of supporting correlations using the present sections. The lithology, thickness, and distance above the B1-B2a contact remain fairly uniform through the various sections located in the middle carbonate belt. The correlation of secondary half-cycles B2c-g remains highly speculative despite an attempt to extend these half-cycles into the present sections.

Lithologies other than siltstone and shale have thus far proved to be of little use for correlation within half-cycle B2. Sandstone is generally rare, and where a thick succession was noted in section 17 (Fig. 2, units 18, 19) it did not prove to be laterally extensive. Wavy, thin bedded limestone is too common and occurs at too many levels to be useful for correlation except when paired as sub-half-cycles with the more extensive siltstone and shale units. Dolomite, when present, predominates in some sections and is nearly absent in others. An example of major lateral change, and hence the limited use of dolomite for correlations, can be seen in a comparison of half-cycle B2 in sections 24 and 23 (Fig. 3). At section 24 the half-cycle is composed almost wholly of dolomite while at section 23 it is composed almost wholly of limestone. Only a limited amount of light coloured limestone in thick beds and mounds (Fig. 3, units 16, 18, 20; Pl. 6, figs. 5, 6) is present at section 23 to suggest that a barrier may have controlled the deposition of the thick succession of dolomite at nearby section 24.

## POST-SEKWI DARK SHALE AND PLATY LIMESTONE

The lower portion of this map-unit was measured in an attempt to position the Lower-Middle Cambrian boundary and to locate younger Cambrian faunas. The dark shale and thin bedded limestone are typically recessive (Pl. 6, figs. 1, 5), and outcrops are confined to rare, sharp ridges (Pl. 3, fig. 3; Pl. 5, fig. 4) or to narrow gullies. While fossils are locally abundant, they were found in a limited number of horizons, and therefore time-stratigraphic boundaries could be only roughly located. The horizon commonly used for the Lower-Middle Cambrian boundary is the base of the first thick succession of black, non-limy shale above the highest Lower Cambrian fossil locality. Except for sponge spicules, no fossils were found in the black shale. Most of the fossils from the first significant localities above the black shale belong to either the late Middle Cambrian or to the early Upper Cambrian.

The widespread distribution of this map-unit is attributed to a regional increase of water depth and a resulting change in carbonate deposition from nodular limestone and laminated dolomite (Sekwi Formation) to dark shale and platy limestone (this map-unit). The change in environment is believed to be from the platform or shelf to the slope and basin. This change took place during the last half of the **Bonnia-Olenellus** Zone time (Fritz, 1976b, p. 2).

At section 19 the basal contact of the map-unit differs from that described above in that it is closely underlain by 231 feet of light grey limestone in thick beds (Pl. 4, figs. 1, 4; Fig. 2, unit 25). Here the light coloured strata is thought to mark a local area in which limestone deposition briefly matched the rapid sinking rate.

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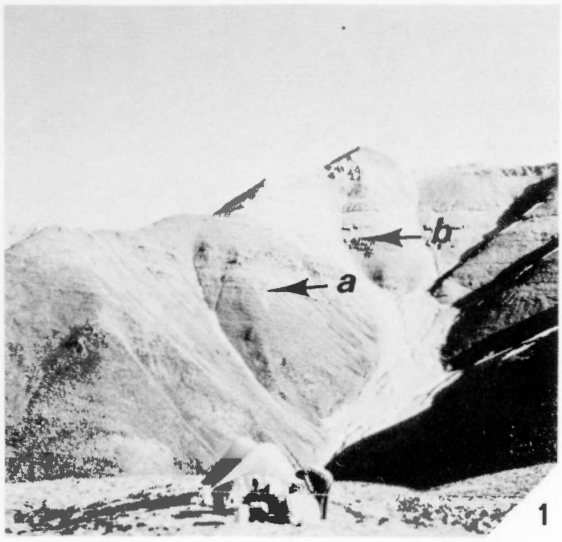
PLATES

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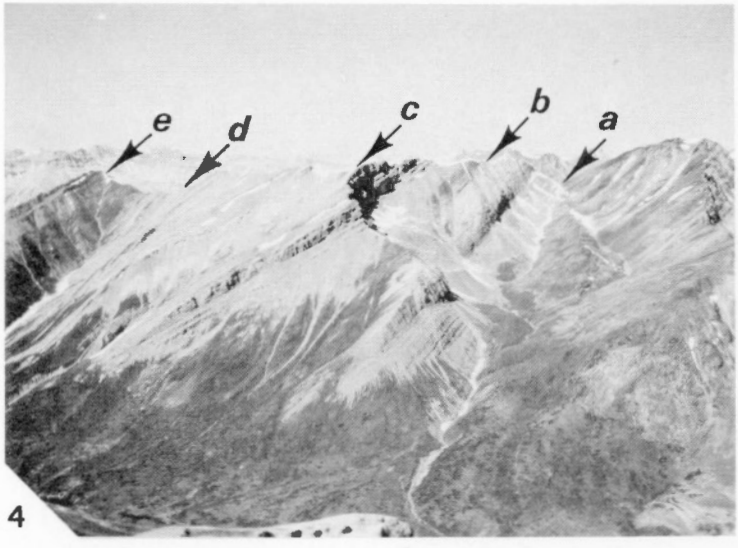


