Annotated bibliography of selected references on the geology of the Baird Mountains quadrangle, northwestern Alaska

by

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This report is preliminary and has not been reviewed for conformity with Geological Survey editorial standards and stratigraphic nomenclature.

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Introduction

The Baird Mountains 1:250,000 quadrangle, in the southwestern Brooks Range, roughly bounded by the Kobuk and Noatak Rivers, encompasses approximately 14,015 km². The quadrangle includes portions of the Noatak National Wildlife Preserve, the Kobuk Valley National Park, and a large tract of land in the Squirrel River drainage basin currently administered by the U.S. Bureau of Land Management (Figure 1).

The Baird Mountains have attracted geologic interest since the recognition of its mineral resource potential at the turn of the century. The area was initially mined for coal and placer gold deposits, and has more recently been prospected for base and precious metal deposits. In adjacent quadrangles, proven mineral reserves occur in rock units continuous with, or similar to, those in the Baird Mountains quadrangle. The geology of the Baird Mountains also has important regional implications because lithologic and structural trends extending for the length of the Brooks Range change abruptly in the Baird Mountains. The regional strike changes from an easterly trend to a north-northeasterly trend for the western half of the quadrangle. West of the deflection in strike, the rocks change from pelitic schists to an extensive accumulation of lower to middle Paleozoic carbonates. To the north of these schists and carbonates are middle and upper Paleozoic carbonates and clastic rocks that are more consistent with regional trends.

The bibliography consists of 339 annotated references and a subject index (table 1). The subject index includes topical, area specific and regional categories. References designated as regional are limited to the Brooks Range. Annotations are brief, pertain only to the portion of the article relevant to the geology of the Baird Mountains quadrangle, and are not
intended to evaluate the reference. Publications such as maps with sufficiently self-explanatory titles do not have annotations. Unobtainable references also lack annotations.

The bibliography represents a comprehensive, but not exhaustive literature survey. Some lesser-known publications may have been omitted. Sources of information include GEOREF, U.S. Geological Survey bibliographies, and State of Alaska bibliographies. References include state and federal publications, articles and abstracts from scientific journals, and some unpublished theses and dissertations. Trade journals were not consulted. Articles published after April 1, 1985 do not appear in this bibliography.

**Acknowledgements**

The preparation of this bibliography was greatly facilitated by comprehensive bibliographies prepared by Edward H. Cobb of the U.S. Geological Survey. Special thanks go to Ellen White and Mike Mullen of the Technical Data Unit of the Alaskan Branch, and to the Public Inquires Office in Anchorage.
FIGURE 1.—Land use status in the Baird Mountains quadrangle. Hatched areas designate lands managed by the Bureau of Land Management. Stipled areas designate wilderness areas, which, along with the white areas of the Noatak National Wildlife Preserve and the Kobuk Valley National Park, are managed by National Park Service.
Table 1.

Explanation of Subject Coding

Subject Key

A - Areal Geology
E - Economic Geology
G - Geophysics
H - Historical
I - Igneous Rocks
M - Metamorphic Rocks
Q - Quaternary
S - Stratigraphy
T - Structure and Tectonics
W - Water Resources

r - reference provides a regional perspective
b - reference pertains specifically to the Baird Mountains quadrangle
a - reference contains isotopic or fossil age
u - reference names or redefines a rock unit

Examples

(T,r) Reference concerns regional tectonics (i.e. tectonics of the western Brooks Range)
(S,u) Reference names stratigraphic unit
(S,T,b) Reference discusses stratigraphy and structure of an area within the Baird Mountains quadrangle
Annotated References


(S,r) Adams, K. E., 1985, Facies comparison of autocthanous and allochthonous Permian and Triassic units, north-central Brooks Range, Alaska, American Association of Petroleum Geologists, Programs and Abstracts, p. 35. **** Palinspastic reconstructions suggest shallowing trend from southwest to northeast for marine Siksikpuk and Otuk formations. Silica content and the occurrence of barite increase to the southwest. For Permian rocks, coarser grained clastic material increases toward the northeast. For Triassic rocks, sooty and phosphatic material increases to the northeast.


