A SUMMARY OF RADIOMETRIC AGE DETERMINATIONS ON TERTIARY VOLCANIC ROCKS FROM NEVADA AND EASTERN CALIFORNIA: PART II,[1] WESTERN NEVADA[2]

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The radiometric age determinations summarized comprise 73 previously published and 32 unpublished dates on samples collected from various localities in western Nevada. Sample descriptions, given here by locality number (keyed to map, fig. 1), include field or laboratory number, age, rock type, location, and for new ages, the analytical data used for their calculation. Short discussions of the geologic significance of many of the ages are included under comments. For some areas, groups of ages precede a short discussion of their topical significance.

All ages were determined by the K-Ar method. For the published ages, details of analytical procedure may be found in the literature sources given. Ages not published were determined by procedures used in Isotope Geology Laboratories of the U. S. Geological Survey (McKee and others, 1971) or by Geochron Laboratories of Krueger Enterprises, Cambridge, Mass. (Krueger and Schilling, 1972).

GEOLOGIC DISCUSSION

The area of rocks sampled covers 19,000 square miles, including Lyon, Douglas, Ormsby, Storey, Mineral, and Esmeralda Counties, and parts of Nye and Churchill Counties, and is shown in Figure 1 with the sample localities.

Samples are concentrated in several areas, in particular western Mineral County, Storey County, and the Goldfield area of Nye and Esmeralda Counties. There are large areas of western Nevada that have little or no radiometric geochronology, notably all of eastern Mineral County and the northeastern and northern areas of the region outlined, yet these are areas of extensive volcanic fields of various composition. The distribution of dates reflects in part detailed geochronologic studies of the U. S. Geological Survey in the mining districts of Aurora, Goldfield, Silver Peak, Tonopah, and Comstock, and those of Gilbert and others (1968) in Mono Basin.

Although widespread ash-flow tuffs occur in western Nevada, it also contains numerous local volcanic fields. The stratigraphy of most of the volcanic fields in western Nevada is poorly understood, as radiometric dating has not yet attained the geographic distribution necessary to correlate events across the region.

The volcanic rocks of the western Nevada can be divided into two groups that contrast both in overall composition and in mode of origin or emplacement: (1) ash-flow sheets of rhyolite and quartz latite, mostly emplaced between 28 and 20 m.y. ago; and (2) younger calc-alkalic rocks consisting of separate flows, tuffs, and intrusive plugs. The ash-flow sheets of the first group, though widespread, probably are not as voluminous as those of central Nevada, and none as old as the oldest central Nevada sheets have been found. Source areas, presumably calderas from which these sheets erupted, have not been located. The source for some of the ash-flow sheets may have been to the east (the central and eastern Nevada ignimbrite province of Cook, 1965). The northern Gillis and Gabbs Valley Ranges, which are composed largely of middle Miocene ash flows, in some places several thousand feet thick may be the source for some of the more westerly ash-flow sheets. Voluminous rhyolitic ash-flow activity ceased in western Nevada about 20 m.y. ago; volcanism has since been characterized by local lava flows, ash flows, and shallow intrusive rocks.

The younger volcanic rocks that form the second group are more varied in composition than the earlier ash-flow sheets. These rocks compose volcanic fields of calc-alkaline rocks, which generally are predominantly andesitic and dacitic in composition but range from rhyolite to alkali-olivine basalt. Separate flows, ash flows, flow breccias, air-fall tuffs, and intrusive plugs generally are of small volume compared with the earlier ash-flow sheets, but aggregate thicknesses of volcanic piles commonly exceed several thousand feet. Volcanic fields of this type occur in the Virginia and Carson Ranges

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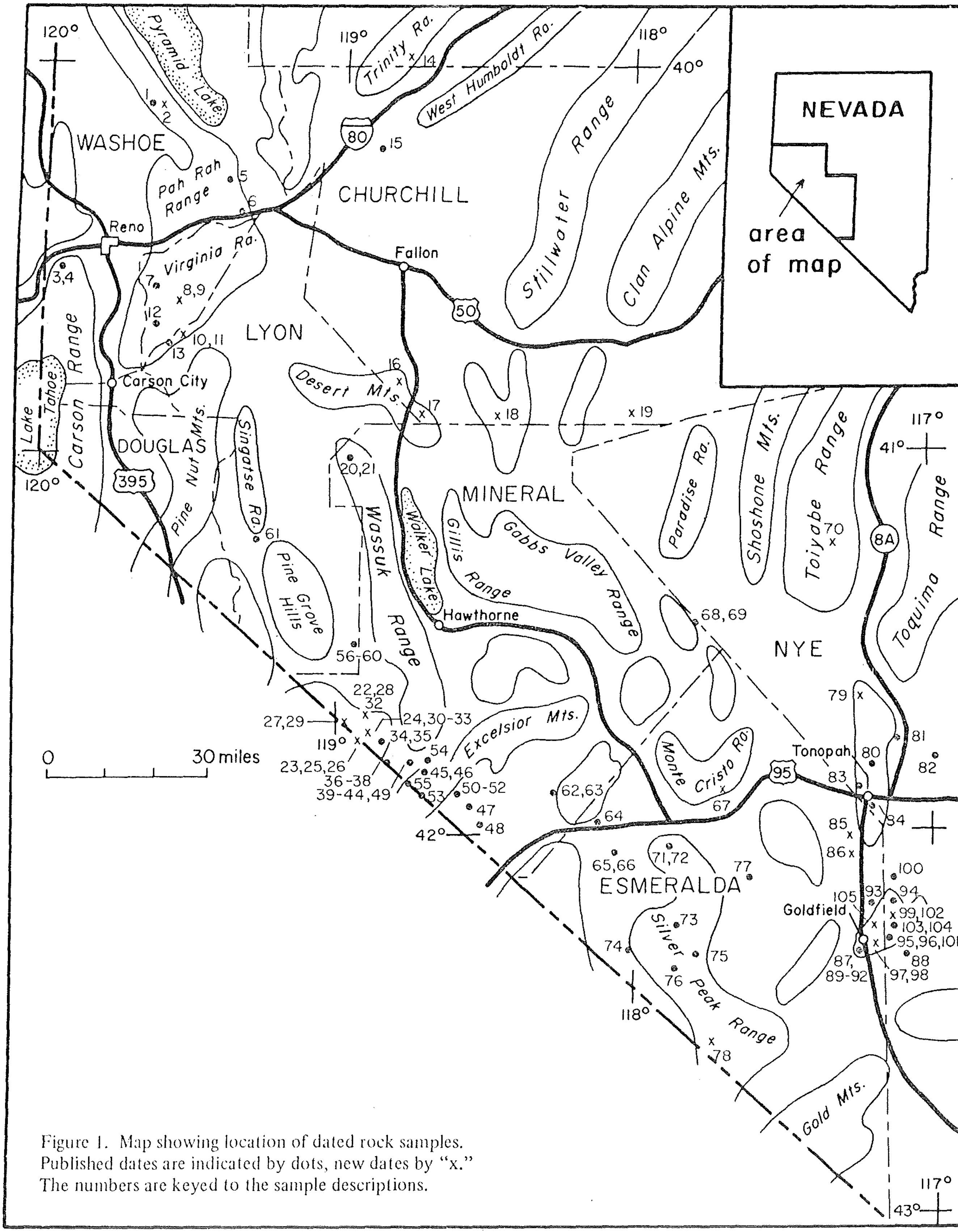

Figure 1. Map showing location of dated rock samples. Published dates are indicated by dots, new dates by "x." The numbers are keyed to the sample descriptions.

(Alta and Kate Peak Formations), the Bodie Hills (just west of the State boundary in the Mono Basin area), the Aurora area west of the Wassuk Range, the Goldfield Hills, the San Antonio Mountains (Kleinhampl and Ziony, 1967), the eastern part of the Gabbs Valley Range (Ross, 1961), and the Pah Rah Range (Bonham, 1969).

The calc-alkaline volcanic rocks in many areas intertongue with, or are superseded by, tuffaceous sedimentary rocks and air-fall tuffs locally named the Siebert, Coal Valley, Aldrich Station, or Esmeralda Formations. These rocks appear to have formed in separate, restricted basins and probably are the result of Basin and Range faulting that began in the period 15 to 20 m.y. ago. In some areas, notably the Virginia Range and the Anchorite Hills (southeast of the Wassuk Range), extensive fields of alkali-olivine basalt or trachyandesite (as much as 50 km^3 in volume) were erupted late in the Tertiary and Quaternary, particularly in the late Pliocene and Pleistocene. In other areas, such as the region surrounding Aurora, fields of alkaline andesites and dacites accompanied by rhyolite and alkali-olivine basalt or trachyandesite were erupted in late Cenozoic time.

A histogram of the ages summarized here, Figure 2, illustrates the nature of volcanism in the region through time. Comparison of this histogram with that in McKee and others (1971, fig. 2) shows the differences in volcanism between western and central Nevada. In central Nevada, ash-flow sheets erupted before 20 m.y. ago are the most voluminous rocks. Relatively little volcanism of any type has occurred in this region since that time. In western Nevada, in contrast, post-20-m.y. volcanism is dominant, although it is possible that future geologic studies may show that the overall volume of the older ash-flow sheets is, or once was, comparable to that of the younger andesitic, dacitic, and basaltic volcanism.