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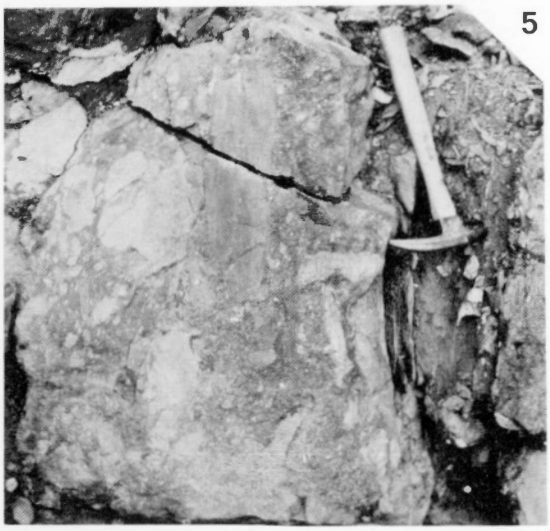

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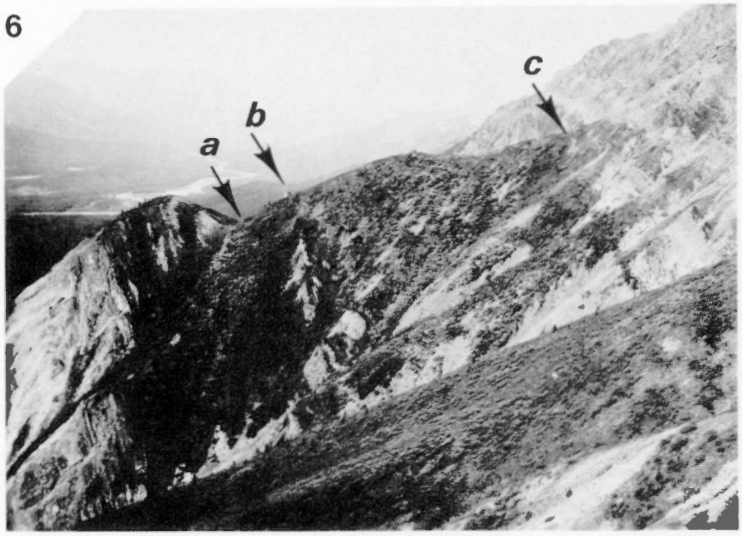


## PLATE 1

Figure 1. View looking north toward section 11. Base of Sekwi Formation is at "a" and top is at "b". GSC photo no. 202887-W.

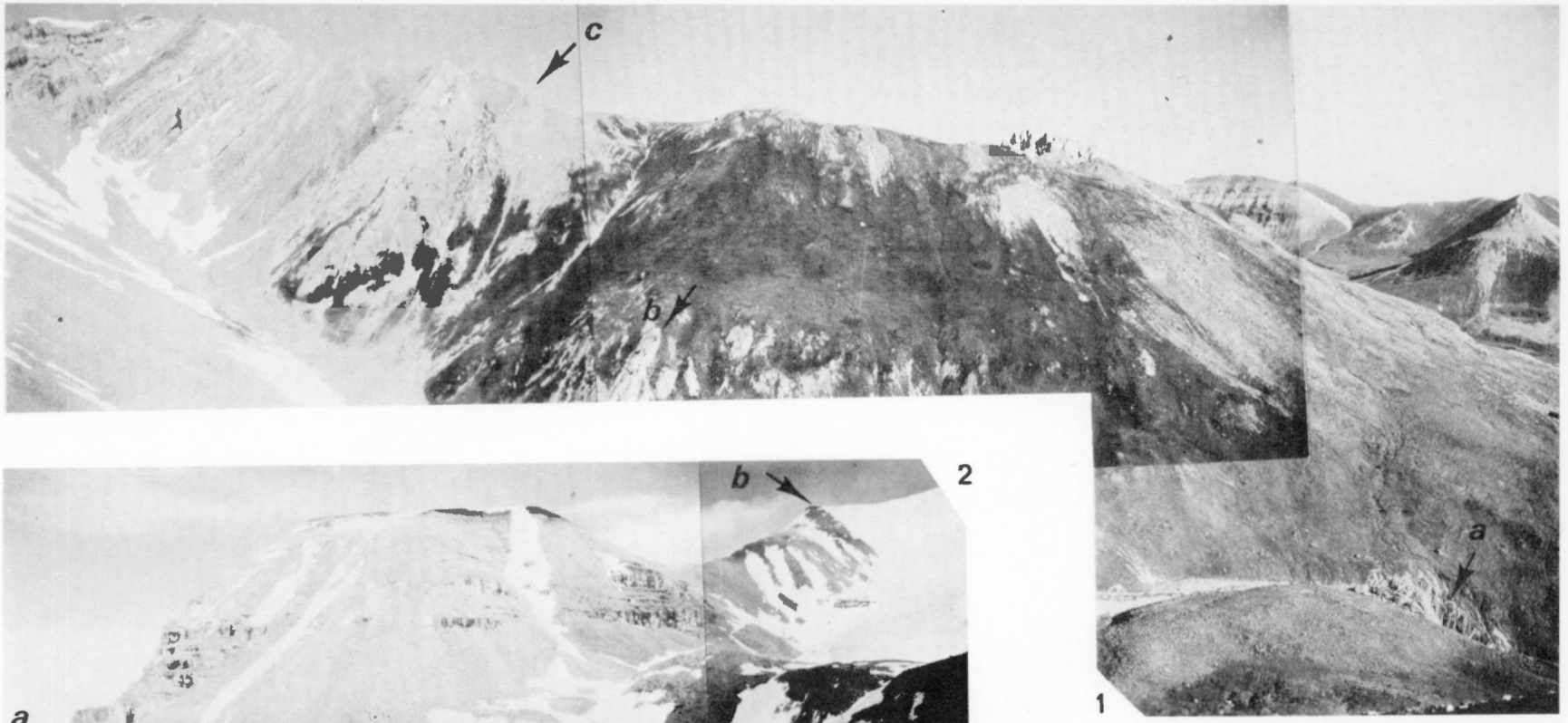
Figure 2. View looking north toward section 12. Approximate base (covered) of Sekwi Formation is at "a" and top is at "b". GSC photo no. 202887-Z.

