The Taku Arm District, Northern British Columbia.

Summer Essay

by

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—

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ILLUSTRATIONS.

THE TAKU ARM DISTRICT, NORTHERN BRITISH COLUMBIA.

LOCATION.

The Taku Arm district is situated in the Atlin Mining Division, British Columbia. It comprises a strip about fifty miles long by fifteen wide, extending southward both sides of Taku Arm of Tagish Lake, from the Yukon-British Columbia boundary to the head of the lake. (See map in pocket).

ACCESSIBILITY.

Steamers make regular trips the year round from Vancouver and Seattle to Skagway, Alaska. From there the White Pass and Yukon Railway runs to Carcross and Whitehorse. Fron Carcross a lake steamer makes trips to Taku three times a week in the summer. A short tramway connects Taku to the shore of Atlin lake, where another boat runs to Atlin. In the winter a stage runs between Carcross and Atlin, the greater part of the journey being made over the ice.

PHYSIOGRAPHY.

REGIONAL.

British Columbia may be divided into three main physiographic terranes, which run in a north westerly - south easterly direction.

The Coastal system consists of a single range in northern British Columbia, if we except the islands; but northward it becomes more complex. Physiographically it consists of a jumble of knife edged crests and needle like summits separated by steep walled valleys. The summits rise to equal altitudes locally but throughout the province decrease from 8,000 feet in the south to 5,000 feet in the north. This change is so gradual that it does not break the uniformity of summit level. This uniform summit level has led many geologists to believe that it represents an uplifted and dissected peneplain.

The Yukon Plateau is a part of the Interior plateau, separated from the main body by a jumble of mountains at about latitude 56°. It extends from the Coast Range to the Rockies and at the 60th parallel is 300 miles wide. Topographically it is a gently rolling plain of erosion, which has been later uplifted and dissected by deep steep-walled valleys.

LOCAL.

The Taku Arm Belt is situated in the western edge of the Yukon Plateau and also extends over onto the edge of the Coastal province. The northern portion runs well out onto the Yukon Plateau whereas the south-eastern portion takes in part of the Coast Range. Here, no distinct line of demarkation exists, the two terranes merging into each other "so that a transition belt occurs, generally from one to four miles wide, in which many of the points cannot definitely

Plate I.

Looking North from the Engineer Mine. Typical plateau topography is shown in the distance. Hale mountain is at the left. The mine buildings show in the right foreground.

Hale mountain from the top of Gleaner mountain. Note the comparatively flat gently rolling top.

be said to belong to either terrane."[1]

The most noticeable features of the plateau are the deep "U" shaped valleys and the flat topped mountains or inter-valley areas which represent the uneroded portions of an uplifted peneplain. Hale and Tanning mountains are excellent examples of these uneroded plateau fragments. (Plate I).

If one stands on one of the upland tracts away from the valley sides, the different portions appear to make up one rolling plain. The skyline is notably even, except for one or two masses as Mount Clive and Sunday Peak, which stand above the general level and represent portions of a still older land - surface unreduced at the time peneplanation was interrupted. The appearance of the upland plain is that of a country in late maturity or old age. The old valleys are wide and the country is without any great relief. The plateau level bears no relation to structure; the upturned edges of hard and soft strata being truncated at the same level. Such a plateau can only be an uplifted peneplain.

Towards the south, as one approaches the Coast Range, the elevation of the country increases and the plateau remnants disappear, having been destroyed by the greater erosive action. Here the mountains are smooth and rounded and are uniformly distributed. The summits are uniform in elevation.

1. Cairnes, D.D. - "Portions of Atlin District, British Columbia." - p.16, Mem.37, Geol. Survey of Canada.

Plate II.

The Florence Range (a part of the Coast Range) as seen from the Engineer Mine. Note the sharply serrated peaks and the deeply incised valleys.

A cirque in the Florence Range. Note also the sharp knife edge ridges.

Plate III.

Where Taku Arm turns abruptly westward. The Florence range in the distance. Hale mountain to the right.

The Golden Gate marked (X). Arrow points to Fantail Lake and River.

The Coast Range region in the south-east portion of the district is in marked contrast to the Yukon Plateau. The country is higher, with no vestige of an old plateau surface remaining, though the even summit level suggests that it also was base levelled. Brooks and Spencer both believe that the Coast Range was peneplanated, though McConnell disagrees with them. The valleys are deeply incised and the peaks sharp and rugged. (Plate II). Numerous ice masses rest in the higher valleys and cirques. The ice increases as one goes south until the Llewellyn Glacier buries all except the highest peaks.