Another difference in the volcanism of central and western Nevada is the relation of basalts to other petrologic types. In western Nevada, basaltic and andesitic rocks intertongue, although in any one area the basalts tend to be younger. In central Nevada, basalts are at most places considerably younger than andesitic or rhyolitic rocks. In central Nevada, the andesitic volcanism precedes and in part overlaps the period of emplacement of the ash-flow sheets, whereas in western Nevada, andesitic volcanism in any one area generally occurs after the end of ash-flow emplacement.

The histograms indicate that no Tertiary volcanic rocks older than 30 m.y. occur (or have been identified yet) in western Nevada. Ash-flow sheets from about 28 to 20 m.y. form the earliest volcanic activity. Although a great volume of volcanic rock was erupted during this pre-20-m.y. period, only a small number of ages have been determined. Between about 20 and 18 m.y., little volcanism occurred, or has yet been identified. A hiatus in volcanic activity at this time is found at other places in the Great Basin; its significance is discussed by McKee and others (1970) and McKee (1971). Andesitic-dacitic volcanism was greatest in the period between 17 and 8 m.y., although some older andesites are present (includes data from adjacent eastern California (Kleinhampl and others, 1972; Silberman and Chesterman, 1972; Gilbert and others, 1968)). Local basins filled with tuffaceous sediments and air-fall tuffs have developed within the past 15 m.y. In some areas, flows of alkaline-olivine basalt and trachyandesite erupted during this 15-m.y. interval. Some of these are interbedded with the sedimentary rocks. Since about 5 m.y. ago, alkaline andesites and dacites have erupted from scattered vents in the region.

The histogram (fig. 2) illustrates the relative increase in importance of the basaltic volcanism with decreasing geologic age and shows that there is a general overlap of andesitic and basalt-rhyolite volcanism in time for the whole region. The available data, however, suggest that in any one area andesite tends to precede sedimentary rocks and basalts.

Western Nevada has been of major economic importance because of its large epithermal gold- and silver-bearing quartz veins. Metal districts in the region that produced ore worth $30 million or more are Aurora (Mineral County), Tonapah (Nye County), Goldfield (Esmeralda County), and the Comstock Lode (Storey County). Bodie (Mono County) in eastern California, just west of Aurora, produced a similar amount. Numerous smaller districts produced less but significant quantities of gold and silver (Bonham, 1969, 1967; Koschmann and Bergendahl, 1968). Recent study of the geochronology of the large districts (Bonham, 1969; Silberman and Ashley, 1970; Silberman and Chesterman, 1972) suggests some significant similarities. All districts mentioned are in Tertiary volcanic rocks, and in all of them the host rocks are the calc-alkaline andesite-dacite suite. K-Ar ages of the ore deposits based on measurements on vein and alteration minerals, including adularia and alunite (Silberman and Ashley, 1970; Bonham, 1969; Silberman and Chesterman, 1972: Silberman and F. J. Kleinhampl, unpublished data), indicate that mineralization occurred during the end stages of, or shortly after, the end of the calc-alkaline volcanism. The postore volcanic rocks, either basalt-rhyolite association as at Goldfield or alkalic volcanics as at Bodie-Aurora, are in general not mineralized or affected by major hydrothermal alteration.

Paleozoic metasedimentary rocks, Mesozoic plutonic rocks, and Tertiary rhyolitic rocks are host rocks for epithermal mineralization. The relation of many of these deposits to Tertiary volcanism remains to be demonstrated. The large areas of volcanic rocks in western Nevada of only vaguely known age should be of interest for exploration targets. Knowledge of their ages and the age patterns of the mineralization in the region will yield a better evaluation of their mineral potential.

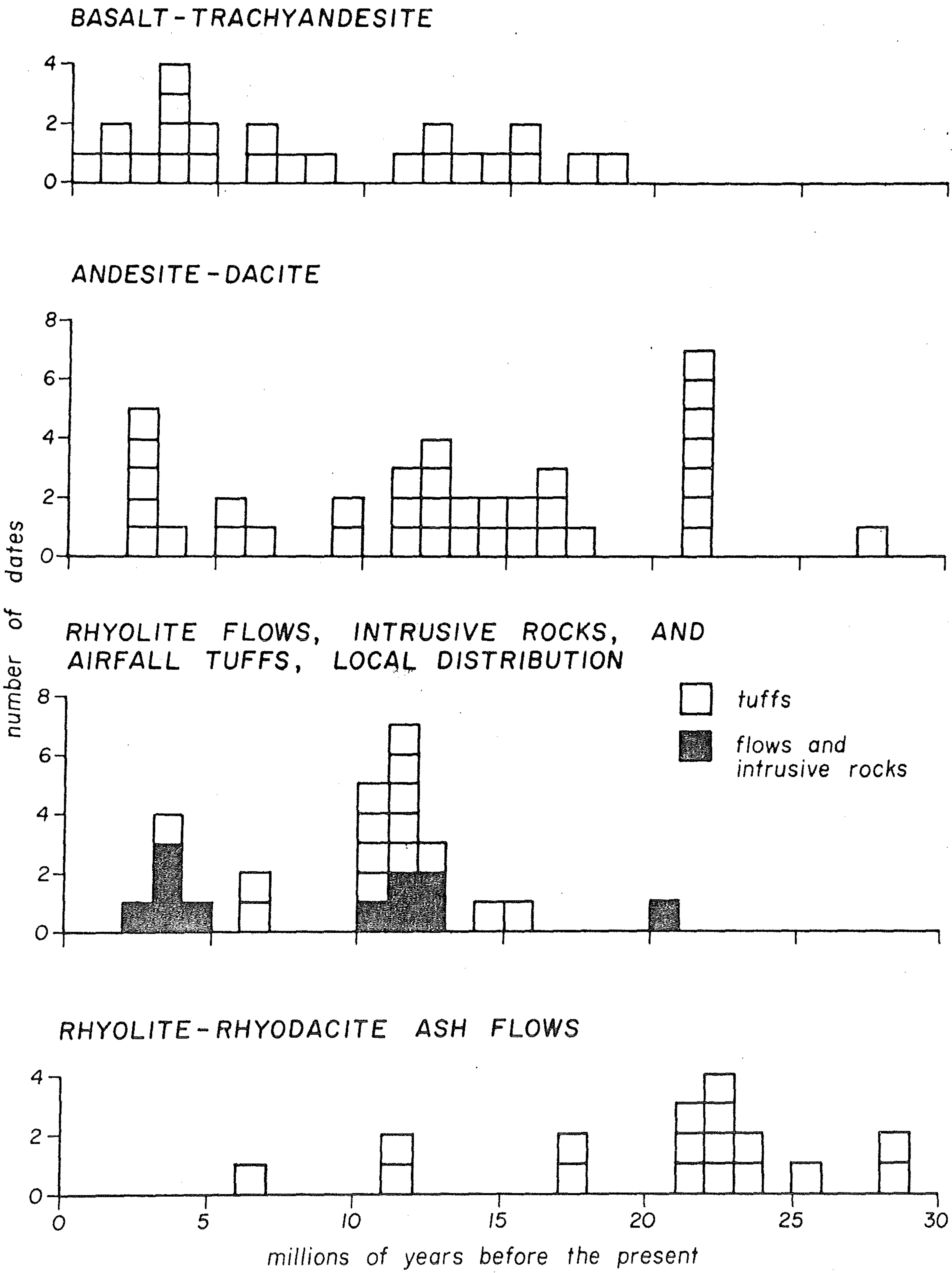

Figure 2. Summary of K-Ar ages of volcanic rocks in western Nevada.

SAMPLE DESCRIPTIONS

Virginia Mountains

1. Evernden and James (1964) K-Ar (plagioclase) 12.4 m.y.
Sample KA1244

Dacite tuff (S central Sec. 4, T23N, R21E; 39°53'12"N, 119°36'42"W; Virginia Mtns; Washoe Co., NV). Collected by: H. Bonham, J. Gimlett, Nev. Bur. Mines, and D. Slemmons, Univ. Nev.; dated by: J. F. Evernden, Univ. Calif. Berkeley. Comment: Volcanic flow immediately above Pyramid flora.

2. Bonham (1969) K-Ar (plagioclase) 15.2±2.4 m.y.
Sample AD-16

Pyramid Formation (Bonham, 1969). Olivine basalt (NE/4 NW/4 Sec. 3, T23N, R21E; 39°53'30"N, 119°36'30"W; Washoe Co., NV). Collected by: H. F. Bonham, Nev. Bur. Mines; dated by: Geochron Laboratories, Inc. Comment: Overlies diatomite unit in which Pyramid flora occurs (Axelrod, 1966), and is unconformably overlain by tuff sample no. 1).

Carson Range

3. Evernden and James (1964) K-Ar (plagioclase) 5.7 m.y.
Sample KA1286

Coal Valley Formation (Axelrod, 1958). Andesitic tuff (N central Sec. 16, T19N, R18E; 39°31'12"N, 119°57'48"W; UCMP Loc. P102; Carson Range; Washoe Co., NV). Collected by: G. T. James, Univ. Calif. Berkeley; dated by: J. G. Evernden, Univ. Calif. Berkeley. Comment: Andesitic tuff interbedded with leaf-bearing tuffaceous shale containing Verdi flora (Axelrod, 1958).

4. Evernden and James (1964) K-Ar (whole rock) 11.0 m.y.
Sample KA1259

Olivine basalt (Sec. 14, T19N, R18E; 39°31'N, 118°56'W; 1 mi E of UCMP Loc. P102; Mogul; Washoe Co., NV). Collected by: G. T. James, Univ. Calif. Berkeley; dated by: J. F. Evernden, Univ. Calif. Berkeley. Comment: Flow is 400' below a fossil mammal horizon of possible Clarendonian age (Evernden and James, 1964).