Figure 3. View of Sekwi Formation looking south at section 13. Quartzite in foreground marks appropriate boundary between **Nevadella** Zone and **Bonnia-Olenellus** Zone, and is basal quartzite in unit 9. Contact between unit 10 and 11 (top of half-cycle B1) is located at "a". GSC photo no. 202887-M.

Figure 4. View looking northwest from section 13 to similar section on ridge across valley. Base of Sekwi Formation is at "a", quartzite equivalent to that shown in figure 3 is at "b", top of unit 14 is at "c", and top of Sekwi Formation is at "d". Unconformity between Lower and Upper Cambrian is at "e". GSC photo no. 202887-Q.

Figure 5. Penecontemporaneous limestone breccia in thick shale unit, section 14. Position of breccia interbed within Sekwi Formation is shown at "b" in Figure 6. GSC photo no. 202887-T.

Figure 6. View looking west at Sekwi Formation from section 14. Contact between thick lower dolomite and thick shale unit is at "a". Penecontemporaneous breccia bed within thick shale is at "b", and top of Sekwi Formation is at "c". GSC photo no. 202887-U.

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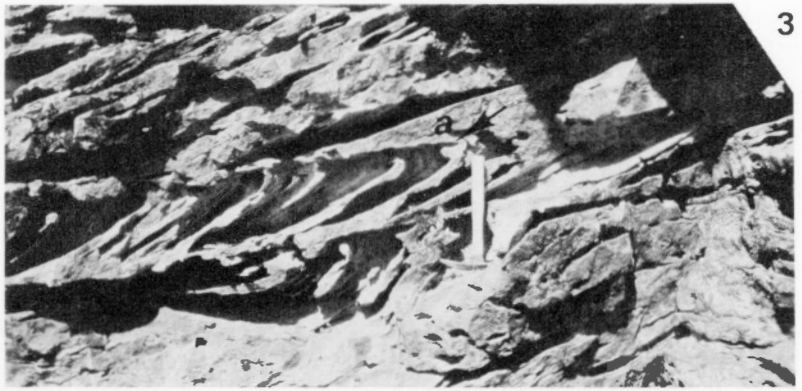


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## PLATE 2

Figure 1. View looking west at section 15. Base of Sekwi Formation is at "a", one of penecontemporaneous limestone breccia interbeds within shale unit 2 is at "b", and contact between units 2 and 3 is at "c". GSC photos no. 202887-L, 202887-M, and 202887-N overlapped.

Figure 2. View looking southeast at section 16. Base of Sekwi Formation is at "a". Point "b" marks top of section at horizon below uppermost (snow covered) Sekwi beds. GSC photos no. 202887-X and 203166-D overlapped.

Figures 3,4. Cross-bedded quartzite in unnamed quartzite unit 1, lower segment of section 16. Note abrupt steepening and overturning of laminae at top of cross-bed in figure 3 at "a" (520 feet above base of unit 1). Interpretation is that sand at top of bed has yielded toward current direction before consolidating. GSC photos no. 203166 (fig. 3) and 203166-G (fig. 4).

## PLATE 3

Figure 1. View looking north at lower segment of section 16. Base of section is at "a" and contact between unnamed quartzite and Sekwi Formation is at "b". GSC photo no. 202887-P.

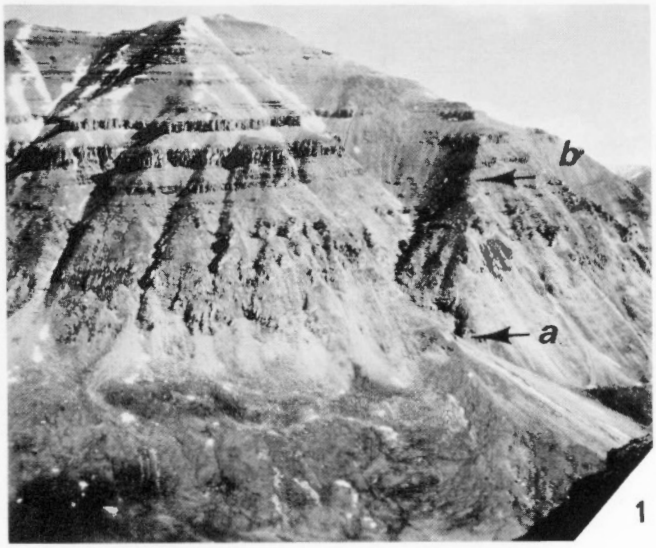
Figure 2. Flat-pebble conglomerate in upper beds of unit 17, section 17. GSC photo no. 203166-F.

Figure 3. View looking southwest at upper segment of section 17. Contact between Sekwi Formation and unnamed dark siltstone and limestone map-unit is at "a". Approximate position of Upper Cambrian fossil localities GSC loc. 92629 and 92630 is at "b". GSC photo no. 202887-S.