VALLEYS AND DRAINAGE.

The principal valley is occupied by Taku Arm which runs north and south. The arm is from 1½ to 2 miles wide, though the valley itself sometimes reaches a width of 4 miles. The southern end turns abruptly westward, the main valley being occupied by Hale Creek and Edgar and Nelson Lakes. (Plate III). The waters of this district drain into Taku Arm and are conveyed through Tagish Lake, Marsh Lake and the Lewes River to the Yukon. Several important tributary valleys which are occupied by bodies of water drain into Taku Arm at grade. (Plate III). These main valleys contain Edgar, Nelson, Racine, Fantail and Tutshi lakes, also Talaka Bay, Graham Inlet and Bighorn Creek. The many small streams which drain into Taku Arm or its main tributaries almost invariably occupy hanging valleys, the lower portions of their valleys having been cut away by glaciers which moved down the master valley.

PHYSIOGRAPHICAL HISTORY.

The plateau region and also possibly the Coast Range was planated during a long period of crustal stability. The country was reduced to a condition of old age. The period of planation was later than the intrusion of the Coast Range bathylith and also later than the deposition of the Laberge beds of Jura-Cretaceous time. From evidence gathered from beds in various parts of the Yukon it would seem that the district was planated in Eocene or post-Eocene pre-Phocene times, and its subsequent uplift in late Miocene or Pliocene time.[1] Spurr[2] shows that the deposition of Miocene strata in the Yukon River was contemporaneous with erosion of the Yukon plateau, but what part the Taku Arm belt took in this is not known.

The amount of uplift is estimated to have been between 4,000 and 5,000 feet,[3] the elevation being greater along the axis of the Coast Range.

The plain became subject to erosion and at a later date became the gathering ground for glaciers, which deepened and widened Taku Arm and its main tributary valleys; giving them the familiar "U" shaped appearance, and leaving the smaller

1. Dawson, G.M. - Trans. Roy. Soc. of Canada, 1890, Vol.VIII, Sec. 4, 1890 - pp.11-17.

2. Spurr, J.E. - Geology of the Yukon Gold district, Alaska. Eighteenth Annual Report, U.S. Geol. Survey, Pt. III, 1898, pp.260, 262, 263.

3. Cairnes, D.D. - Portions of the Atlin District, British Columbia. Geol. Survey of Canada, Memoir 38, pp.22-23.

valleys hanging. The long narrow lakes in the district are caused by the impounding of the waters by deposition of glacial debris in the lower parts of their valleys.[1] The glacier retreated so rapidly that the depressions did not have time to be completely filled with glacial debris. Since Glacial time the topography has been only slightly modified. Glaciers still occupy cirques in the Coast Range, carving the mountains into the sharp rugged forms with which we are familiar. In the Plateau region, glaciers cannot gather due to the lower elevation. Nivation or snowdrift action is the modifying agent here, and has the opposite effects to glaciers, since it tends to smooth out inequalities of the surface.[2]

GEOLOGY

REGIONAL.

The main geological provinces coincide very closely with the physiographic provinces, and like them trend north-west south-east. The Coast Range and the plateau provinces are both represented. The separate formations however have a very irregular and patchwork distribution. This is most evident in the Yukon Plateau province. Geological work is far from

1. Cairnes, D.D. - Portions of the Atlin District, British Columbia. Geol. Survey of Canada, Memoir 37, p.27.
2. Ibid., - pp.24-25.

complete, great areas having as yet been unsurveyed.

At the base of the formations are unclassified metamorphic rocks, probably early Palaezoic in age. The sedimentary rocks fall into three groups. Palaezoic, Mesozoic and Quaternary. The Palaezoic sediments consist of several thousand feet of Devono-Carboniferous limestones, slates and quartzites. The lower beds are mainly quartzite, the limestone becoming more important towards the upper beds. The Mesozoic sediments consist of a conformable series of shallow water ~~sediments~~ deposits. Conglomerates, sandstones and shales with volcanic tuffs and breccias of Jura Cretaceous age. The aggregate thickness attains 6,000 feet. The Quaternary deposits are Pleistocene and Recent. They are lithologically the same being unconsolidated fresh water sediments and glacial debris. Many igneous rocks are represented. The oldest is a group older than the Coast Range and later than early Palaezoic. The next intrusion was the injection of the Coast Range bathylith in Jura-Cretaceous times. Since then, there have been several series of andesites, basalts, tuffs, and other volcanics. There have also been a number of injections of dykes of various kinds.

LOCAL.