Pah Rah Range

5. Bonham (1969) K-Ar (whole rock) 14.5±1.5 m.y.
Sample AD-15

Chloropagus Formation (Axelrod, 1958). Olivine basalt flow (SE/4 Sec. 4, T21N, R23E; 39°42'49"N, 119°24'03"W; Washoe Co., NV). Collected by: H. F. Bonham, Nev. Bur. Mines; dated by: Geochron Laboratories, Inc. Comment: Base of formation.

6. Evernden and James (1964) K-Ar (sanidine) 22.8 m.y.
Sample KA1288, KA1289 (plagioclase) 22.7 m.y.

Hartford Hill Rhyolite (?). Rhyolite welded tuff (SW/4, NE/4 Sec. 14, T20N, R23E; 39°36'12"N, 119°21'54"W; Pah Rah Range; Washoe Co., NV). Collected by: R. Rose, Nev. Bur. Mines; dated by: J. F. Evernden, Univ. Calif. Berkeley. Comment: Rhyolite welded tuff, similar to or equivalent to the Hartford Hill Rhyolite.

Virginia Range

7. Dalrymple and others (1967) K-Ar (whole rock) 6.90±0.19 m.y.
Sample W-22

Lousetown Formation Basalt (NW/4 Sec. 21, T18N, R21E; 39°22′00″N, 119°37′57″W; Storey Co., NV). Collected by: G. B. Dalrymple, Allan Cox, R. R. Doell, and C. S. Gromme′, U. S. Geological Survey; dated by: G. B. Dalrymple, U. S. Geological Survey. Comment: Second flow above creek bed, lower part of the Lousetown Formation.

8. G/UCD-GAX17 K-Ar (biotite) 12.3±0.5 m.y.

Coal Valley Formation (Bonham, 1969); Truckee Formation (Thompson and White, 1964). Pumiceous tuff breccia, rhyolite (S central Sec. 30, T18N, R22E; 39°23′34″N, 119°33′12″W; Storey Co., NV). Analytical data: K_2O = 6.93%; $\overset{*}{Ar}{}^{40}$ = 1.575 x 10^{-10}, 1.630 x 10^{-10}, 1.500 x 10^{-10}, 1.415 x 10^{-10} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 18.7%, 18.9%, 15.8%, and 15.2%. Collected by: D. Axelrod, Univ. Calif. Davis, and H. F. Bonham, Nev. Bur. Mines; dated by: Geochron Laboratories, Inc. Comment: Mineral separated from large pumice block. Date considered tentative–subject to additional work in progress. It supports the essentially equivalent age of upper part of Kate Peak Formation which is interbedded with the Truckee Formation in this area (Thompson and White, 1964). See sample 9.

9. USGS(M)-C1 K-Ar (biotite) 12.4±0.2 m.y.

Kate Peak Formation. Vitrophyre member, glassy rhyolite flow, upper part of formation (W central Sec. 29, T18N, R22E; 39°23′32″N, 119°32′32″W; Storey Co., NV). Analytical data: K_2O = 8.09%; $\overset{*}{Ar}{}^{40}$ = 1.492 x 10^{-10} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 48.0%. Collected by: M. L. Silberman, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: This age is the same within analytical uncertainty as that of no. 8 on the Truckee Formation and supports Thompson and White's (1964) conclusion of the essentially equivalent age of the Truckee and upper part of the Kate Peak.

10. Bonham (1969) K-Ar (plagioclase) 12.8±0.8 m.y.
Sample AD-12

Kate Peak Formation. Porphyritic dacite flow (NE/4 Sec. 9, T16N, R21E; 39°16′29″N, 119°38′21″W; W slope of Kate Peak; Lyon Co., NV). Collected by: H. F. Bonham and L. H. Beal, Nev. Bur. Mines; dated by: Geochron Laboratories, Inc. Comment: 200 ft stratigraphically above base of formation.

11. USGS(M)-C9 K-Ar (plagioclase) 16.5±0.5 m.y.

Alta Formation. Porphyritic pyroxene andesite (SW/4 SE/4 Sec. 4, T16N, R21E; 39°16′27″N, 119°37′41″W; along Storey Co.–Lyon Co. boundary, NV). Analytical data: K_2O = 0.359%; $\overset{*}{Ar}{}^{40}$ = 0.0878 x 10^{-10} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 38.9%. Collected by: M. L. Silberman, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: The Alta, like the overlying Kate Peak, is a complex unit of lava flows, tuff breccias, and intrusive rocks. An interbedded sedimentary unit, the Sutro member yielded a flora suggesting an early Miocene age (Axelrod, 1966). Due to complexities of structure, the relation of the sample to the Sutro member is not known, although its lithology suggests that it is stratigraphically above the Sutro (Calkins, 1944).

12. Evernden and James (1964) K-Ar (sanidine) 22.7 m.y.
Sample KA1267

Hartford Hill Rhyolite Tuff. Rhyolitic welded tuff (NW/4 Sec. 31, T17N, R21E; Storey Co., NV). Collected by: R. Rose, San Jose State College; dated by: J. F. Evernden, Univ. Calif. Berkeley. Comment: Rhyolite conformably underlying Alta Formation in which shales containing Sutro flora are interbedded. The location does not check out with geology as no Alta occurs in vicinity–probably incorrect location.

13. Doell and others (1966) — K-Ar — (whole rock) 1.14±0.04 m.y.
Sample S18

McClellan Peak basalt. Olivine basalt (SE/4 Sec. 8, T16N, R21E; 39°15′36″N, 119°38′47″W; Lyon Co., NV). Collected by: R. R. Doell, U. S. Geological Survey; dated by: G. B. Dalrymple, U. S. Geological Survey.

Trinity Range

14. Wilden and Speed (in press) — K-Ar — (hornblende) 12.0 m.y.
Sample 67W86

Dacite flow (SW/4 NE/4 Sec. 21, T24N, R28E; 39°56′24″N, 118°50′24″W; Pershing Co., NV). Analytical data: K_2O = 0.748%; $\overset{*}{Ar}{}^{40} = 1.32 \times 10^{-11}$ mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 33%. Collected by: R. W. Willden, U. S. Geological Survey; dated by: R. W. Kistler, U. S. Geological Survey.

Desert Peak

15. Evernden and James (1964) — K-Ar — (plagioclase) 13.9 m.y.
Sample KA1261

Chloropagus Formation (Axelrod, 1956). Andesitic tuff (Sec. 3, T22N, R27E; 39°48′N, 118°56′W; UCMP P4134, 7,000 ft N of Desert Peak; Hot Springs Mtns.; Churchill Co., NV). Collected by: G. T. James, Univ. Calif. Berkeley; dated by: J. F. Evernden, Univ. Calif. Berkeley. Comment: Sample from andesitic tuff interbedded with leaf-bearing tuffaceous shales containing Chloropagus flora (Axelrod, 1956).

Desert Mountains, Terrill Mountains

16. Willden and Speed (in press) — K-Ar — (hornblende) 12.2 m.y.
Sample 66CH22

Hornblende andesite lapilli tuff (SW/4 NW/4 Sec. 29 (unsurveyed), T16N, R29E; 39°13′21″N, 118°45′24″W; Pershing Co., NV). Analytical data; K_2O = 0.517%; $\overset{*}{Ar}{}^{40} = 0.932 \times 10^{-11}$ mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 23%. Collected by: R. W. Willden, U. S. Geological Survey; dated by: R. W. Kistler, U. S. Geological Survey.

17. Willden and Speed (in press) — K-Ar — (hornblende) 21.2 m.y.
Sample 66CH159

Hornblende dacite (NW/4 SW/4 Sec. 2, T14N, R29E; 39°06′00″N, 118°42′36″W; Pershing Co., NV). Analytical data: K_2O = 0.742%; $\overset{*}{Ar}{}^{40} = 0.233 \times 10^{-10}$ mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 36%. Collected by: R. W. Willden, U. S. Geological Survey; dated by: R. W. Kistler, U. S. Geological Survey.

Cocoon Mountains

18. Willden and Speed (in press) — K-Ar — (hornblende) 17.6 m.y.
Sample 66CH213

Hornblende andesite (SE/4 Sec. 24, T15N, R31E; 39°08′48″N, 118°27′42″W; Churchill Co., NV). Analytical data: K_2O = 0.558%; $\overset{*}{Ar}{}^{40} = 1.46 \times 10^{-11}$ mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 34%. Collected by: R. W. Willden, U. S. Geological Survey; dated by: R. W. Kistler, U. S. Geological Survey.

Slate Mountain Area

19. Willden and Speed (in press) K-Ar (hornblende) 27.0 m.y.
Sample 67W152

Andesite (SE/4 Sec. 8, T14N, R35E; 39°05'24"N, 118°03'30"W; Churchill Co., NV). Analytical data; K_2O 0.644%; $\overset{*}{Ar}^{40}$ = 2.58 x 10^{-11} mole/gm; $\overset{*}{Ar}^{40}/\Sigma Ar^{40}$ = 39%. Collected by: R. W. Willden, U. S. Geological Survey; dated by: R. W. Kistler, U. S. Geological Survey.

Wassuk Range

20. Bingler (1972) K-Ar (biotite) 25.2±1.0 m.y.
Sample G-B1945/NBM AD45

Augite rhyodacite vitrophyre, welded crystal tuff (NE/4 Sec. 13, T13N, R27E; 38°59'26"N, 118°53'54"W; Mineral Co., NV). Collected by: E. C. Bingler, Nev. Bur. Mines; dated by: Geochron Laboratories, Inc.