Figure 4. View looking southeast at middle segment of section 18. Base of segment is at "a" and top is behind ridge crest at "b". All of strata cropping out in distance belongs to Sekwi Formation. GSC photo no. 202997-K.

Figure 5. View looking southwest at upper segment of section 18. Contact between Sekwi Formation and unnamed dark siltstone and limestone map-unit is at "a". Approximate position of Lower Cambrian fossil localities GSC loc. 92855 and 92856 is at "b". GSC photo no. 203166-B.

Figure 6. View looking southeast at lower segment of section 19 (lower part of Sekwi Formation). Base of segment is at "a" and top is at "b". GSC photo no. 203166-C.



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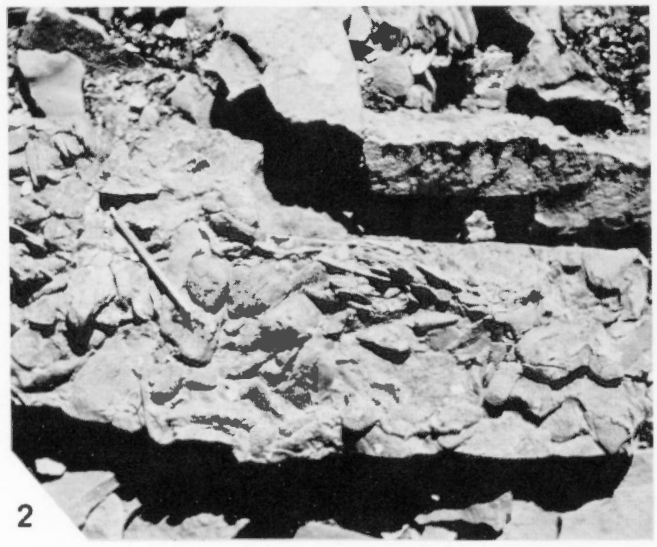
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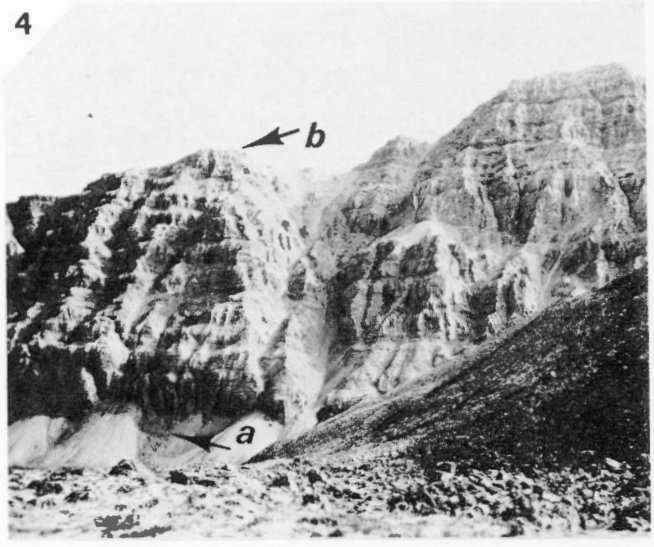

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## PLATE 4

Figure 1. View looking northwest at upper two segments of section 19. Base of medial segment is at "a", base of unit 12 is at "b", top of medial segment is at "c"; base of upper segment is at "d" (just below top of Sekwi Fm.) and upper Cambrian fossil locality GSC loc. 92881 is at "e". GSC photo no. 203166-H.

Figure 2. Outcrop and slabby talus showing typical lithology of light brown to orange-brown weathering limy siltstone in lower part of Sekwi Formation, section 19. GSC photo no. 202887-O.

Figure 3. Massive to thick bedded light grey weathering limestone in unit 9 of section 20. Assistant sitting at "a" gives scale. GSC photo 202997-V.

Figure 4. Massive to thick bedded, light grey weathering limestone (unit 25, upper right in photograph) in section 19 that is similar to, but younger than limestone (unit 9) in section 20 (fig. 3). Assistant in lower centre of photograph is standing near contact between units 23 and 24. Top of massive limestone in this figure is shown at "c" in figure 1. GSC photo no. 203166-A.

Figure 5. View looking north at medial segment of section 20. Base and top of unit 18 are shown at "a" and "b", respectively. GSC photo no. 203166-E.

Figure 6. View looking west at Sekwi Formation, medial segment of section 21. Base of medial segment and of unit 7 is at "a" and top of unit 13 is at "b". GSC photo no. 203166-O.