(G,b) Alaska Division of Geological and Geophysical Surveys, 1975, Aeromagnetic map, eastern two thirds of Baird Mountains quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File Map AOF-77, 1 sheet, scale 1:250,000. **** Incomplete aeromagnetic coverage of Baird Mountains quadrangle. Contoured data from one-mile spaced flight lines with tie lines at 15-mile intervals.


Brosge, W. P., and Reiser, H. N., 1964, Geologic map of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-375, scale 1:250,000. **** Named units include Bergman Group, Lisburne Group, Kayak Shale, Kanayut Conglomerate, and Skagit Limestone; some ages have since been refined.

Incorporation of wacke member (Devonian shale and sandstone of Bowsher and Dutro, (1957) into Hunt Fork Shale.


(T,r) Carey, S. W., 1958, The tectonic approach to Continental drift, in Continental Drift, a Symposium: Hobart, Tasmania, Tasmania University, Geology Department, p. 177-355. **** Rotational opening of Arctic Alaska from the Canadian Arctic Archipelago.

(S,b,a) Carter, Claire, and Tailleur, I. L., 1984, Ordovician graptolites from the Baird Mountains, western Brooks Range, Alaska: Journal of Paleontology, v. 58, no. 1, p. 40-57. **** Early and Middle Ordovician graptolites in a phyllitic slate thought to conformably underlie the Baird Group carbonates. A lower age range for the base of Baird Group (previously Silurian and Devonian) is indicated.


(T,u,r) Churkin, Michael, Jr., Nokleberg, W. J., and Huie, Carl, 1979a, Collision-deformed Paleozoic continental margin, western Brooks Range, Alaska: Geology, v. 7, no. 8. p. 379-383. **** Naming of Kagvik sequence, a thrust sheet of internally imbricated Carboniferous through Cretaceous cherts and siliceous shales, in the western Brooks Range. Tectonic interpretation includes late Paleozoic subduction and both southward and northward thrusting in the late Mesozoic, associated with the rifting of the Canada basin. Comments and replies in Geology (Crane, R. C., Dutro, J. T., Mayfield, C. F., Metz, P. A., Mull, C. G., and Nelson, S. W.) point out that detailed mapping and stratigraphy by other workers do not support these interpretations.


(T,r) Churkin, Michael, Jr., Whitney, J. W., and Rogers, J. F., 1984, Arctic paleogeography--Continental growth and fragmentation [abs.]: Geological Society of America Abstracts with Programs, v. 16, no. 5, p. 275. **** Hypothesis that Arctic Alaska-Chukotka was a peninsula of North America separated from the Siberian Platform in Late Jurassic through Early Cretaceous time.

(E,b) Cobb, E. H., 1972, Metallic mineral resources of the Baird Mountains quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map 386, 1 sheet, scale 1:250,000. **** Compilation of lode (copper) and placer (gold) deposits in the Baird Mountains quadrangle, from a literature search.


Includes three copper occurrences in the Baird Mountains quadrangle, with references; no descriptions.


(S,T,u) Crane, R. C., and Wiggins, V. D., 1976, Ipewick Formation, significant Jurassic-Neocomian map unit in northern Brooks Range fold belt [abs.]: American Association of Petroleum Geologists Bulletin, v. 60, no. 12, p. 2177. **** The Ipewick Formation is named for clay shales, red shales, bituminous shales, coquinoïd limestone, and quartz sandstone in the central and western Arctic region. A quiescent, lagoonal depositional environment is suggested.


**** Context for Mesozoic depositional environment in Brooks Range.


(T,E,a) Dillon, J. T., Pessel, G. H., Chen, J. H., and Veach, N. C., 1978, Tectonic and economic significance of Late Devonian and late Proterozoic U-Pb Zircon ages from the Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 61, p. 36–41. **** Reports new dates from felsic metavolcanic rocks (Ambler River and Wiseman quadrangles) and felsic plutonic rocks (Survey Pass and Wiseman quadrangles) and discusses geologic implications.