Representatives of all these groups are found in the Taku Arm belt.

The oldest rocks of which we have any record in this district are the Mt. Stevens group which is a much metamorphosed, sheared complex formation consisting mainly of schists gneisses, mashed basic volcanics, quartzites and limestones.

TABLE OF FORMATIONS.
Sedimentary Rocks

Age		
Quaternary	Superficial deposits	Chiefly gravels, sands, boulder clays, silts, muck, peat and soil.
Jura-Cretaceous.	Tantalus conglomerate	Conglomerate chiefly with some sandstone and shale.
	Laberge series	Conglomerates, sandstones, grey-wackes, tuffs, shales, slates, and quartzites.
Carboniferous?	Braeburn limestones	Limestones.

Igneous Rocks.

Pleistocene to early Cretaceous - probably mainly Tertiary.	Wheaton River volcanics.	Chiefly rhyolites and rhyolitic tuffs.
	Carmack basalts	Basalts and basalt tuffs.
	Klusha intrusives	Chiefly granite-porphyry.
	Chieftain Hill volcanics.	Chiefly andesites and andesitic tuffs and breccias.

(Igneous Rocks cont'd.)

Jurassic(?)	Coast Range intrusives	Chiefly granodiorites.
Probably all upper Palaeozoic.	Perkins group.	Chiefly andesites, andesitic tuffs, diabase, diorite, and magnesite.

Unclassified Rocks.

Devonian (?)	Taku group.	Cherts and slates.
Pre-Devonian, probably all lower Palaeozoic.	Mt. Stevens group.	Chiefly schistose amphibolites, mashed basic volcanics, mica, and horn-blende-gneisses, sercite-schists, quartzites, and limestones.

The limestones and quartzites occur in beds which are usually quite thin. All the rocks are highly metamorphosed. These rocks outcrop in the south western portion of the district as a band about four miles wide, bordering the Coast Range intrusives. No fossils have been found in this group but Cairnes[1] places them as Lowes Palaezoic from lithological comparison with the Palaezoic terranes in the Yukon and Alaska. In Alaska, Silurian fossils were found in limestones resembling those of the Mt. Stevens group.

In Devonian and Carboniferous time a great transgression of the sea took place over much of the Yukon and Northern British Columbia. Several thousand feet of marine sediments were deposited. In this district they are represented by the Bracburn limestonea and possibly also by the Taku group. The Taku group outcrops only in three small areas and consist mainly of cherts and slates. The Braeburn limestones are a very extensive formation, and in places are over 3,000 feet in thickness. The structure is that of marble and ranges from subcrystalline to crystalline. Silica is present in varying amounts. These rocks are believed to be the same as Dawson's Upper Cache Creek series. Some Fusilinae were found in the Bracburn Limestones on the east side of Windy Arm, showing these beds to be Carboniferous.

In the interval between the Carboniferous and the Jurassic this district was probably land area, subject to

1. Cairnes, D.D. - Portions of Atlin District, British Columbia. Mem. 37, Geol. Survey Canada, pp.24-25.

erosion and volcanic activity. These volcanics are represented by the Perkino group which occur in several isolated areas in the district. This group consists mainly of andesites, andesitic tuffs, diabase, diorite and magnesitic rocks. According to McConnell, the andesitic rocks are post Carboniferous, though some of the other members of the Perkins group may be as old as Devonian.[1]

Along the south-western edge of the district are the Coast Range granodiorites. They are usually fresh in appearance, of a greyish colour, and sometimes become coarsely porphyritic. The phenocrysts are large feldspar crystals.

Later than the Coast Range intrusives we have the Laberge series and the Tantalus conglomerate. The former consists mainly of shales, sandstones, and conglomerates of Jura-Cretaceous age. Apparently the intrusion of the Coast range bathylith was followed by a short period of erosion, then submergence beneath the sea, when the Laberge series was laid down. This series is one of the most important in the Taku Arm district. Parts of this series are metamorphosed into quartzites and slates. Some sediments appear to be continental and are interspersed with volcanic tuffs of an andesitic character. The age of this series has been determined from a few poorly preserved speciments of ammonites.

The Tantalus conglomerate overlies the Laberge series conformably. In this district only a few feet of this conglomerate are left in isolated patches, but in other localities

1. McConnell, R.G. - The Whitehorse Copper Belts Yukon Territory, Geol. Survey Can., 1909, pp.9-12.

the conglomerate attains a thickness of 1,000 feet and contains seams of coal. This bed is apparently a continental deposit, chiefly consolidated river gravels. All the component pebbles consist of either quartz chert or slate.