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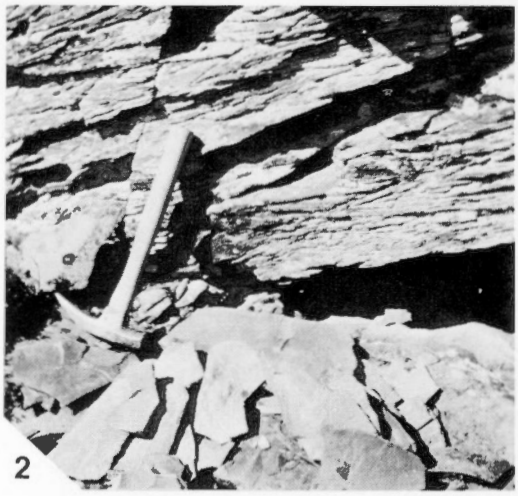
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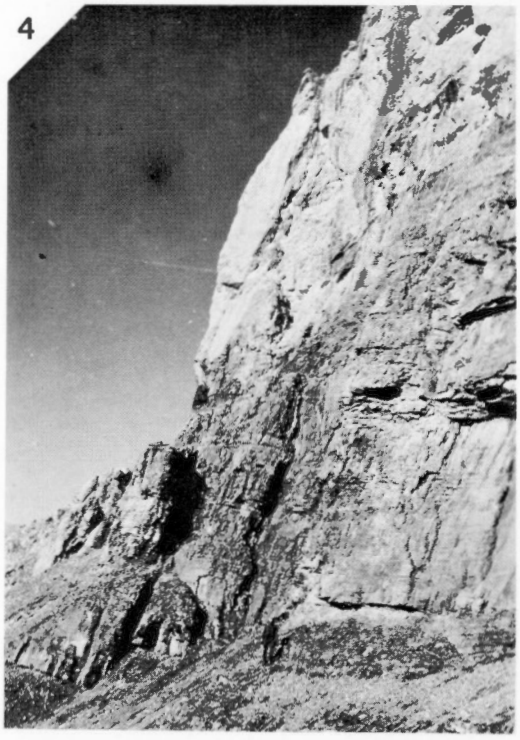
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## PLATE 5

Figure 1. View looking west at stacked limestone mounds (foreground) composing bioherm in Sekwi Formation, 52-102 foot interval in unit 3, lower segment of section 21. Similar bioherm at approximately same stratigraphic horizon is visible in background at "a". Base of medial segment of section 21 is visible on far skyline at "b". Crossfaults offset bioherm horizon in foreground same horizon at "a", second crossfault offsets strata at "a" from strata at "b". Assistant at "c" gives scale. GSC photo no. 203166-V.

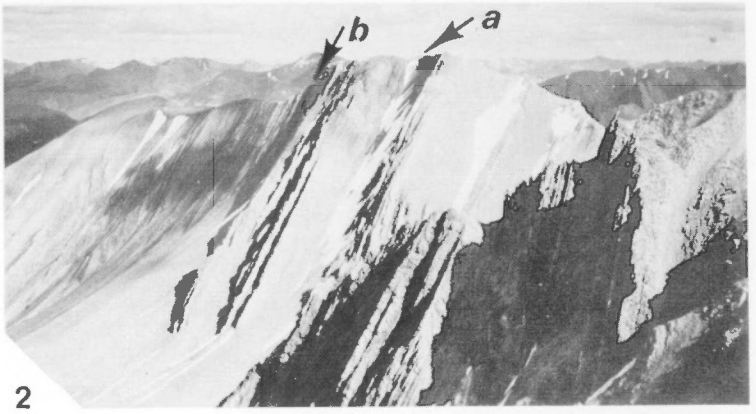
Figure 2. View looking east at upper segment of section 21. Base of segment is at "a" and top of Sekwi Formation is at "b". GSC photo no. 203166-J.

Figure 3. View looking northwest at lower segment of section 22. Base of map-unit 13 is at "a", base of Sekwi Formation is at "b", unit 13 of Sekwi Formation is at "c", and top of lower segment is at "d". GSC photo no. 203166-Q.

Figure 4. View looking northeast at upper segment of section 21. Top of Sekwi Formation is at "a". Approximate position of Upper Cambrian fossil localities GSC loc. 92759 and 92760 is at "b". GSC photo no. 203166-P.

Figure 5. View looking northeast at lower segment of section 22. Contact between map-unit 13 (foreground) and Sekwi Formation is at "a". Unit 13 of Sekwi Formation is at "b". GSC photo no. 203166-U.

Figure 6. Penecontemporaneous slump structure in limy siltstone in lower portion of Sekwi Formation, 106 feet above base of unit 7, section 22. GSC photo no. 202887-Y.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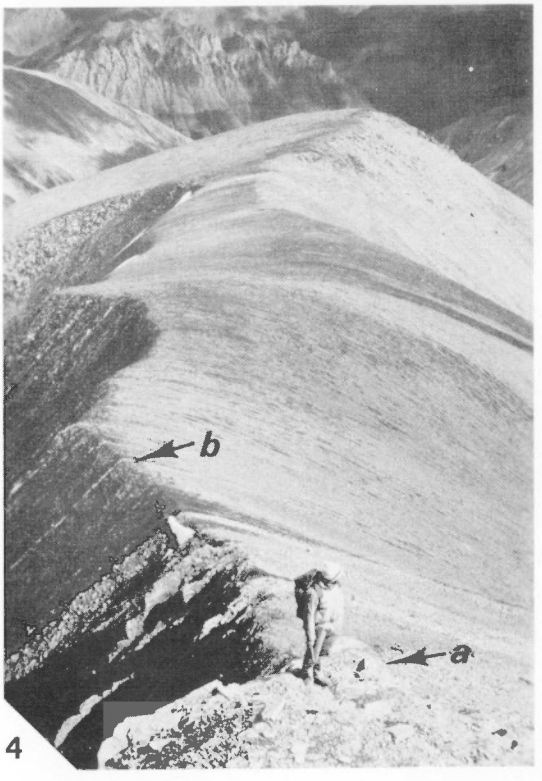