21. Bingler (1972) K-Ar (biotite) 28.5±1.1 m.y.
Sample GB-1788/NBM AD43

Moderately welded, hornblende quartz-latite tuff (SW/4 Sec. 23, T13N, R27E; 38°58'30"N, 118°56'20"W; Mineral Co., NV). Collected by: E. C. Bingler, Nev. Bur. Mines; dated by: Geochron Laboratories, Inc.

Aurora-Cedar Hill-Trench Canyon
Alkali Valley Area

22. USGS(M)-711-67 K-Ar (hornblende) 13.5±0.3 m.y.

Porphyritic hornblende andesite of Aurora mining district (E border, Sec. 13, T5N, R27E; 38°17'22"N, 118°54'33"W; in Aurora Creek Valley; Mineral Co., NV). Analytical data; Hornblende (4% pyroxene) K_2O = 0.708%; $\overset{*}{Ar}^{40}$ = 1.413 x 10^{-11} mole/gm; $\overset{*}{Ar}^{40}/\Sigma Ar^{40}$ = 49.4%. Collected by: M. L. Silberman, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: This is a relatively unaltered part of the andesitic host rock sequence of the Aurora mining district. It is overlain by rhyolite, correlative with sample no. 28.

23. USGS(M)-668-G10 K-Ar (hornblende) 14.4±0.3 m.y.

Hornblende andesite of Aurora mining district (NE corner Sec. 6, T4N, R28E; 38°14'25"N, 118°53'30"W; approximately 1 mi E of Calif. Border; Mineral Co., NV). Analytical data: Hornblende (4% pyroxene) K_2O = 0.658%; $\overset{*}{Ar}^{40}$ = 1.403 x 10^{-11} mole/gm; $\overset{*}{Ar}^{40}/\Sigma Ar^{40}$ = 43.0%. Collected by: F. J. Kleinhampl and M. L. Silberman, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: Altered, mildly propylitized andesite, correlative with the mineralized andesite of the Aurora mining district. The hornblende occurs as large phenocrysts and apparently is not affected by the hydrothermal alteration which usually destroys the ferro-magnesium minerals. Chemical analysis suggests this rock has not suffered gain or loss of major elements.

24. USGS(M)-711-8 K-Ar (plagioclase) 15.4±0.3 m.y.

Intrusive, porphyritic pyroxene-andesite of Aurora mining district (NE/4 NE/4 Sec. 30, T5N, R28E; 38°16'05"N, 118°53'30"W; Mineral Co., NV). Analytical data: K_2O = 0.993%; $\overset{*}{Ar}^{40}$ = 7.144 x 10^{-11} mole/gm; $\overset{*}{Ar}^{40}/\Sigma Ar^{40}$ = 42.6%. Collected by: M. L. Silberman, F. J. Kleinhampl, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: Intrusive phase of the andesitic host rock sequence of the Aurora mining district. This rock is unaltered. It may be a volcanic neck from which flows of the Aurora mineralized andesites were erupted.

25. Gilbert and others (1968) K-Ar (plagioclase) 12.5±0.3 m.y.
Sample KA2048

Biotite-hornblende andesite porphyry of west Brawley Peak (center N/2 Sec. 36, T5N, R27E; 38°15'08"N, 118° 55'03"W; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, and K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley. Comment: See sample 26 from same locality.

26. USGS(M)-712-1 K-Ar (biotite) 11.2±0.2 m.y.
(plagioclase) 10.9±0.3 m.y.
(hornblende) 11.6±0.3 m.y.

Intrusive biotite hornblende andesite porphyry of west Brawley Peak. Felsporphyritic andesite of Al-Rawi (1970) (center N/2 Sec. 36, T5N, R27E; 38°15'08"N, 118°55'03"W; Mineral Co., NV). Analytical data: (Biotite) K_2O = 8.47%; $\overset{*}{Ar}{}^{40}$ = 1.405 x 10^{-10} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 50.1%. (Hornblende) K_2O = 0.690%; $\overset{*}{Ar}{}^{40}$ = 1.186 x 10^{-11} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 38.3%. (Plagioclase) K_2O = 0.594%; $\overset{*}{Ar}{}^{40}$ = 0.962 x 10^{-11} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 44.8%. Collected by: M. L. Silberman and F. J. Kleinhampl, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: Flows from the west Brawley intrusive mass overlie altered andesites of the Aurora mining district. Sample no. 25 is from approximately the same area as no. 26. This rock is characterized by large phenocrysts of plagioclase (up to 1 cm across). A more felsic variety with the same large plagioclase phenocrysts crops out in Bodie Canyon to the west (see sample no. 27).

27. USGS(M)-710-7 K-Ar (biotite) 11.2±0.2 m.y.

Rhyolite porphyry of Bodie Canyon (NE corner Sec. 23, T5N, R27E; 38°16'56"N, 118°55'41"W; Mineral Co., NV). Analytical data: K_2O = 8.36%; $\overset{*}{Ar}{}^{40}$ = 1.393 x 10^{-10} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 73.7%. Collected by: M. L. Silberman, U. S. Geological Survey. Comment: This rock is a more felsic variety of the biotite hornblende andesite porphyry of west Brawley. It shows the large feldspar phenocrysts and is approximately the same age.

28. USGS(M)-NTS10B K-Ar (biotite) 10.9±0.2 m.y.
(sanidine) 11.0±0.2 m.y.

Porphyritic rhyolite flow (NW/4 SE/4 Sec. 7, T5N, R28E; 38°18'04"N, 118°53'48"W; Mineral Co., NV). Analytical data: (Biotite) K_2O = 8.37%; $\overset{*}{Ar}{}^{40}$ = 1.357 x 10^{-10} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 55.7%. (Sanidine) K_2O = 11.3%; $\overset{*}{Ar}{}^{40}$ = 1.836 x 10^{-10} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 63.5%. Collected by: M. L. Silberman, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: This flow is part of a rhyolitic complex cropping out in Bodie Canyon, west and north of the Aurora mining district. Parts of the rhyolite are altered, but no mineralization occurs within it. The age of this rhyolite (see sample no. 29 also) overlaps the age of mineralization of the Aurora mining district (F. J. Kleinhampl and M. L. Silberman, unpublished data).

29. USGS(M)-Baghdad K-Ar (sanidine) 9.9±0.3 m.y.
(plagioclase) 10.2±0.4 m.y.

Porphyritic rhyolite intrusive (E central Sec. 22, T5N, R27E; 39°16'43"N, 118°56'48"W; Mineral Co., NV). Analytical data: (Sanidine) K_2O = 11.40%; $\overset{*}{Ar}{}^{40}$ = 1.668 x 10^{-10} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 33.1%. (Plagioclase) K_2O = 0.693%; $\overset{*}{Ar}{}^{40}$ = 0.1048 x 10^{-10} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 23.4%. Collected by: M. L. Silberman and F. J. Kleinhampl, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: Part of 10 to 11 m.y.-old rhyolite complex outcropping north and east of the Aurora mining district (see also sample no. 28). The rhyolitic complex is the same age as the mineralization of Aurora, and may be genetically related to the ore deposits (F. J. Kleinhampl and M. L. Silberman, unpublished data).

30. USGS(M)-670G4 K-Ar (biotite) 2.5±0.1 m.y.

Glassy, porphyritic rhyolite plug (NE/4 NW/4 Sec. 20, T5N, R28E; 38°16′52″N, 118°53′03″W; Mineral Co., NV). Analytical data: $K_2O = 8.75\%$; $\overset{*}{Ar}{}^{40} = 3.252 \times 10^{-11}$ mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40} = 24.9\%$. Collected by: F. J. Kleinhampl and M. L. Silberman, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: This small plug intrudes altered mineralized andesite of the Aurora mining district. Several large veins are cut off at the contact.

31. USGS(M)-610-1B K-Ar (biotite) 2.5±0.2 m.y.
(hornblende) 2.7±0.2 m.y.

Porphyritic biotite-hornblende andesite intrusive (SE/4 NE/4 Sec. 21, T5N, R28E; 38°16′40″N, 118°51′31″W; Mineral Co., NV). Analytical data: (Biotite) $K_2O = 7.65\%$; $\overset{*}{Ar}{}^{40} = 2.844 \times 10^{-11}$ mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40} = 25.0\%$. (Hornblende) $K_2O = 0.948\%$; $\overset{*}{Ar}{}^{40} = 3.790 \times 10^{-12}$ mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40} = 18.4\%$. Collected by: J. F. Kleinhampl, M. L. Silberman, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: This plug is east of the Aurora mining district and is not in contact with the host rocks. It is overlain by younger basalts of Mount Hicks (no. 34).

32. USGS(M)-672-2 K-Ar (whole rock) 0.25±0.05 m.y.

Basaltic andesite of Aurora-Crater (NE/4 NW/4 Sec. 8, T5N, R28E; 38°18′46″N, 118°52′57″W; Mineral Co., NV). Analytical data: $K_2O = 3.27\%$; $\overset{*}{Ar}{}^{40} = 1.205 \times 10^{-12}$ mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40} = 6.6\%$. Collected by: M. L. Silberman, F. R. Glass, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: The Aurora-Crater volcano is a complex of lavas and dikes with a central partly collapsed core within which the cinder cones have been built. It has suffered minimal erosion and retains geomorphic features common to very young volcanoes (Kleinhampl and others, 1972). It occupies about 8 square miles, north of the Aurora mining district. Its age is the youngest isotopic age on volcanic rock from this area.