After the Tantalus conglomerate was laid down the seas retreated; and from that time, records are few and indefinite as there are no sedimentary beds. Erosion was active and apparently the country was base levelled. Later there was another uplift.

At least four separate intrusions of volcanics took place after the Tantalus beds were laid down. The Chieftain Hill volcanics were the first to be intruded. They are mainly andesites and andesitic tuffs and breccias and are usually porphyritic, containing phenocrysts of feldspar or augite. They are basaltic in appearance and composition and on Ear Mountain have their flow structure well preserved. These volcanos occur in a strip lying between Taku and Peninsula Mountain and also make up the summit of Gleaner Mountain.

Three intrusions took place in what was probably Tertiary time. These are the Carmack basalts, the Klusha intrusives and the Wheaton River volcanics. In the Wheaton district the Wheaton rocks cut the Carmack basalts. What relation the Klusha intrusives have to the other series is not definitely known, though Cairnes[1] appears to think that

1. Cairnes, D.D. - Portions of Atlin District, British Columbia, Memoir 37, Geol. Survey, Canada, pp.68-71.

the Klusha intrusives and the Wheaton River volcanics are nearly if not quite synchronous.

The Carmack basalts are greenish to reddish brown rocks. They are generally porphyritic in structure, phenocrysts of olivine and augite being discernable with the unaided eye. These rocks occur over two small areas in the Taku Arm belt, one along the west shore of Taku Arm south of Fantail river and one on Armstrong Peak.

The Klusha intrusives and Wheaton River volcanics occur mainly as dikes. The Klusha intrusives are coarse granite porphyrics greyish in colour. The Wheaton River volcanics are mainly light colored rhyolites, though in places they contain pyrite which oxidizes, staining them reddish. The rock is usually porphyritic, small phenocrysts of feldspar occurring in the ground mass.

The Quaternary deposits comprise the Pleistocene and Recent terranes which are lithologically similar, and grade into each other. The Pleistocene deposits are mainly gravels, sands, silts and boulder clays. These are often of considerable thickness, forming the reversed slopes in valleys, damming back the lakes etc. The same kind of glacial deposits are still being produced by the high valleys glaciers. Except on precipitous slopes and escarpments there is usually a thin layer of soil, a Recent weathering product.

ACKNOWLEDGMENTS

The writer has made extensive use of various geological reports, especially the report on the Atlin District by D.D. Cairnes.

TR 7

TR 6

TR 3

TR 2

TR 8

TR 1

See Insert No.1

TR 4

Old Trench

TR 9

TR 5

TR 11

TR 10

See Insert No 2

TR 12

2 N

1 N

1 S

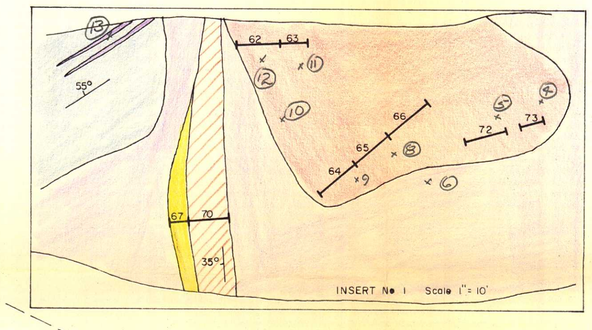
2 S

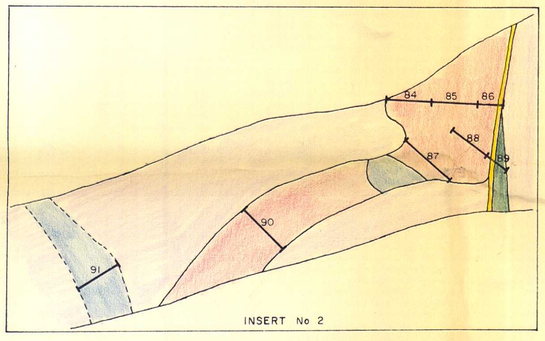
2 W

1 W

1 E

2 E





SILVER DIAMOND

4 3

400' to claim corner

LEGEND

- Limestone
- Quartzite
- Alaskite
- Basic Volcanics - Intrusives
- Diopside Zones
- Quartz Veins
- Rusty Quartzose Zones
- Mineralized Zones
- Sample Number 83

PREFIX ON SAMPLES REFERS TO the TRENCH No.

SILVER DIAMOND CLAIMS
ATLIN, B.C.

SURFACE PLAN

Scale 1" = 50' Aug. 1963