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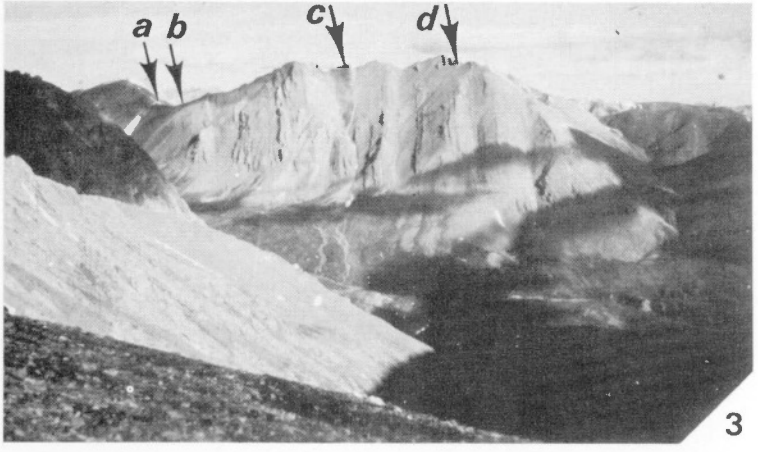


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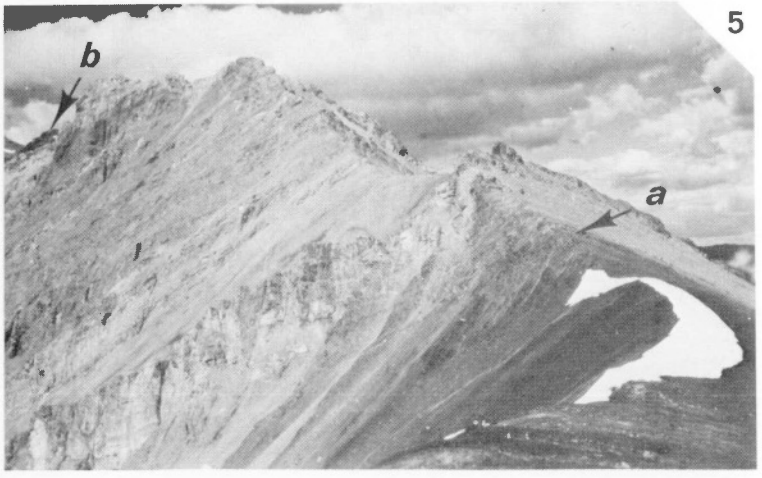


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## PLATE 6

Figure 1. View looking north at post-Sekwi dark shale and platy limestone map-unit, upper segment of section 22. Camera is near top of Sekwi Formation. Late Middle Cambrian fossil locality GSC loc. 91725 is at "a". GSC photo no. 203166-S.

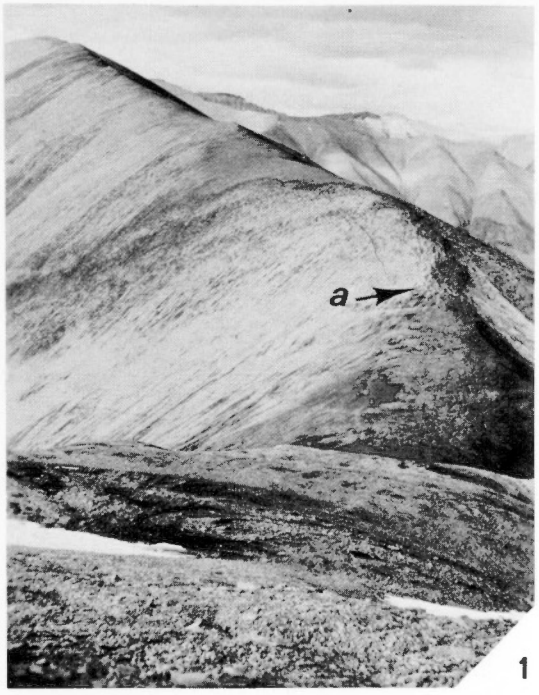
Figure 2. View looking north at Sekwi Formation, lower segment of section 23. Irregular interbeds of penecontemporaneous limestone breccia (units 4 and 5) are located between "a" and "b". Base of quartzite unit 12 is at "c". GSC photo no. 203166-T.

Figure 3. Penecontemporaneous breccia in interbeds between "a" and "b" in figure 2. GSC photo no. 203166-R.

Figure 4. Conglomerate and breccia in interbed located high in unit 5 and short distance below point "b" in figure 2. GSC photo no. 202887-R.

Figure 5. View looking south at upper segment of section 23. Base of segment is at edge of main stream (not visible) located below point "a", top of Sekwi Formation is at "c", Upper Cambrian fossil locality GSC loc. 92739 is at "d". GSC photo no. 203166-L.

Figure 6. Irregular limestone mounds in upper part of Sekwi Formation, unit 18, section 23, located at point "b" in figure 5. Hammer at "a" in figure 6 gives scale. GSC photo no. 203166-I.

