

## ***K-Ar ages of Tertiary ash-flow tufts in the Carson City-Silver City area, central western Nevada***

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# K-AR AGES OF TERTIARY ASH-FLOW TUFFS IN THE CARSON CITY—SILVER CITY AREA, CENTRAL WESTERN NEVADA

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This article reports four new potassium-argon age determinations on ash-flow tuffs previously assigned to the Hartford Hill Rhyolite Tuff of former usage in central western Nevada. One sample (AD-49) was run by the Geochron Laboratories Division of Krueger Enterprises, Inc. in 1975. The remaining three were analyzed during 1976 at the U.S. Geological Survey laboratories in Menlo Park, Calif. employing procedures and equipment similar to those reported in Silberman and McKee (1971). Constants used in the age calculation are:  $\lambda_{e+\lambda} = 0.581 \times 10^{-10} \text{ yr}^{-1}$ ,  $\lambda_{\beta} = 4.96 \times 10^{-10} \text{ yr}^{-1}$ ,  $K^{40}/K_{\text{total}} = 1.167 \times 10^{-4} \text{ mole/mole}$ . Plus/minus ( $\pm$ ) represents estimated analytical uncertainty only, at the one sigma level.

## GEOLOGICAL DISCUSSION

Recently completed mapping in the New Empire 7½' quadrangle (Bingler, 1977) revealed that the Hartford Hill Rhyolite Tuff (Thompson, 1956, p. 50) is made up of a thick sequence of genetically and compositionally unrelated ash-flow tuff cooling units derived from widely separated source regions. The name Hartford Hill Rhyolite Tuff was subsequently abandoned (Bingler, 1978): some of the rocks previously assigned to this formation are now included in the Mickey Pass Tuff named in the Yerington area (Proffett and Proffett, 1976), or with as yet unnamed tuffs mapped in the Gillis and Gabbs Valley Ranges (Ekren, E. B., written comm., 1976). The bulk of the tuffs mapped in the Carson City-Silver City area and previously assigned to the Hartford Hill are now included in four new formations (Bingler, 1978), from oldest to youngest: Lenihan Canyon Tuff, Nine Hill Tuff, Eureka Canyon Tuff, and the Santiago Canyon Tuff. The dates reported here establish the Oligocene age for the Eureka Canyon and underlying formations and a Miocene age for the Santiago Canyon Tuff and provide additional data on the age of the Mickey Pass Tuff. The concordant 28 m.y. dates on biotite and plagioclase separated from vitrophyre at the base of the Mickey Pass Tuff agree well with K-Ar ages of 27.1 and 28.0 m.y. on biotite from basal vitrophyre in the Mickey Pass at its type locality in the Singatse Range (Proffett and Proffett, 1976, p. 16). Isotopic ages obtained from the Lenihan Canyon and Eureka Canyon Tuffs cluster at 25–26 m.y. and suggest that these compositionally and texturally distinct ash-flow tuffs were erupted as part of a regional volcanic episode involving different centers. As the Nine Hill Tuff unconformably overlies the Lenihan Canyon Tuff and is disconformably overlain by the Eureka Canyon Tuff, the Nine Hill must be about 26 m.y. old. The Miocene age

reported here for the Santiago Canyon Tuff is in good agreement with dates previously cited for the Hartford Hill Rhyolite Tuff by Whitebread (1976, p. 6) and Evernden and James (1964, p. 972).

