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EOCENE MINERALIZATION AT MOUNT TOLMAN (KELLER), WASHINGTON, AND SILVER DYKE, MONTANA

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A culmination of magmatic activity affected a large region of the northwestern U.S. and western Canada about 50 m.y. ago (Armstrong, 1974; 1978; 1981). Plutons of great variety in size and petrography were emplaced, and economically important mineralization is associated with many of these intrusive igneous bodies or related to the hydrothermal circulation systems that they generated. Porphyry-type mineral deposits created during this brief but remarkable epoch of magmatism are illustrated by Berg, Bell, Rossland, Granisle, Catface, and Morrison in British Columbia (Christopher and Carter, 1976), and several deposits of the Idaho–Montana porphyry belt (Armstrong et al., 1977; Rostad, 1978).

We report here dates for two important mineral deposits that can now be added to the growing list of those formed during Eocene time, between 48 and 55 m.y. ago.

The K-Ar dating laboratory of the University of British Columbia is supported by a Canadian Natural Sciences and Engineering Research Council operating grant and the Government of British Columbia. K. Scott did the K analyses reported here. The decay constants used for K are 5.81×10^{-11}/yr, 4.962×10^{-10}/yr, and $^{40}K/K = 1.167 \times 10^{-4}$.

Mt. Tolman, Washington

Mt. Tolman is considered to the largest porphyry copper-molybdenum deposit in Washington, with a reserve in excess of half a billion tons of ore. It has been described by Pardee (1918), and his geologic description is followed.

Mt. Tolman, also known as the Keller porphyry, is associated with a Tertiary alaskitic to quartz monzonitic stock that intrudes the southern edge of the Colville quartz diorite batholith. Both plutons intrude Carboniferous metasedimentary and metavolcanic rocks. Mineralization and alteration are centered in the Tertiary stock, but extend into the Colville batholith and the Carboniferous metamorphic rocks.

The deposit contains well-developed potassic, phyllic, argillic, and propylitic alteration zones. Drilling by Kennecott from 1964 to 1973 established significant mineralization in the phyllic zone, and a sample collected during this episode of exploration was used for dating. The phyllic zone from which the dated sample was obtained is composed largely of sericite, quartz, and pyrite, although minor orthoclase, biotite, rutile, and molybdenite are also present. The intergrowth of sulfide and silicate is compatible with simultaneous formation of the ore and host silicates. It is therefore likely that the K-Ar date is for the mineralizing event.

Silver Dyke, Montana

The Silver Dyke Mine in the Neihart District has been of interest in the past for its precious and base metal and molybdenum potential. The District has been described by Weed (1900), Young (1927), and Schafer (1935), and this summary follows the geologic nomenclature used by these workers.

Precious and base metals and molybdenite occur zonally in veins and breccias that cut Precambrian gneiss and a granite stock. The Silver Dyke breccia dyke is the most productive precious and base metal ore structure in the District. A granite porphyry dyke of late intra-mineral or early post-mineral age cuts the breccia dyke. Samples of the porphyry dyke are rich in fresh orthoclase, and these were used for K-Ar dating. The date is a minimum value for the time of intrusion at the end of mineralization.

SAMPLE DESCRIPTIONS

1. *KELLER* — K-Ar
Mineralized, coarse-grained quartz monzonite (from mine pit, Mt. Tolman porphyry copper-molybdenum deposit; 48°03'35"N, 118°41'32"W; S31,T29N,R33E, Ferry Co., WA) with fresh K-spar and quartz, altered plagioclase, and mafic minerals.
Analytical data: K = 11.46, 11.45%; $^{*}Ar^{40} = 23.136 \times 10^{-6}$ cc/gm; $\Sigma Ar^{40} = 89.6\%$.
(K-feldspar) 51.2 ± 1.8 m.y.

2. *SILVER DYKE* — K-Ar
Quartz-feldspar porphyry (from drill core; 46°59'05"N, 110°41'45"W; Cascade Co., MT) with greenish-gray aphanitic groundmass.
Analytical data: K = 11.33, 11.21%, $^{*}Ar^{40} = 20.801 \times 10^{-6}$ cc/gm, $\Sigma Ar^{40} = 65.5\%$.
(K-feldspar) 46.9 ± 1.6 m.y.

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