(S,u,a) Dutro, J. T., Jr., 1953, Stratigraphy and paleontology of the Noatak and associated formations, Brooks Range, Alaska: Geological Society of America Bulletin, v. 64, no. 12, p. 14-
15. **** The Noatak Formation of P. S. Smith is subdivided and restricted to Upper Devonian and Lower Mississippian marine clastic rocks.


(S,a) Dutro, J. T., Jr., Palmer, A. R., Repetski, J. E., Jr., and Brosge, W. P., 1984b, Middle Cambrian fossils from the Doonerak anticlinorium, central Brooks Range, Alaska: Journal of
Paleontology, v. 58, no. 6, p. 1364-1371. **** Photographs, systematic paleontology.


(E,r) Forrest, Kimball, Sawkins, F. J., and Rye, R. O., 1984, The Lik deposit, western Brooks Range, Alaska--Sedex mineralization along axial vent sites in a structural basin [abs.]: Geological Society of America Abstracts with Programs, v. 16, no. 6, p. 511. **** Geologic and isotopic evidence for source of Ag, Pb, Zn mineralization in the Kuna Formation at the Lik deposit, interpreted to be chemical precipitation of metals and sulfides from vented hydrothermal fluids in a euxinic basin.


(A) Fritts, C. E., 1969, Geology and geochemistry in the southeastern part of the Cosmos Hills, Shungnak D-2 quadrangle, Alaska: Alaska Division of Mines and Geology Report 37, 35 p., scale 1:48,000. *** Report on an area which includes felsic plutons, mafic volcanic and mid-Paleozoic metasedimentary rocks which are probably correlative with similar lithologies of the Baird Mountains quadrangle.


of the rifting theory for the Canada Basin, using geophysical, structural and geologic data. Proposed identification of the Northwind and Camden Fracture Zones which divide the Barter Island, Barrow, and Chukchi sectors of the northern Alaska margin.


(T) Grantz, Arthur, May, S. D., and Marinai, Robert, 1984, Tectonic implications of the Phanerozoic paleogeography of offshore Arctic Alaska [abs.]: Geological Society of America Abstracts with Programs, v. 16, no. 5, p. 287. **** Magnetic anomaly west of Cape Lisburne may be serpentinite marking an Alaska-Siberia suture. Wrangel Island rocks resemble Brooks Range nappes and may be thrust over autochthonous basins in the Chukchi Sea.

(S,T,a) Grantz, Arthur, Tailleur, I. L., and Carter, Claire, 1983, Tectonic significance of Silurian and Ordovician graptolites, Lisburne Hills, northwest Alaska [abs.]: Geological Society of America Abstracts with Programs, v. 15, no. 5, p. 274. **** Graptolites are used to correlate Ordovician and Silurian rocks of Lisburne Hills with paraautochthonous rocks of the Brooks Range.

(E) Grybeck, Donald, 1977a, Known mineral deposits of the Brooks Range Alaska: U.S. Geological Survey Open-File Report 77-166C, 45 p., 1 sheet, scale 1:1,000,000. **** Map showing location, type and relative size of mineral deposits; table includes brief description and references for each deposit.

(E,r) Grybeck, Donald, 1977b, Map showing geochemical anomalies in the Brooks Range, Alaska: U.S. Geological Survey Open-File Map 77-166D, 1 sheet, scale 1:1,000,000. **** Map shows location of stream sediment anomalies, sample density, and land status.

rock units defined by age. Includes map showing the distribution of metamorphic rocks and the locations of radiometrically dated samples.

(Grybeck, Donald, and DeYoung, J. H., Jr., 1978, Map and tables describing mineral resource potential of the Brooks Range, Alaska: U.S. Geological Survey Open-File Report 78-1-B, 20 sheets, scale 1:1,000,000. **** Generalized map showing areas favorable for specific mineral deposit types, and status of private, state, and federal work with respect to mineral resource assessment of the Brooks Range.


(Hamilton, T. D., 1984a, Late quaternary offsets along the Kobuk and related fault zones, northwestern Alaska [abs.]: Geological Society of America Abstracts with Programs, v. 16, no. 5, p. 288. **** Vertical E-W faults along Kobuk Valley extend at least from Bettles to Kotzebue and have been offset as much as 2 m in the last 20,000 years.