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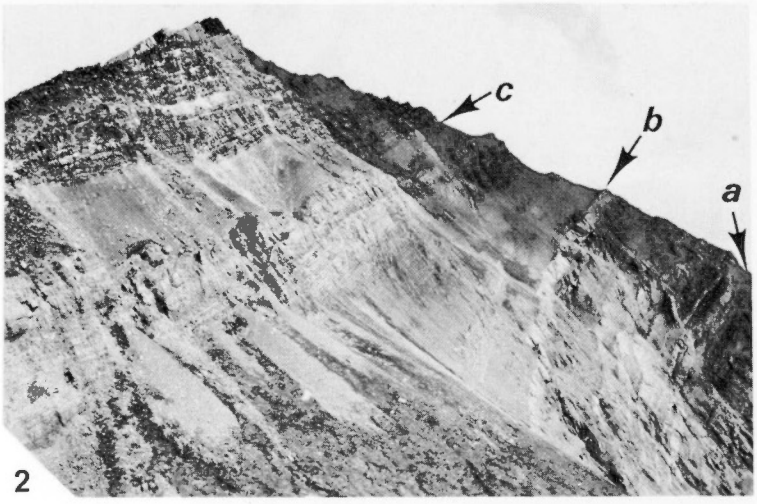


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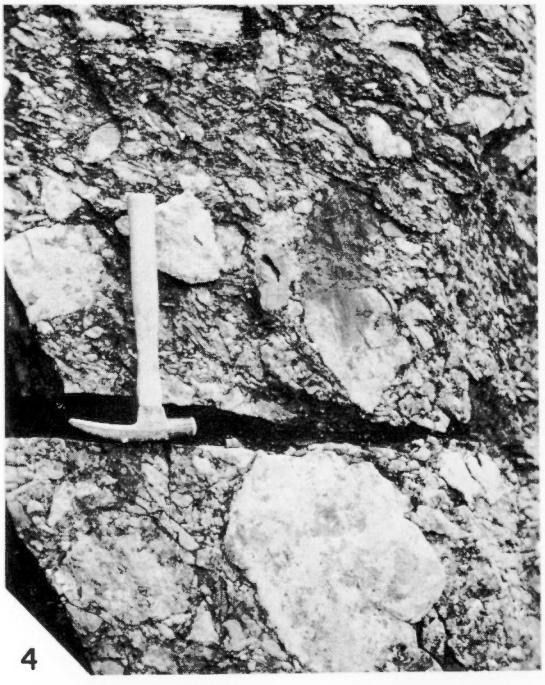

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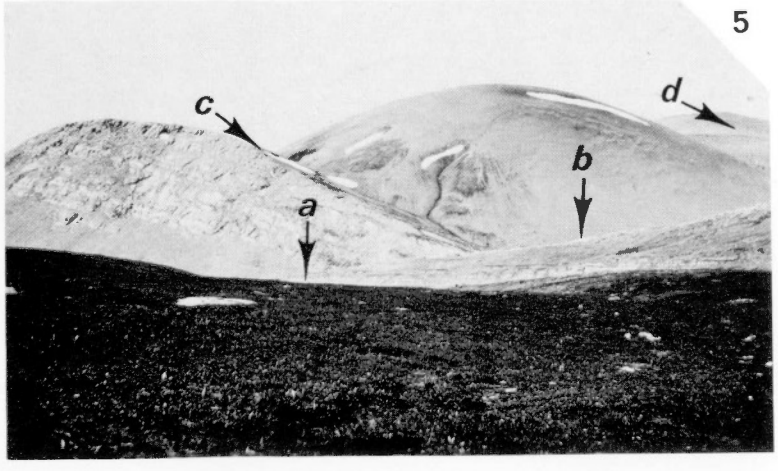


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## PLATE 7

Figure 1. View looking south at lower segment of section 24. Base of map-unit 13 is at "a", Sekwi Formation is at "b", unit 4 is at "c", and unit 8 is at "d". GSC photo no. 202887-C.

Figure 2. View looking south at Sekwi Formation, upper segment of section 24. Unit 4 is at "a", base of unit 9 is at "b", unit 10 is at "c", and base of unit 16 is at "d". Exposure of unit 9 shown in figure 3 is at "e". GSC photo no. 203166-K.

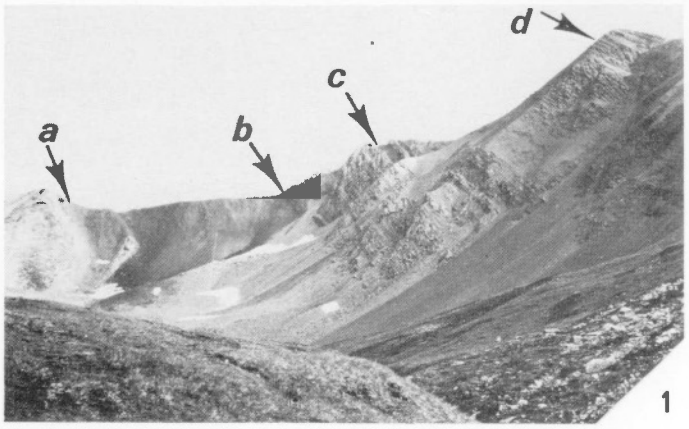
Figure 3. View looking west at thick bedded, light grey limestone in unit 9. Location of outcrop is shown at "e" in figure 2. Scale is given by assistant standing at "a". GSC photo no. 202887-E.

Figure 4. View looking east at Sekwi Formation, lower segment of section 25. Unit 2 is at "a", unit 4 is at "b", and base of unit 10 is at "c". Section 7 is located east of section 25 on ridge marked "d". GSC photo no. 202887-F.

Figure 5. Dark platy limestone in Sekwi Formation, unit 2, section 25. Outcrop is located at "a" in figure 4. GSC photo no. 202887-J.

