

INTRODUCTION PR83-511

The study area is located about 20 mi northeast of Walker Lake and 10 mi south of the Alutna River (Tps. 23 and 24 N., Rs. 21 and 22 E., Kotel River Meridian, Survey Pass Quadrangle) in the Arrigetch Peaks of the central Brooks Range, Alaska. The area is characterized by high, rugged relief and an alpine environment. Elevations vary from over 6,600 ft at Caliban to less than 2,000 ft in the southeastern part of the map area. Glacial landforms are abundant, including arêtes, horns, cirques, and U-shaped valleys. Till is common on valley floors, and talus deposits occur on higher slopes below steep bedrock outcrops.

GEOLOGIC SUMMARY

Abundant mid-Paleozoic metamorphic rocks are exposed in the central Brooks Range (Grybeck and others, 1977). Within this terrane is a central belt of more highly metamorphosed bedrock that includes granite orthogneiss plutons (including the Arrigetch Peaks massif), Silurian-Devonian marble, and Proterozoic(?) Lower Paleozoic schist. Metamorphic grade decreases north and south into regions of unmetamorphosed rock (Grybeck and others, 1977).

In this report, the Arrigetch Peaks Pluton is termed an orthogneiss, and the gneiss formed by metamorphism of crystalline igneous rocks (Spry, 1969). According to Nelson and Grybeck (1980), the composition of the pluton ranges from alkali-feldspar granite to tonalite in the classification of Streckeisen (1976). A well-developed regional foliation typically formed by mica in most of the pluton and country rock is noticeable, and a relict granitic texture is locally evident in the pluton. Structures in the Arrigetch Peaks pluton include deformed compositional layers and locally folded joints. K-feldspar schlieren and large to small-scale banding are common, and folds and large domal structures are present in some areas. The pluton and country rocks have been regionally metamorphosed in the greenschist facies.

Concordant uranium-lead and lead-lead radiometric ages for an Arrigetch Peaks pluton sample are 357 m.y. (Dillon and others, 1980); a rubidium-strontium isochron age of 373 ± 25 m.y. has been determined for the Arrigetch Peaks and Mt. Igkpak plutons (Silberman and others, 1979). These ages indicate magmatic crystallization occurred in Middle Devonian time. Potassium-argon ages from biotite and muscovite from the pluton are 86 to 92 m.y. (Broeg and Bower, 1971; Turner and others, 1978), which indicates mid-Mesozoic regional metamorphism or Late Cretaceous uplift and cooling, or both.