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Hamilton, W., 1968, Continental Drift in the Arctic [abs.]: Geological Society of America, Cordilleran Section, Annual Meeting, Tucson, Arizona, p. 61. Rotation of Arctic Alaska away from Canadian Arctic Archipelago in the Late Mesozoic. Oroclinal folding began Late Jurassic or Early Cretaceous.


Hill, K., 1985, Geology of the Sunshine Creek prospect, Ambler District, Alaska: unpublished M.S. thesis, University of Alaska,
Fairbanks. *** Describes one of the volcanogenic massive sulfide deposits in the Brooks Range schist belt (Ambler River quadrangle).


(A,E,r) Hitzman, M. W., 1983b, Geology of the Cosmos Hills and its relationship to the Ruby Creek copper-cobalt deposit: unpublished Ph.D. dissertation, Stanford University, California, 266 p., 5 plates, scale 1:24,000 and 1:12,000. *** Discusses origin and setting of a large, unique mineral deposit hosted in Devonian carbonates lithologically similar to those of the Baird Mountains.


Geologic Report 75, 2 plates, scale 1:250,000. **** Detailed division of rock units in the schist belt accentuate metamorphic protoliths. Map units differ from those of previous workers.


(S,r,a) Imlay, R. W., 1955, Characteristic Jurassic mollusks from northern Alaska: U.S. Geological Survey Professional Paper 274-D, p. 69-96. **** Jurassic rocks divided into 3 lithologic facies: (1) coarse clastic facies, (2) shale and siltstone facies, and (3) glauconitic calcareous sandstone, siltstone and shale facies. Photographs and systematic paleontology for Jurassic megafossil collections.


Jones, D. L., and Grantz, Arthur, 1964, Stratigraphic and structural significance of Cretaceous fossils from Tiglukpuk Formation, northern Alaska: American Association of Petroleum Geologists Bulletin, v. 48, no. 9, p. 1462-1474. The Tiglukpuk Formation contains Buchia Sublaevis, and is thus of Early Cretaceous rather than Jurassic age. The rocks are younger than those of the Okpikruak Formation, though structurally beneath them. This major age revision is the basis for abandoning the term Tiglukpuk Formation.

Jones, R. W., 1968, Overthrusting in the central Brooks Range, Arctic Alaska [abs.]: Geological Society of America Cordilleran Section Meeting, p. 70. Evidence for large scale imbricate thrusting; the faults young from south to north, and possibly also young from west to east.


Mayfield, C. F., Curtis, S. M., Ellersieck, I. F., and Tailleur, I. L., 1982, Reconnaissance geologic map of the southeastern part of
the Misheguk Mountain quadrangle, Alaska: U.S. Geological Survey Open-File Report 82-613, scale 1:63,360. *** Map, fossil tables, brief unit descriptions and general geologic history in terms of seven thrust sequences, also referred to as the allochthon model.


(H) Mendenhall, W. C., 1902, Reconnaissance from Fort Hamlin to Kotzebue Sound, Alaska, by way of Dall, Kanuti, Allen, and Kowak Rivers: U.S. Geological Survey Professional Paper 10, p. 31-35. **** Lithologic descriptions of rocks along the Kobuk and Squirrel Rivers; reference to various early workers in the area, including topographic surveys by Reaburn, from the 1901 field season.


Interpretation of reversal and subduction direction to produce south vergent folds in Skagit Limestone and similar south vergent asymmetry of granitic bodies in the Schwatka Mountains.


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relatively allochthonous Kanayut Conglomerate and the relatively autochthonous Kekiktuk Conglomerate, both thought to be parts of one southwestward prograding fluvio-deltaic system. Preferred hypothesis involves post-Mississippian translation from a source terrane in eastern Greenland.