33. USGS(M)-611-5 K-Ar (whole rock) 2.2±0.1 m.y.
(hornblende) 2.5±0.2 m.y.

Hornblende andesite flow (SE/4 SE/4 Sec. 28, T5N, R28E; 38°15′28″N, 118°51′21″W; Mineral Co., NV). Analytical data: (Whole rock) $K_2O = 4.48\%$; $\overset{*}{Ar}{}^{40} = 1.451 \times 10^{-11}$ mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40} = 29.1\%$. (Hornblende, 5% pyroxene) $K_2O = 1.09\%$; $\overset{*}{Ar}{}^{40} = 3.989 \times 10^{-12}$ mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40} = 21.4\%$. Collected by: M. L. Silberman, F. J. Kleinhampl, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: This volcanic flow overlies altered andesite south of the main part of the Aurora mining district.

34. Gilbert and others (1968) K-Ar (whole rock) 1.6±0.1 m.y.
Sample KA2089

Olivine basalt of Mount Hicks (N/2 Sec. 2, T4N, R28E; 38°14′21″N, 118°49′35″W; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley. Comment: Overlies rhyolite (see sample no. 35).

35. Gilbert and others (1968) K-Ar (sanidine) 3.6±0.1 m.y.
Sample KA2066

Rhyolite perlite of Mount Hicks (center N boundary, Sec. 36, T5N, R28E; 38°15′22″N, 118°48′31″W; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley. Comment: Underlies basalt (no. 34). Most of Mount Hicks is rhyolite.

36. Gilbert and others (1968) K-Ar (plagioclase) 2.7±0.8 m.y.
Sample KA2003

Pyroxene andesite flow of Cedar Hill (SW corner NW/4 Sec. 30, T4N, R29E; 38°10′42″N, 118°49′12″W; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, K. R. LaJoie, Y. Al-Rawi, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley.

37. Gilbert and others (1968) K-Ar (plagioclase) 2.8±0.4 m.y.
Sample KA1859

Hornblende andesite of Cedar Hill (SE corner NW/4 Sec. 30, T4N, R29E; 38°10′42″N, 118°49′12″W; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, K. R. LaJoie, Y. Al-Rawi, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley.

38. Gilbert and others (1968) K-Ar (biotite) 2.7±0.2 m.y.
Sample KA1912

Biotite-pyroxene pumice of Cedar Hill (center Sec. 30, T4N, R29E; 38°10′42″N, 118°49′12″W; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, K. R. LaJoie, Y. Al-Rawi, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley. Comment: The last three samples are in stratigraphic order with no. 36 being the youngest. The preceeding 9 samples (nos. 30 through 38) are a complex of young, alkaline volcanic rocks ranging from 3.6 to 0.25 m.y. in age and consist of sub-alkaline olivine basalt, basaltic andesite, andesite, dacite and rhyolite flows, domes and plugs. These young volcanics represent a fundamental change in the chemical nature of volcanism in the Mono Basin area, from an earlier calk-alkaline volcanic suite to one of alkali-calcic or alkaline nature (Kleinhampl and others, in press). Their estimated volume is 30 km^3 (Gilbert and others, 1968).

Anchorite Hills-Excelsior Mountains

Huntoon Valley Area

39. Dalrymple and others (1967) K-Ar #1 (sanidine) 3.32±0.10 m.y.
Sample W19, nos. 1 and 2
(biotite) 3.39±0.24 m.y.
#2 (sanidine) 3.19±0.10 m.y.
(biotite) 3.45±0.17 m.y.

Latite perlite (E central T4N, R29E; 38°11′23″N, 118°42′44″W; 1,300 ft, N32°E of BM-7401, along Highway 31; Mineral Co., NV). Collected by: G. B. Dalrymple, A. Cox, R. Doell, C. S. Gromme′, U. S. Geological Survey; dated by: G. B. Dalrymple, U. S. Geological Survey.

40. Gilbert and others (1968) K-Ar (sanidine) 3.5±0.1 m.y.
Sample KA1813

Biotite-latite perlite (E central T4N, R29E; 38°11′23″N, 118°42′44″W; ¼ m N30°E of BM-7401 along Highway 31; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley.

41. Dalrymple and others (1967) K-Ar (biotite) 3.46±0.14 m.y.
Sample W20
(plagioclase) 3.77±0.34 m.y.

Biotite andesite (E central T4N, R29E; 38°11′31″N, 118°42′54″W; Mineral Co., NV). Collected by: A. Cox, R. Doell, C. S. Gromme′, G. B. Dalrymple, U. S. Geological Survey; dated by: G. B. Dalrymple, U. S. Geological Survey. Comment: This and previous 2 samples (nos. 39-41) are related to the alkalic volcanic rocks of the Aurora-Cedar Hills and Trench Canyon areas.

42. Gilbert and others (1968) K-Ar (sanidine) 3.4±0.1 m.y.
Sample KA1856

Rhyolitic pumice block in tuffaceous beds, underlies basalt (S central T4N, R29E; 38°10′40″N, 118°44′48″W; elevation 7,340 ft, approximately 1,400 ft W of BM-7257 along Highway 31; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley.

43. Dalrymple and others (1967) K-Ar (whole rock) 3.50±0.11 m.y.
Sample W21

Olivine basalt of Anchorite Hills (Sec. 23, unsurveyed, T4N, R29E; 38°11′24″N, 118°42′48″W; Mineral Co., NV). Collected by: G. B. Dalrymple, A. Cox, R. Doell, C. S. Gromme′, U. S. Geological Survey; dated by: G. B. Dalrymple, U. S. Geological Survey.

44. Gilbert and others (1968) K-Ar (whole rock) 3.7±0.1 m.y.
Sample KA1867

Olivine basalt of Anchorite Hills (T4N, R29E; 38°10′39″N, 118°44′10″W; hill E of BM-7257 along Highway 31; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, and K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley.

45. Gilbert and others (1968) K-Ar (whole rock) 3.9±0.1 m.y.
Sample KA1876

Olivine basalt of Anchorite Hills (SE/4 T4N, R29E; 38°10′57″N, 118°41′57″W; 0.85 mi S78E of BM-7401 along Highway 31, Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley.

46. Gilbert and others (1968) K-Ar (whole rock) 4.5±0.2 m.y.
Sample KA1866

Olivine basalt of Anchorite Hills (T4N, R29E; 38°10′02″N, 118°42′11″W; 1.55 mi S45°E, from BM-7401 on Highway 31, W of Anchorite Pass; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley.

47. Gilbert and others (1968) K-Ar (whole rock) 2.7±0.1 m.y.
Sample KA2016

Olivine basalt (Sec. 31, unsurveyed, T3N, R31E; 38°04′17″N, 118°33′48″W; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley.

48. Gilbert and others (1968) K-Ar (whole rock) 3.1±0.1 m.y.
Sample KA2015

Olivine basalt (SW/4 Sec. 9, T2N, R31E; 38°02′46″N, 118°31′46″W; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley. Comment: This and the preceding 5 samples (nos. 43-48) are part of an extensive field of thin, alkali-olivine basalt flows which cover nearly 300 square miles east and south of Mono Lake in Nevada and California. The basalts, which are intercalated with small volumes of rhyolite, andesite and latite, were erupted from numerous local centers between 2.6 and 4.5 m.y. ago. The aggregate thickness of these flows locally exceeds 600 feet. Their volume is estimated as 65 km^3 (Gilbert and others, 1968).

49. Dalrymple and others (1967) K-Ar (biotite) 9.52±0.38 m.y.
Sample W23

Biotite-augite latite tuff (S central T4N, R29E; 38°10'34"N, 118°44'34"W; 500 ft S30°W of BM-7257, 30 ft NW of road, Highway 31; Mineral Co., NV). Collected by: G. B. Dalrymple, A. Cox, R. R. Doell, and C. S. Gromme', U. S. Geological Survey; dated by: G. B. Dalrymple, U. S. Geological Survey.

50. Gilbert and others (1968) K-Ar (biotite) 11.6±0.3 m.y.
Sample KA1852

Sanidine-free latite ignimbrite (Sec. 35, unsurveyed, T3N, R30E; 38°04'21"N, 118°36'13"W, 0.9 mi S72 W of Huntoon Spring; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley.

51. Gilbert and others (1968) K-Ar (sanidine) 11.3±0.2 m.y.
Sample KA1916, 1918 (plagioclase) 11.6±0.2 m.y.

Sanidine-bearing latite-ignimbrite (Sec. 35, unsurveyed, T3N, R30E; 38°04'32"N, 118°36'11"W; ¾ mi W of Huntoon Spring, bottom of creek; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley.

52. Gilbert and others (1968) K-Ar (sanidine) 11.2±0.2 m.y.
Sample KA1860

Sanidine-bearing latite-ignimbrite (Sec. 35, unsurveyed, T3N, R30E; 38°04'50"N, 118°35'23"W; 0.3 mi N16°W of Huntoon Spring; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley. Comment: The sample and the previous two were collected in stratigraphic order. The youngest is sample 50.

53. Gilbert and others (1968) K-Ar (biotite) 11.3±0.2 m.y.
Sample KA1911

Sanidine-free latite ignimbrite (Center N boundary Sec. 24, T3N, R29E; 38°06'44"N, 118°43'44"W; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley. Comment: This and the preceding 4 samples are from a sequence of widespread welded latite ignimbrites which crop out in a broad belt crossing Mono Basin in a northwesterly direction. They fall into two age groups, an older one from 11.1 to 11.9 m.y., and a younger one from 9.0 to 9.8 m.y. The older of the two groups crops out in the southeastern part of the area, and the younger to the NW. The Anchorite Hills is the dividing line. The two age groups are probably from different eruptive centers (Gilbert and others, 1968). The thickest exposures, 700', occur in Huntoon Valley (locations 50, 51, 52), but generally the ignimbrites are relatively thin and extensive.