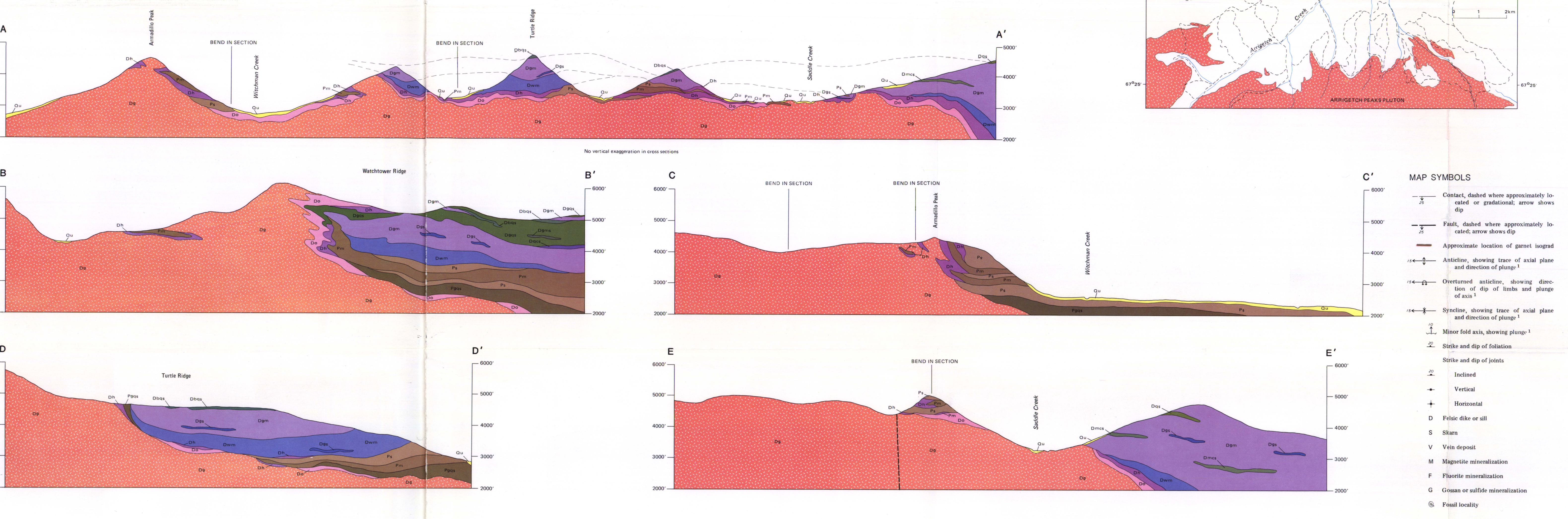
Hornfels, skarn, and dikes and sills of aplite and pegmatite rocks define the contact between the pluton and country rock (Dillon and others, 1980). The contact zone is well preserved and typically ranges up to several tens of meters in thickness. Hornfels-hornfels facies and albite-epidote-hornfels facies minerals can be recognized. Contacts are largely discordant but typically concordant. The intrusive contact typically dips steeply near the mass and apparently flattens to the north. The youngest rocks clearly intruded by the pluton are thick marbles of the Skagit Formation of Silurian to Devonian age and Middle to Upper Devonian metasediments (units Dmcs, Dm, Dmca, Dmca, Dmca, and Dmca) (Adams, 1983). Units Dm, Dmca, Dmca, and Dmca are correlated with the Skagit Formation on the basis of both lithologic similarity and the identification of a phaceloid rugose corals of Silurian to Devonian age (W.A. Oliver, Jr., written commun., 1982). Units Pm, Pm, and Pmca probably correlate with the lower part of the Skagit Formation or with sub-Skagit Formation rocks.

CORRELATION OF MAP UNITS

Qu	Quaternary	Quaternary
Dmca, Dm, Dmca, Dmca, Dmca, Dmca	Devonian (?)	Devonian
Dg, Dg, Dg, Dg	Silurian (?)	Silurian
Pm, Pm, Pm, Pm	Lower Paleozoic or Proterozoic	Lower Paleozoic or Proterozoic