(S,u) Nilsen, T. H., and Moore, T. E., 1984, Stratigraphic nomenclature for the Upper Devonian and Lower Mississippian (?) Kanayut Conglomerate, Brooks Range, Alaska: U.S. Geological Survey Bulletin 1529A, 64 p. **** Kanayut Conglomerate redefined to include 3 fluvial units: The Ear Peak Member overlain by the Shainin Lake Member, in turn overlain by the Stuver Member. The basal marine sandstone is assigned to the Noatak Sandstone.


(T,S) Nilsen, T. H., and Moore, T. E., 1985, Tectonic significance of Kanayut Conglomerate and related middle Paleozoic deposits, Brooks Range, Alaska: American Association of Petroleum Geologists Bulletin, vol. 69, no. 4, p. 673. **** Kanayut Conglomerate may have been displaced from a position contiguous with the Old Red Sandstone in Svalbard and East Greenland. Translation was post-Mississippian and may have begun prior to the late Mesozoic opening of the Canada basin.


Nokleberg, W. J., and Winkler, G. R., 1978a, Geologic setting of stratiform zinc-lead mineralization, Drenchwater Creek area, Howard Pass quadrangle, western Brooks Range, Alaska: Geological Society of America Abstracts with Program, v. 10, no. 3, p. 139. 319 m.y. K/Ar date on biotite from felsic volcanic rocks at Drenchwater Creek. Mineralization interpreted to have its source as volcanic exhalatives, and was remobilized by later tectonism.


Map and detailed description of Drenchwater Creek deposit, including petrographic, chemical and isotopic analyses.


Palmer, A. R., Dillon, John, and Dutro, J. T., Jr., 1984, Middle Cambrian trilobites with Siberian affinities from the central Brooks Range, northern Alaska [abs.]: Geological Society of America Abstracts with Programs, v. 16, no. 5, p. 327. **** Middle Cambrian trilobites from Mount Doonerak and Snowden Mountain have affinities with Siberian platform shelf facies fauna, and do not resemble Cordilleran faunas.


(A,a,b) Patton, W. W., Jr., and Miller, T. P., 1968, Regional geologic map of the Selawik and southeastern Baird Mountains quadrangles, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-530, 1 sheet, scale 1:250,000. **** Distribution of upper Mesozoic rocks and a K/Ar biotite age of 85 m.y. for a tuff on the Kobuk River.


Alaskan Geology 1977, p. 3-5. **** Describes paleo-karst features in Devonian(?) carbonate rocks.


(S,a) Plafker, George, Hudson, Travis, and Jones, D. L., 1978, Upper Triassic radiolarian chert from the Kobuk volcanic sequence in the southern Brooks Range, in Johnson, K. M., ed., The United States Geological Survey in Alaska--Accomplishments during 1977: U.S. Geological Survey Circular 722-B, p. B45-B47. **** Radiolarian ribbon cherts intercalated with pillow basalts which were previously considered to be Jurassic, and subsequently thought be late Paleozoic in age, yielded Late Triassic radiolarians. These rocks were included in the Yukon-Koyukuk ophiolite belt, later to become the Angayuchum terrane.


(E,b) Reed, Irving, 1932, Report on the placer deposits of the Squirrel River gold field: Territory of Alaska Department of Mines MR 27-1, p 32.


(T) Rowley, D. B., Lottes, A. L., and Zeigler, A. M., 1985, North America-Greenland-Eurasian relative plate motions—Implications for circum-Arctic tectonic reconstructions [abs.]: American Association of Petroleum Geologists Bulletin, v. 69, no. 2, p. 303. **** Interpretation that (1) North America and Eurasia were fixed relative to each other until latest Cretaceous time, (2) North Slope-Seward-Chuktoka block constituted an isthmus between North America and Asia since Paleozoic time, (3) Canada Basin opened behind clockwise rotation of the Alph-Cordillera-Mendeleyev ridge arc during early to middle Cretaceous, and (4) 250 km of transpressive motion took place between northern Ellesmere Island and Greenland.

(S,E,r) Rubin, C. M., 1984, Geologic setting and sulfide mineralization of the Smucker deposit, southcentral Brooks Range, Alaska [abs.]: Geological Society of America Abstracts with Programs, v. 16, no. 6, p. 640. **** Describes structure, mineralogy, and mineralization. Interprets tectonic setting of mineralization of Smucker deposit in Ambler Group schists as late Devonian epicratonic rift margin or back-arc basin.