54. Gilbert and others (1968) K-Ar (sanidine) 28.5±0.6 m.y.
Sample KA2047

Rhyolite ignimbrite, basal vitrophyre zone (Sec. 13, unsurveyed, T4N, R29E; 38°11'57"N, 118°41'21"W, 0.25 mi N10°E of BM-7592 near Highway 31; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ, Calif. Berkeley. Comment: Oldest Tertiary K-Ar age in the Mono Basin area; overlies pre-Tertiary granitic rocks.

55. Gilbert and others (1968) K-Ar (plagioclase) 23.6±0.5 m.y.
Sample KA2000

Rhyolite ignimbrite (Sec. 14, T3N, R29E; 38°07'23"N, 118°44'39"W; along state boundary at 7,900 ft; Mineral Co., NV). Collected by: C. K. Gilbert, M. N Christensen, Y. Al-Rawi, K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley.

Aldrich Station (Coal Valley)

56. Evernden and others (1964) — K-Ar — (biotite) 11.0 m.y.
Sample KA552

Aldrich Station Formation (Axelrod, 1956). Rhyolite tuff (near nos. 58 and 59, Aldrich Station). Collected by: G. H. Curtis, D. E. Savage, Univ. Calif. Berkeley; dated by: G. H. Curtis, Univ. Calif. Berkeley. Comment: Unit A-6 of Axelrod (1956). This sample from below nos. 58 and 59.

57. Evernden and others (1964) — K-Ar — (biotite) 11.2 m.y.
Sample KA414

Aldrich Station Formation (Axelrod, 1956). Rhyolite tuff (Sec. 6, T7N, R28E; 38°29'33"N, 118°54'15"W; 2,000 ft W of Aldrich Station, Coal Valley; Mineral Co., NV). Collected by: G. H. Curtis and D. E. Savage, Univ. Calif. Berkeley; dated by: G. H. Curtis, Univ. Calif. Berkeley. Comment: See nos. 58 and 59 from same general area near top of unit A-6 of Axelrod (1956).

58. Evernden and others (1964) — K-Ar — (biotite) 10.5 m.y.; (biotite) 11.2 m.y.
Samples KA482, 482II

Aldrich Station Formation (Axelrod, 1956). Rhyolite tuff (Sec. 1, T7N, R27E; 38°29'36"N, 118°54'36"W; near UCMP Loc. V4707, about 3,000 ft W of Aldrich Station; Lyon Co., NV). Collected by: G. H. Curtis and J. F. Evernden, Univ. Calif. Berkeley; dated by: G. H. Curtis, Univ. Calif. Berkeley. Comment: Near top of unit A-6 of Axelrod (1956).

59. Evernden and others (1964) — K-Ar — (glass-pumice) 10.6 m.y.
Sample KA500

Aldrich Station Formation (Axelrod, 1958). Rhyolite tuff (Sec. 6, T7N, R28E; 38°29'30"N, 118°54'15"W; E of Aldrich Station near UCMP Loc. V3939; Mineral Co., NV). Collected by: G. H. Curtis and D. E. Savage, Univ. Calif. Berkeley; dated by: G. H. Curtis, Univ. Calif. Berkeley. Comment: Top of unit A-6 of Axelrod (1956).

60. Evernden and others (1964) — K-Ar — (biotite) 10.8 m.y.
Sample KA551

Coal Valley Formation (Axelrod, 1958). Biotite crystal vitric rhyolite tuff (Sec. 1,T7N, R27E; 38°29'36"N, 118°54'36"W; near UCMP Loc. 4707, W of Aldrich Station; Lyon Co., NV). Collected by: G. H. Curtis and D. E. Savage, Univ. Calif. Berkeley; dated by: G. H. Curtis, Univ. Calif. Berkeley. Comment: 200 ft above base of unit 1 of Coal Valley Formation (Axelrod, 1956).

Smith Valley

61. Evernden and others (1964) — K-Ar — (biotite) 9.3 m.y.
Sample KA485

Smith Valley "beds," Morgan Ranch Formation of Axelrod (1956). Biotite-dacite tuff (approximately NW T11N, R25E; 38°49'N, 119°14'W; near Wilson Canyon; Lyon Co., NV). Collected by: G. H. Curtis and D. E. Savage, Univ. Calif. Berkeley; dated by: G. H. Curtis, Univ. Calif. Berkeley. Comment: Very approximate location.

Candalaria Hills-Miller Mountain

62. Gilbert and others (1968) K-Ar (sanidine) 22.1±0.3 m.y.
Samples KA1970, 1988, 2009 (plagioclase) 22.8±0.4 m.y.
(biotite) 24.0±0.7 m.y.

Vitrophyre (approximately NW corner Sec. 26, T3N, R33E; 38°05′48″N, 118°16′42″W; along Highway 10; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley. Comment: This sample underlies that of sample no. 63.

63. Gilbert and others (1968) K-Ar (sanidine) 22.0±0.4 m.y.
Samples KA1979, 1989 (plagioclase) 22.0±0.9 m.y.

Rhyolite tuff (approximately NW corner Sec. 26, T3N, R33E; 38°05′48″N, 118°16′42″W; along Highway 10; Mineral Co., NV). Collected by: C. K. Gilbert, M. N. Christensen, Y. Al-Rawi, K. R. LaJoie, Univ. Calif. Berkeley; dated by: K. R. LaJoie, Univ. Calif. Berkeley. Comment: Overlies sample no. 62.

64. Robinson and others (1968) K-Ar (biotite) 22.8±1.0 m.y.
Sample 14

Rhyolite welded tuff (Sec. 20, T2N, R35E; 38°01′N, 118°06′W; SE of Miller Mtn.; Esmeralda Co., NV). Collected by: J. P. Albers, U. S. Geological Survey; dated by: E. H. McKee, U. S. Geological Survey.

Fish Lake Valley

65. Evernden and others (1964) K-Ar (biotite) 11.1 m.y.
Sample KA480

Esmeralda Formation. Biotite crystal vitric tuff (Sec. 22, T1N, R35E; 37°56′N, 118°05′W; Fish Lake Valley; Esmeralda Co., NV). Collected by: G. H. Curtis and D. E. Savage, Univ. Calif. Berkeley; dated by: G. H. Curtis, Univ. Calif. Berkeley. Comment: See Robinson and others (1968). Overlies sample no. 66.

66. Evernden and others (1964) K-Ar (biotite) 11.4 m.y.
Sample KA499

Esmeralda Formation. Biotite-crystal vitric tuff (Sec. 22, T1N, R35E; 37°56′N, 118°05′W; Fish Lake Valley; Esmeralda Co., NV). Collected by: G. H. Curtis and D. E. Savage, Univ. Calif. Berkeley; dated by: G. H. Curtis, Univ. Calif. Berkeley. Comment: Discussed by Robinson and others (1968). Underlies no. 65.

Monte Cristo Range

67. Albers and Stewart (1972) K-Ar (biotite) 15.1±0.6 m.y.
Sample Gilbert

Gilbert andesite (38°05′N, 117°42′W; near road to S Gilbert, about 3 mi N of Highway U. S. 95; Esmeralda Co., NV). Analytical data: $K_2O = 8.12\%$; $Ar^{40} = 1.816 \times 10^{-10}$ mole/gm; $Ar^{40}/\Sigma Ar^{40} = 66\%$. Collected by: J. P. Albers, U. S. Geological Survey; dated by: E. H. McKee, U. S. Geological Survey.

Cedar Mountains

68. Evernden and others (1964) K-Ar (sanidine) 11.5 m.y.
Sample KA577

Esmeralda Formation. Rhyolite tuff (38°32′N, 117°45′W; Cedar Mtn. area, approximately 1 mi NW of "Tedford pocket"; Esmeralda Co., NV). Collected by: G. H. Curtis and D. E. Savage, Univ. Calif. Berkeley; dated by: G. H. Curtis and J. F. Evernden, Univ. Calif. Berkeley. Comment: See sample no. 69.

69. Evernden and others (1964) K-Ar (biotite) 10.7 m.y.
Sample KA452

Esmeralda Formation. Biotite-crystal vitric tuff (38°32′N; 117°45′W; Cedar Mtn. area, about 1 mi N of "Tedford pocket"; Esmeralda Co., NV). Collected by: G. H. Curtis and D. E. Savage, Univ. Calif. Berkeley; dated by: G. H. Curtis and J. F. Evernden, Univ. Calif. Berkeley. Comment: 200 feet above fossil mammal-bearing beds of early Clarendonian age. 50 feet lower than sample no. 68.

Toiyabe Range

70. F. J. Kleinhampl (written communication, 1971) K-Ar (biotite) 21.5±0.4 m.y.
Sample Z15326-9a

Toiyabe quartz latite. Rhyolite tuff, basal vitrophyre. (T10N, R41E, unsurveyed; 38°41′24″N, 117°20′06″W; Peavine Canyon, Toiyabe Range; Nye Co., NV). Analytical data: K_2O = 8.57%; $\overset{*}{Ar}{}^{40}$ = 2.730 x 10^{-10} mole/gm; $\overset{*}{Ar}{}^{40}$/ΣAr^{40} = 76%. Collected by: F. J. Kleinhampl, U. S. Geological Survey; dated by: R. W. Kistler, U. S. Geological Survey.