## SAMPLE DESCRIPTIONS

- AD-49** K-Ar  
 Santiago Canyon Tuff (39°10'33"N, 119°38'11"W; NE/4 SW/4 SW/4 S9, T15N, R21E; New Empire 7½' quad., Carson City Co., NV). Gray, medium-grained, crystal-rich, strongly welded and devitrified, sphene-bearing hornblende-biotite quartz latite crystal-vitric tuff. *Analytical data:* (sanidine) K<sub>2</sub>O = 10.70, 10.62%; \*Ar<sup>40</sup> = 3.593 × 10<sup>-10</sup>, 3.119 × 10<sup>-10</sup>, 3.310 × 10<sup>-10</sup> mol/gm; \*Ar<sup>40</sup>/ΣAr<sup>40</sup> = 59, 57, 37%; (biotite) K<sub>2</sub>O = 7.24, 7.26%; \*Ar<sup>40</sup> = 2.370 × 10<sup>-10</sup>, 2.423 × 10<sup>-10</sup> mol/gm; \*Ar<sup>40</sup>/ΣAr<sup>40</sup> = 32, 31%. *Collected by:* E. C. Bingler and H. F. Bonham; *dated by:* Geochron Laboratories, Inc. *Comment:* Youngest known ash-flow tuff in the Carson City-Silver City-Virginia City area. Correlative with the tuff of Copper Mountain in the northern Gillis Range (Ekren, E. B., written comm., 1976).  
 (sanidine) 21.6 ± 0.9 m.y.  
 (biotite) 22.8 ± 0.7 m.y.
- NE-253A** K-Ar  
 Eureka Canyon Tuff (39°12'49"N, 119°43'34"W; C NE/4 NW/4 S34, T16N, R20E; New Empire 7½' quad., Carson City Co., NV). Gray-black, weakly welded and glassy, rhyolite vitric tuff. *Analytical data:* (sanidine) K<sub>2</sub>O = 9.43%; \*Ar<sup>40</sup> = 3.567 × 10<sup>-10</sup> mol/gm; \*Ar<sup>40</sup>/ΣAr<sup>40</sup> = 97%. *Collected by:* E. C. Bingler; *dated by:* E. H. McKee, U.S. Geol. Survey. *Comment:* Disconformably overlies the Nine Hill Tuff and is locally overlain by rhyolite tuff correlative with tuff near the Blue Sphinx, Gabbs Valley Range (Ekren, E. B., written comm., 1976).  
 (sanidine) 26.1 ± 0.2 m.y.
- NE-238** K-Ar  
 Lenihan Canyon Tuff (39°07'58"N, 119°42'35"W; NE/4 NW/4 NW/4 S14, T16N, R20E; Virginia City 7½' quad., Washoe Co., NV). Pale lavender-brown, fine-grained, strongly welded and devitrified, hornblende-biotite quartz latite vitric crystal tuff. *Analytical data:* (sanidine) K<sub>2</sub>O = 10.84, 10.87%; \*Ar<sup>40</sup> = 3.947 × 10<sup>-10</sup> mol/gm; \*Ar<sup>40</sup>/ΣAr<sup>40</sup> = 78%; (biotite) K<sub>2</sub>O = 7.35, 7.37%; \*Ar<sup>40</sup> = 2.851 × 10<sup>-10</sup> mol/gm; \*Ar<sup>40</sup>/ΣAr<sup>40</sup> = 81%. *Collected by:* E. C. Bingler; *dated by:* M. L. Silberman,

## 3. (continued)

U.S. Geol. Survey. *Comment:* Disconformably overlies the Mickey Pass Tuff and is unconformably overlain by the Nine Hill Tuff.

(sanidine)  $25.1 \pm 0.8$  m.y.  
(biotite)  $26.7 \pm 0.8$  m.y.

## 4. NE-205

K-Ar

Mickey Pass Tuff ( $39^{\circ}11'42''N$ ,  $119^{\circ}39'47''W$ ; NE/4 SW/4 NE/4 S6,T15N,R21E; New Empire  $7\frac{1}{2}'$  quad., Carson City Co., NV). Black, very crystal-rich, medium-grained, densely welded and glassy, rhyodacite crystal tuff. *Analytical data:* (biotite)  $K_2O = 8.51, 8.52\%$ ;  $*Ar^{40} = 3.462 \times 10^{-10}$  mol/gm;  $*Ar^{40}/\Sigma Ar^{40} = 56\%$ ; (plagioclase)  $K_2O = 0.927, 0.923\%$ ;  $*Ar^{40} = 0.3834 \times 10^{-10}$  mol/gm;  $*Ar^{40}/\Sigma Ar^{40} = 49\%$ . *Collected by:* E. C. Bingler and H. F. Bonham; *dated by:* M. L. Silberman, U.S. Geol. Survey. *Comment:* Sample collected from basal vitrophyre that rests on Mesozoic basement rocks within the New Empire quadrangle.

(biotite)  $28.0 \pm 0.8$  m.y.  
(plagioclase)  $28.6 \pm 0.9$  m.y.

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