Figure 6. Penecontemporaneous folds in sandstone and siltstone, Sekwi Formation near sections 7 and 25. Strata in outcrop correlates with unit 6, section 25, and is located at lat. 63°27', long. 129°27'. GSC photo no. 202887-H.

Figure 7. View looking north at upper segment of section 25. Base of unit 8 is at "a", base of unit 11 is at "b". Post-Sekwi Formation units 1 and 2 were measured over crest of hill below "c". Latter two units were remeasured below "d" along with successive units 3-6. GSC photo no. 203166-N.

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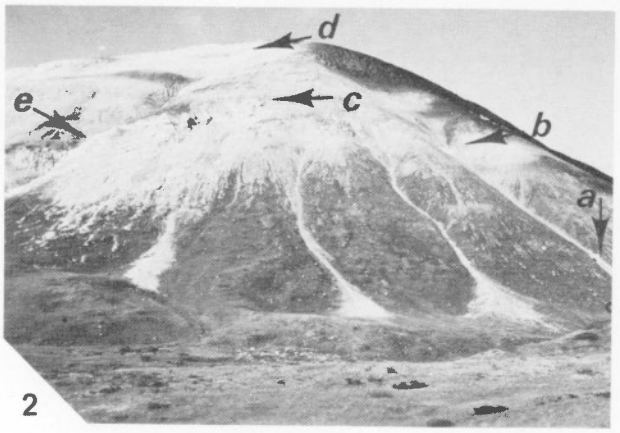


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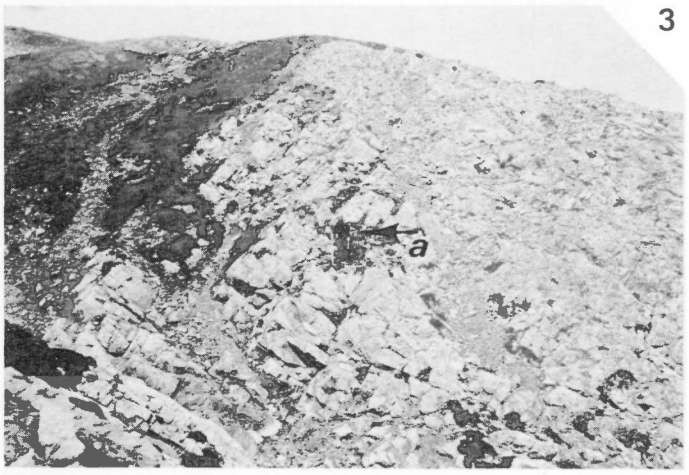


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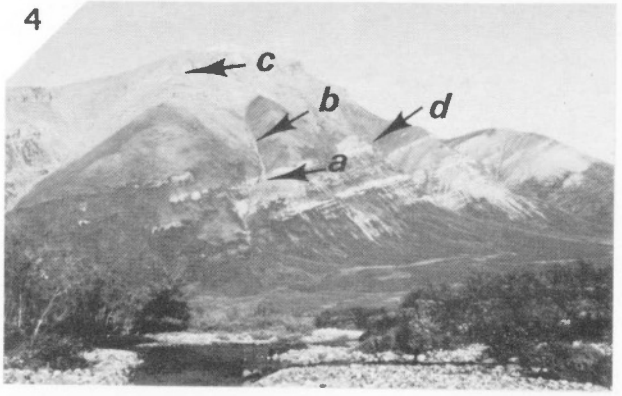


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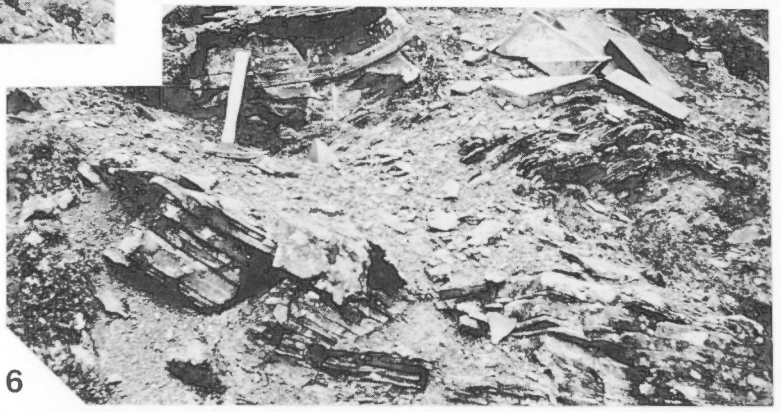

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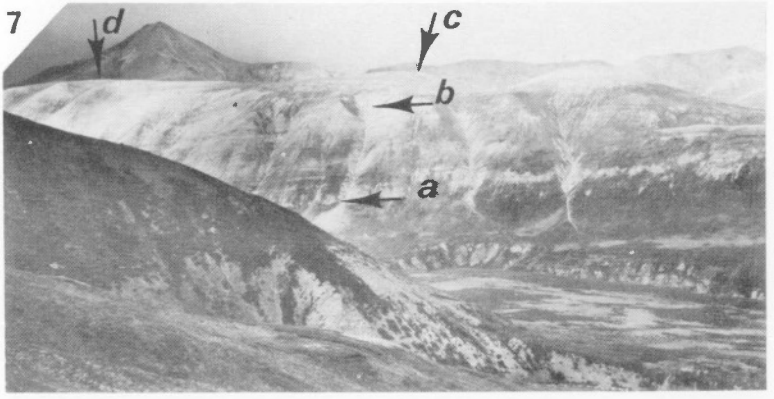


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