Silver Peak Range

71. Evernden and James (1964) K-Ar (biotite) 12.7 m.y.
Sample KA1268

Esmeralda Formation. Biotite tuff, probably rhyolitic (S part T2N, R37E; 37°60′, 117°51′W; UCMP Loc. P3924; at Darmes Coal Mine, Silver Peak Range; Esmeralda Co., NV). Collected by: G. T. James, Univ. Calif. Berkeley; dated by: J. F. Evernden, Univ. Calif. Berkeley. Comment: Biotite tuff interbedded with fossil plant-bearing tuffaceous shale and lignite seam (Axelrod, 1940, quoted in Robinson and others, 1968).

72. Robinson and others (1968) K-Ar (biotite) 21.5±1.0 m.y.
Sample 12

Rhyolite welded tuff (Sec. 31, T2N, R37E; 37°59′N, 117°54′W; Silver Peak Range; Esmeralda Co., NV). Collected by: R. J. Moiola, Mobil Oil Corp.; dated by: J. F. Evernden, Univ. Calif. Berkeley.

73. Robinson and others (1968) K-Ar (biotite) 6.0±0.5 m.y.
Sample 6

Rhyolite tuff (Sec. 2, T2S, R37E, unsurveyed; 37°48′N, 117°50′W; S of Cave Spring; Esmeralda Co., NV). Collected by: P. T. Robinson, Ore. State Univ.; dated by: E. H. McKee, U. S. Geological Survey.

74. Robinson and others (1968) K-Ar (whole rock) 4.8±0.6 m.y.
Sample 7

Basalt (Sec. 31, T2S, R36E; 37°43′N, 118°02′W; Esmeralda Co., NV). Collected by: P. T. Robinson, Ore. State Univ.; dated by: E. H. McKee, U. S. Geological Survey.

75. Robinson and others (1968) K-Ar (biotite) 5.9±0.2 m.y.
Sample 8

Trachyandesite welded tuff (Sec. 10, T3S, R38E; 37°42′N, 117°45′W; S of Nivloc Mine; Esmeralda Co., NV). Collected by: J. P. Albers, U. S. Geological Survey; dated by: M. A. Lanphere, U. S. Geological Survey.

76. Robinson and others (1968) K-Ar (biotite) 6.1±0.3 m.y.
Sample 5

Trachyandesite welded tuff (Sec. 25, T3S, R37E, unsurveyed; 37°39′N, 117°49′W; Silver Peak Range; Esmeralda Co., NV). Collected by: P. T. Robinson, Ore. State Univ.; dated by: E. H. McKee, U. S. Geological Survey.

77. Robinson and others (1968) — K-Ar — (biotite) 6.9±0.3 m.y.
Sample 13

Rhyolite air-fall tuff (Sec. 15, T1S, R39E; 37°51′N, 117°38′W; on the Monocline between Big Smokey and Clayton Valleys; Esmeralda Co., NV). Collected by: R. J. Moiola, Mobil Oil Corp; dated by: J. F. Evernden, Univ. Calif. Berkeley.

78. McKee (1968) — K-Ar — (biotite) 4.5±0.2 m.y.
Sample Pigeon Spring

Rhyolite tuff breccia (Sec. 16, T6S, R39E; 37°25′N, 117°40′W; Esmeralda Co., NV). Analytical data: K_2O = 5.79% $^{*}Ar^{40}$ = 3.81 x 10^{-11} mole/gm; $^{*}Ar^{40}/\Sigma Ar^{40}$ = 42%. Collected by: E. H. McKee, Jr., U. S. Geological Survey; dated by: J. D. Obradovich, U. S. Geological Survey. Comment: Cited as Pliocene, no date published.

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79 USGS(M)-12789-75 — K-Ar — (biotite) 16.7±0.5 m.y.
(hornblende) 16.8±0.5 m.y.

Porphyritic biotite-hornblende dacite flow (center Sec. 34, T6N, R42E; 38°20′09″N, 117°15′00″W; Nye Co., NV). Analytical data: (Biotite) K_2O = 8.41%; $^{*}Ar^{40}$ = 2.088 x 10^{-10} mole/gm; $^{*}Ar^{40}/\Sigma Ar^{40}$ = 79.4%. (Hornblende) K_2O = 0.815%; $^{*}Ar^{40}$ = 2.057 x 10^{-11}, 2.001 x 10^{-11} mole/gm; $^{*}Ar^{40}/\Sigma Ar^{40}$ = 42.6%, 41.6%. Collected by: F. J. Kleinhampl, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: Part of extensive unit of porphyritic dacite as much as 1,500 feet thick which overlies Tertiary tuffs (Davis and others, 1971).

80. Armstrong and others (1972) — K-Ar — (whole rock) 17.9±3 m.y.
Sample 57233

Labradorite trachyandesite flow (SE/4 SE/4 T4N, R42E, unsurveyed; 38°09′45″N, 117°12′35″W; Nye Co., NV). Collected by: C. J. Vitaliano, Ind. Univ.; dated by: R. L. Armstrong and H. Dick, Yale Univ.

81. Armstrong and others (1972) — K-Ar — (whole rock) 15.8±2 m.y.
Sample 5780

Olivine trachyandesite flow (NE/4 NE/4 NW/4 Sec. 23, T4N, R43E, unsurveyed; 38°11′35″N, 117°07′10″W; Nye Co., NV). Collected by: C. J. Vitaliano, Ind. Univ.; dated by: R. L. Armstrong and H. Dick, Yale Univ.

82. Armstrong and others (1972) — K-Ar — (whole rock) 18.9±1.5 m.y.
Sample D-3-13

Olivine trachyandesite flow from Thunder Mountain (NE/4 NE/4 SE/4 Sec. 28, T4N, R44E; 38°10′15″N, 117°02′21″W; Nye Co., NV). Collected by: C. J. Vitaliano, Ind. Univ.; dated by: R. L. Armstrong and H. Dick, Yale Univ. Comment: Uppermost flow of a series of flows.

83. Bonham and others (1972) — K-Ar — (biotite) 20.4±0.6 m.y.
Sample USGS-(M)T219

Mizpah Trachyte. Porphyritic biotite-hornblende andesite (SE/4 SE/4 Sec. 15, T3N, R42E; 38°06′39″N, 117°14′24″W; Nye Co., NV). Collected by: H. F. Bonham and L. J. Garside, Nev. Bur. Mines; dated by: M. L. Silberman, U. S. Geological Survey. Comment: Principal host rock for Tonopah ore deposits.

84. USGS(M)-11549-1 K-Ar (biotite) 17.1±0.3 m.y.
(sanidine) 16.9±0.3 m.y.

Fraction breccia, rhyolitic welded tuff (NE/4 Sec. 2, T2N, R42E; 38°03'38"N, 117°13'37"W; at Heller Butte; Nye Co., NV). Analytical data: (Biotite) K_2O = 8.74%; $\overset{*}{Ar}{}^{40}$ = 2.222 x 10^{-10} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 62.3%. (Sanidine) K_2O = 11.11%; $\overset{*}{Ar}{}^{40}$ = 2.782 x 10^{-10} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 53.9%. Collected by: F. J. Kleinhampl, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: The fraction breccia is the oldest postore unit in the Tonopah district. The age of 17 m.y. places an upper limit and the previous one (sample no. 83) places a lower limit of 20.4 m.y. on the time of mineralization. Age of mineralization at Tonopah has been estimated as 19.1 m.y. based on a single date on adularia from one of the veins (Bonham and others, 1972, this issue).

85. L. J. Garside (written communication, 1972) K-Ar (biotite) 15.5±1.6 m.y.
Sample AD 34

Siebert Tuff. Rhyolite tuff (SW/4 SE/4 Sec. 20, T2N, R42E; 38°00'57"N, 117°17'01"W; Esmeralda Co., NV). Analytical data: K_2O = 7.05%; $\overset{*}{Ar}{}^{40}$ = 1.968 x 10^{-10}, 1.525 x 10^{-10}, 1.358 x 10^{-10} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 10.5%, 11.2%, 7.3%. Collected by: L. J. Garside, Nev. Bur. Mines; dated by: Geochron Laboratories, Inc.

86. Albers and Stewart (1972) K-Ar (sanidine) 16.2±0.4 m.y.
Sample 659-66 (biotite) 16.2±0.4 m.y.

Brougher Dacite. Porphyritic quartz latite (center Sec. 10, T1N, R42E; 37°57'N, 117°15'W; Esmeralda Co., NV). Analytical data: (Sanidine) K_2O = 10.9%; $\overset{*}{Ar}{}^{40}$ = 2.617 x 10^{-10} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 94%. (Biotite) K_2O = 7.77%; $\overset{*}{Ar}{}^{40}$ = 1.872 x 10^{-10} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 62%. Collected by: J. P. Albers and J. H. Stewart, U. S. Geologocial Survey; dated by: M. A. Lamphere and J. C. Engels, U. S. Geological Survey.

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87. Armstrong and others (1972) K-Ar (sanidine) 6.7±1.0 m.y.
Sample Tsp (whole rock) 6.8±1.4 m.y.

Spearhead Member of Thirsty Canyon Tuff. Rhyolitic welded tuff (NW/4 SE/4 NE/4 Sec. 10, T3S, R42E; 37°41'40"N, 117°14'20"W; Esmeralda Co., NV). Collected by: C. J. Vitaliano, Ind. Univ.; dated by: R. L. Armstrong and H. Dick, Yale Univ. Comment: Type locality of the Spearhead Member. Underlies Malpais basalt (see discussion in Armstrong and others, 1972).