DESCRIPTION OF MAP UNITS

- Qu** QUATERNARY DEPOSITS, UNDIFFERENTIATED - Includes alluvial, colluvial, and glacial deposits.
- Dmca** GRANITE TO QUARTZ MONZONITE ORTHOGNEISS, ARRIGETCH PEAKS PLUTON - White to gray, fine to coarse-grained, with perthitic alkali feldspar and plagioclase (albite-oligoclase). Accessory minerals include zircon, apatite, ilmenite, allanite, fluorite, cassiterite, and garnet. Secondary minerals include biotite, white mica, chlorite, garnet, epidote, sphene, calcite, hematite, and kaolinite. Recrystallized biotite and white mica define the foliation of the pluton. CPW norm calculations average 30-40 percent quartz, 25-30 percent orthoclase, 20-30 percent albite, and 0.5-3.5 percent corundum. Recrystallized quartz forms lenses, and perthite forms augen. Quartz and feldspar have local granulated textures in thin section. Major-oxide values indicate these rocks are silica oversaturated and peraluminous according to the Shand (1950) classification.
- Dg** SCHISTOSE ORTHOGNEISS OF THE ARRIGETCH PEAKS PLUTON - Brown to gray, fine- to medium-grained, with abundant biotite and white mica; otherwise mineralogy similar to unit Dm. Small-scale folds are common. Contacts with unit Dg are gradational, and contacts with units Pm and Pmca are not distinct.
- Dh** CALC-SILICATE AND CALCAREOUS HORNFELS AND CALC-SILICATE MARBLE - Greenish, fine- to coarse-grained. Includes skarn, which occurs as discontinuous zones in hornfels or marble, and veins that cross hornfels or marble. Diopside pyroxene, garnet (grossularite), and amphibole (tremolite-actinolite) are common. Wollastonite, idocrase, phlogopite, biotite, plagioclase, calcite, quartz, and alkali feldspar occur as minor or accessory minerals. Typical retrograde minerals include amphibole, epidote, clinzoisite, zoisite, and white mica. Polite hornfels are rare and in one locality consist of biotite + garnet (almandine?) + plagioclase + magnetite, with retrograde chlorite + siderite. Skarn mineralogies include clinzoisite + tremolite, garnet + pyroxene, scapolite + garnet, magnetite + garnet, and fluorite + magnetite (ribbon skarn). Vein minerals include prehnite, axinite, tremolite, clinzoisite, calcite, siderite, quartz, beryl, fluorite, rutile, chlorite, and grunerite. Sulfide minerals occur rarely in skarns or veins and include chalcocopyrite, pyrite, sphalerite, and galena. Contacts with units Dg and Dm are sharp, but with marble range from gradational to sharp.
- Dmca** QUARTZ-CHLORITE-WHITE MICA CALC-SCHIST - Green to orange, medium- to coarse-grained.
- Dm** WHITE MICA-CHLORITE-QUARTZ SCHIST - Green to gray, medium- to coarse-grained.
- Dmca** CHLORITE-WHITE MICA-BIOTITE-QUARTZ SCHIST - Brown to gray, fine- to coarse-grained, with accessory epidote and calcite.
- Dmca** GARNET-BIOTITE-WHITE MICA-CHLORITE-QUARTZ SCHIST - Green to buff, fine- to coarse-grained, with almandine garnet and accessory quartz, calcite, white mica, and opaque minerals.
- Dmca** GARNET-BIOTITE-CHLORITE SCHIST - Green, fine- to coarse-grained, porphyroblastic, with almandine garnet and accessory quartz, calcite, white mica, and opaque minerals.
- Dmca** GRAPHIC QUARTZ-WHITE MICA-CHLORITE SCHIST - Gray to green, fine- to medium-grained, locally porphyroblastic, with accessory calcite. Includes chloritoid-bearing schist in northwest part of map area.
- Dmca** IMPURE CALCITE MARBLE - Gray to pink, medium- to coarse-grained, with accessory dolomite, quartz, white mica, chlorite, and amphibole (tremolite-actinolite).
- Dmca** QUARTZ-CHLORITE-WHITE MICA-PHLOGOPITE CALC-SCHIST - Gray to buff, medium- to coarse-grained, with accessory tremolite and alkali feldspar.
- Dmca** ACTINOLITE GREENSCHIST - Green, fine- to medium-grained, with minor sphene and epidote, accessory albite, ilmenite, and hematite, and trace chlorite and biotite.
- Dmca** WHITE, IMPURE CALCITE MARBLE - White, coarse-grained, with accessory quartz, phlogopite, white mica, chlorite, and plagioclase (andesine-albite).
- Pm** CHLORITE-WHITE MICA-BIOTITE-QUARTZ SCHIST, PARAGNEISS, AND QUARTZITE - Brown to buff, medium- to coarse-grained, with accessory epidote, plagioclase, alkali feldspar, calcite, and amphibole. Includes local carbonate material and hornfels zones.
- Pmca** CALCITE MARBLE - Gray to white, medium- to coarse-grained, with accessory quartz, white mica, chlorite, and amphibole (tremolite-actinolite).
- Pmca** GARNET-CHLORITE-BIOTITE-WHITE MICA-QUARTZ SCHIST AND PARAGNEISS - Brown to buff, medium- to coarse-grained, with almandine garnet and accessory plagioclase, alkali feldspar, and amphibole.



MAP SYMBOLS

- Contact, dashed where approximately located or gradational; arrow shows dip
- Fault, dashed where approximately located; arrow shows dip
- Approximate location of garnet isograd
- Anticline, showing trace of axial plane and direction of plunge¹
- Overturned anticline, showing direction of dip of limbs and plunge¹
- Syncline, showing trace of axial plane and direction of plunge¹
- Minor fold axis, showing plunge¹
- Strike and dip of foliation
- Strike and dip of joints
- Inclined
- Vertical
- Horizontal
- D Félsic dike or sill
- S Skarn
- V Vein deposit
- M Magnetite mineralization
- F Fluorite mineralization
- G Gossan or sulfide mineralization
- @ Fossil locality

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GEOLOGIC MAP OF THE NORTHERN CONTACT AREA OF THE ARRIGETCH PEAKS PLUTON, BROOKS RANGE, ALASKA

By
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