Abstracts with Programs, v. 13, no. 7, p. 54 **** Uses the composition of Devonian to Mississippian meta-igneous rocks to interpret the tectonic setting in which these rocks formed.


(E) Schmidt, J. M., 1983a, Geology and Geochemistry of the Arctic prospect, Ambler District, Alaska: unpublished Ph.D. dissertation, Stanford University, California, 253 p. **** Summarizes the geologic setting, stratigraphy, alteration and chemistry of the Arctic prospect from drill core data.


(S,a) Schrader, F. C., 1904, A reconnaissance in northern Alaska: U.S. Geological Survey Professional Paper 20, 139 p. Results of the 1901 field season, including a description of the Paleozoic Skajit, Totsen, Stuver, Lisburne, and Fickett series, the Mesozoic Corwin, Anaktuvuk, Koyukuk, Bergman, and Nanushuk, series, the Cenozoic Colville series, and Pleistocene deposits. Also includes fossil age determinations, a correlation chart, and a summary of mineral resources.


Smith, P. S., 1912, The Alatna-Noatak region: U.S. Geological Survey Bulletin 520, p. 315-338. **** The schists from the headwaters of the Alatna and Noatak Rivers are thought to be equivalents of the Nome Group of the Seward Peninsula by both Smith and Mendenhall. The schists are considered to be early Paleozoic or older. Carbonates are thought to correspond to both Schrader's Skajit Formation and the Silurian dolomite horizon on the Seward Peninsula.


Stewart, B. D., 1933, Mining investigations and mine inspection in Alaska, including assistance to prospectors, biennium ending March 31, 1933: Juneau, Alaska, 192 p.


Sweeney, J. F., 1982, Mid-Paleozoic travels of Arctic Alaska: Nature, v. 298, p. 647-649. **** Middle Devonian to early Mississippian orogeny accompanied by left lateral translation of Arctic Alaska from a position adjacent to northern Greenland to a position near Banks Island. Late Jurassic counterclockwise rotation of Arctic Alaska subsequently opened the Arctic Ocean basin.


Geological Survey Open-File report 445, 16 p. **** Naming of Red Dog Creek and report of significant mineral potential there and in similar rocks in the western Brooks Range.


(S,T,a,u) Tailleur, I. L., Mamet, B. L., and Dutro, J. T., Jr., 1973, Revised age and structure interpretations of Nuka Formation at Nuka Ridge, northwestern Alaska: American Association of Petroleum Geologists Bulletin, v. 57, no. 7, p. 1348-1352. **** New collections of macrofossils and foraminifers indicates type section of the Nuka Formation has internal structural repetition. The Nuka formation is redefined as the arkosic unit from the middle of the previous type section.


(S,u) Tailleur, I. L., and Sable, E. G., 1963, Nuka Formation of Late Mississippian to Late Permian age, new formation in northern
**Alaska:** American Association of Petroleum Geologists Bulletin, v. 47, no. 4, p. 632-642. ***Naming paper for the Nuka Formation, subsequently redefined (Tailleur, Mamet, and Dutro, 1973).***


(T) Tailleur, I. L., and Snelson, Sigmund, 1969, Large-scale thrusting in northwestern Alaska possibly related to rifting of the Arctic Ocean: Geological Society of America Special Paper 121, p. 569. ***More than 150 miles of shortening due to southward underthrusting during counterclockwise rotation of northern Alaska, resulting from Jurassic rifting of the Canada Basin.***


Turner, D. L., Grybeck, Donald, and Wilson, F. H., 1975, Radiometric dates from Alaska—A 1975 compilation: Alaska Division Geological Geophysical Surveys Special Report 10, 64 p. **** K/Ar age for biotite from tuff in southeastern Baird Mountains quadrangle is 83.4 m.y.


Report 546, 164 p. **** Status report on knowledge of geology and mineral resource potential for each land withdrawal in the state of Alaska.