88. Armstrong and others (1972) K-Ar (whole rock) 7.1±0.5 m.y.
Sample 58N264

Spearhead Member of Thirsty Canyon Tuff. Rhyolitic welded ash-flow tuff (SE/4 SW/4 NW/4 Sec. 25, T3S, R43E; 37°39'10"N, 117°06'40"W; Nye Co., NV). Collected by: C. J. Vitaliano, Ind. Univ.; dated by: R. L. Armstrong and H. Dick, Yale Univ.

89. Armstrong and others (1972) K-Ar (whole rock) 7.6±1.7 m.y.
Sample B-1-14

Malpais Basalt. (NW/4 NE/4 SE/4 Sec. 10, T3S, R42E; 37°41'45"N, 117°14'50"W; Esmeralda Co., NV). Collected by: C. J. Vitaliano, Ind. Univ.; dated by: R. L. Armstrong and H. Dick, Yale Univ. Comment: Top of uppermost flow.

90. Armstrong and others (1972) K-Ar (whole rock) 8.0±2.0 m.y.
Sample B-1-17

Malpais Basalt. (NW/4 NE/4 SE/4 Sec. 10, T3S, R42E; 37°41′45″N, 117°14′45″W; Esmeralda Co., NV). Collected by: C. J. Vitaliano, Ind. Univ.; dated by: R. L. Armstrong and H. Dick, Yale Univ. Comment: Base of uppermost flow, same flow as sample no. 89.

91. Armstrong and others (1972) K-Ar (whole rock) 6.8±1.5 m.y.
Sample B-1-2

Malpais Basalt. (NW/4 NE/4 SE/4 Sec. 10, T3S, R42E; 37°41′45″N, 117°14′40″W; Esmeralda Co., NV). Collected by: C. J. Vitaliano, Ind. Univ.; dated by: R. L. Armstrong and H. Dick, Yale Univ. Comment: Basal flow, below the flow of nos. 89 and 90.

92. Armstrong and others (1972) K-Ar (whole rock) 8.7±1.5 m.y.
Sample B-1-1

Malpais Basalt. (NW/4 NE/4 SE/4 Sec. 10, T3S, R42E; 37°41′45″N, 117°14′40″W; Esmeralda Co., NV). Collected by: C. J. Vitaliano, Ind. Univ.; dated by: R. L. Armstrong and H. Dick, Yale Univ. Comment: Basal flow. The last 4 samples were collected from 2 flows of the Malpais Basalt.

93. Armstrong and others (1972) K-Ar (whole rock) 13.5±3.0 m.y.
Sample 5813

Pigeonite-labradorite andesite (NE/4 NW/4 NE/4 Sec. 12, T2S, R42E; 37°47′10″N, 117°12′40″W; Esmeralda Co., NV). Collected by: C. J. Vitaliano, Ind. Univ.; dated by: R. L. Armstrong and H. Dick, Yale Univ.

94. Armstrong and others (1972) K-Ar (whole rock) 12.0±0.5 m.y.
Sample 58441

Olivine trachyandesite flow (SE/4 NW/4 NW/4 Sec. 11, T2S, R43E; 37°52′15″N, 117°07′45″W; Nye Co., NV). Collected by: C. J. Vitaliano, Ind. Univ.; dated by: R. L. Armstrong and H. Dick, Yale Univ. Comment: Overlies dacite of sample no. 100.

95. Armstrong and others (1972) K-Ar (whole rock) 12.9±1.2 m.y.
Sample B-2-3

Labradorite andesite from Black Cap Mountain, lower flow (SE/4 SW/4 NE/4 Sec. 9, T1S, R43E; 37°41′45″N, 117°09′20″W; Nye Co., NV). Collected by: C. J. Vitaliano, Ind. Univ.; dated by: R. L. Armstrong and H. Dick, Yale Univ. Comment: See sample 96, collected from same outcrop, 18 meters above no. 95.

96. Armstrong and others (1972) K-Ar (whole rock) 11.8±0.4 m.y.
Sample B-2-7

Labradorite andesite of Black Cap Mountain, upper flow of two (SE/4 SW/4 NE/4 Sec. 9, T1S, R43E; 37°41′45″N, 117°09′20″W; Nye Co., NV). Collected by: C. J. Vitaliano, Ind. Univ.; dated by: R. L. Armstrong, Yale Univ. Comment: See sample 95.

97. USGS(M)-164-69 K-Ar (biotite) 14.2±0.3 m.y.

Siebert Tuff. Pumiceous rhyolite air-fall tuff (NW/4 NE/4 Sec. 18, T3S, R43E; 37°41′17″N, 117°11′38″W; Esmeralda Co., NV). Analytical data: K_2O = 8.57%; $\overset{*}{Ar}{}^{40} = 1.807 \times 10^{-10}$ mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 62.7%. Collected by: R. P. Ashley and M. L. Silberman, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: Biotite separated from pumice fragments in the tuff to avoid contamination from lithic fragments.

98. USGS(M)-164-15 K-Ar (biotite) 17.8±0.4 m.y.

Meda Rhyolite. Rhyolite welded tuff (NE corner Sec. 18, T3S, R43E; 37°41′10″N, 117°11′23″W; Esmeralda Co., NV). Analytical data: K_2O = 7.83%; $\overset{*}{Ar}{}^{40} = 2.069 \times 10^{-10}$ mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 37.5%. Collected by: R. P. Ashley and M. L. Silberman, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey.

99. Silberman and Ashley (1970) K-Ar (biotite) 20.6±0.4 m.y.
Sample 288-1 (sanidine) 20.6±0.4 m.y.

Rhyolite flow (NW corner Sec. 23, T2S, R43E; 37°45′24″N, 117°07′53″W; Nye Co., NV). Collected by: R. P. Ashley and M. L. Silberman, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: This flow overlies mineralized volcanic rocks of the Goldfield district but is itself unaffected by hydrothermal alteration.

100. Armstrong and others (1972) K-Ar (plagioclase) 21.6±1.1 m.y.
Sample 58N260 (biotite) 21.8±0.3 m.y.

Dacite flow (NW/4 SW/4 NE/4 Sec. 15, T1S, R43E; 37°51′20″N, 117°08′25″W; Esmeralda Co., NV). Collected by: C. J. Vitaliano, Ind. Univ.; dated by: R. L. Armstrong and H. Dick, Yale Univ.

101. Kistler (1968) K-Ar (biotite) 21.1 m.y.
Sample 644-3B

Dacite vitrophyre (rhyodacite welded tuff) (NW/4 NW/4 Sec. 16, T3S, R43E; 37°41′11″N, 117°09′57″W; Esmeralda Co., NV). Collected by: J. P. Albers and H. R. Cornwall, U. S. Geological Survey; dated by: R. W. Kistler, U. S. Geological Survey. Comment: Youngest pre-ore unit in the Goldfield mining district. Silberman and Ashley (1970) report age of mineralization of 20.7±0.4 m.y., from K-Ar age of hypogene alunite.

102. Albers and Stewart (1972) K-Ar (biotite) 21.6±0.5 m.y.
Sample 97VV-5 (hornblende) 20.8±0.7 m.y.

Porphyritic dacite (NW/4 NW/4 Sec. 34, T2S, R43E; 37°43′30″N, 117°09′00″W; Nye Co., NV). Analytical data: (Biotite) K_2O = 5.65%; $\overset{*}{Ar}{}^{40} = 1.813 \times 10^{-10}$ mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 75%. (Hornblende) K_2O = 0.962%; $\overset{*}{Ar}{}^{40} = 2.967 \times 10^{-11}$ mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 54%. Collected by: J. P. Albers, U. S. Geological Survey; dated by: M. A. Lanphere and J. C. Engels, U. S. Geological Survey. Comment: Part of host rock sequence for Goldfield ore deposits. Same unit as samples 103 and 104.

103. Silberman and Ashley (1970) K-Ar (biotite) 21.4±0.4 m.y.
Sample 203-11

Porphyritic dacite (NE corner Sec. 34, T2S, R43E; 37°43′37″N, 117°08′07″W; Nye Co., NV). Collected by: R. P. Ashley, U. S. Geological Survey; dated by: M. L. Silberman. Comment: Part of host rock sequence for Goldfield ore deposits (see no. 102).

104. Silberman and Ashley (1970) K-Ar (biotite) 21.2±0.4 m.y.
Sample Y-47

Porphyritic dacite (NE/4 SE/4 Sec. 33, T2S, R43E; 37°43′08″N, 117°09′17″W; Nye Co., NV). Collected by: R. P. Ashley, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: Part of host rock sequence for the Goldfield ore deposits (see no. 102).

105. Albers and Stewart (1972) K-Ar (hornblende) 21.5±0.5 m.y.
Sample 97VV-299

Milltown andesite. Porphyritic andesite (NE corner Sec. 30, T2S, R43E; 37°44'30"N, 117°11'16"W; Esmeralda Co., NV). Analytical data; K_2O = 0.853%; $\overset{*}{Ar}{}^{40}$ = 2.72 x 10^{-11} mole/gm; $\overset{*}{Ar}{}^{40}/\Sigma Ar^{40}$ = 58%. Collected by: J. P. Albers, U. S. Geological Survey; dated by: M. A. Lanphere and J. C. Engels, U. S. Geological Survey. Comment: Part of host rock sequence for Goldfield ore deposits, underlies the porphyritic dacite.

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