Radiometric ages; compilation A, U. S. Geological Survey

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Isochron/West, Bulletin of Isotopic Geochronology, v. 22, pp. 3

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RADIOMETRIC AGES: COMPILATION A, U.S. GEOLOGICAL SURVEY

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ABSTRACT

Radiometric ages are reported for 83 samples from Alaska, Arizona, California, Colorado, Montana, Nevada, New Mexico, New York, Oregon, Utah, Washington, and British Columbia, Canada. Sample location, geologic information, and analytical data are given for each sample.

INTRODUCTION

Radiometric ages have been of great value to Survey geologists in mapping, mineral-resources studies, geothermal-potential investigations, geologic evaluation of special energy problems, etc. Geologists in other government agencies, in the mineral industries, in non-government research institutes, and in consulting and teaching positions also have frequent need of current radiometric-age information. Although it would be ideal for all radiometric ages originating within the Survey to be promptly published or otherwise made available to the public, many singular ages and limited studies do not warrant direct publication. This compilation lists (1) unpublished ages and (2) ages which have been published without complete location, petrologic, and/or analytical data needed for evaluation and utilization. Users of this compilation are asked to use these ages with discretion as they constitute only a small part of the total geologic picture in any particular area. The small map, figure 1, shows the approximate locations of the samples included in this report.

Analytical data for K-Ar, Rb-Sr, Pb-alpha, and fission-track ages are given. All the ages were determined by the Survey, except in a few cases as noted. The analytical techniques are not described as these are common knowledge to most geologists. Any non-conventional techniques used to determine rock or mineral ages are briefly stated with the analytical data. Persons desiring additional information about individual samples and/or analytical data should contact the person(s) listed as collector or analyzer of the sample. Unless otherwise stated, persons named in the descriptive material are geologists, geophysicists, or chemists of the U.S. Geological Survey.

The decay constants used in the age calculations are as follows:

Potassium – 40

$\lambda_\beta = 4.962 \times 10^{-10} yr^{-1}$, $\lambda_\epsilon = 0.581 \times 10^{-10} yr^{-1}$, and $K^{40}/\Sigma K = 0.01167$ atomic percent.

The quoted analytical error for the calculated age of a sample represents 2 standard deviations (2σ).

Rubidium – 87

$\lambda = 1.42 \times 10^{-10} yr^{-1}$

The letter "N" or "T" in parentheses following the strontium content of a sample indicates that the quoted value represents either normal (N) strontium or total (T) strontium. Total strontium equals normal plus radiogenic strontium.

Fission – track

spontaneous fission of $U^{238} = \lambda_F = 7.03 \times 10^{-17} yr^{-1}$.

P_s = fossil track density—number of fossil-tracks counted is in parentheses.

P_i = induced track density—number of induced-tracks counted is in parentheses.

Ages calculated for zircons and apatite reflect a 95% confidence level (2σ).

The above decay constants and isotopic abundances are slightly different from the ones previously used by the U.S. Geological Survey; these constants are the ones recommended by the IUGS Subcommission on Geochronology, August 24, 1976. To avoid confusion concerning recalculated ages and published ages, the published age is included under "comments".

SAMPLE DESCRIPTIONS

ALASKA

1. *USGS(D)-A-T7* K-Ar

Andesite (S shore of Kiska Harbor, Tanaga Island, Aleutian Islands; 51°42'15"N, 178°04'43"W; Gareloi Island B-1 NE quad., AK). *Analytical data:* K_2O = 1.06, 1.05%; $*Ar^{40} = 0.0458 \times 10^{-10}$ mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 44%. *Collected by:* R. E. Anderson; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Minimum age of volcanism.

(whole-rock) 3.0 ± 1.1 m.y.

2. *USGS(D)-A-U23* K-Ar

Metadiorite (NW shore of Ulak Island, Aleutian Islands; 51°33'20"N, 178°59'02"W; Ulak Island quad., AK). Metadiorite(?) intrudes older marine series. *Analytical data:* K_2O = 1.74, 1.70%; $*Ar^{40} = 0.8480 \times 10^{-10}$ mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 49%. *Collected by:* R. E. Anderson; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Age not evaluated.

(whole-rock) 33.9 ± 1.1 m.y.

3. *USGS(D)-A-Kv4* K-Ar

Andesite (N shore of Kavalga Island, Aleutian Islands; 51°33'20"N, 178°48'00"W; Kavalga Island quad., AK). *Analytical data:* K_2O = 0.63, 0.62%; $*Ar^{40} = 0.562 \times 10^{-10}$ mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 38%. *Collected by:* R. E. Anderson; *analyzed by:* R. F. Marvin, H. H.

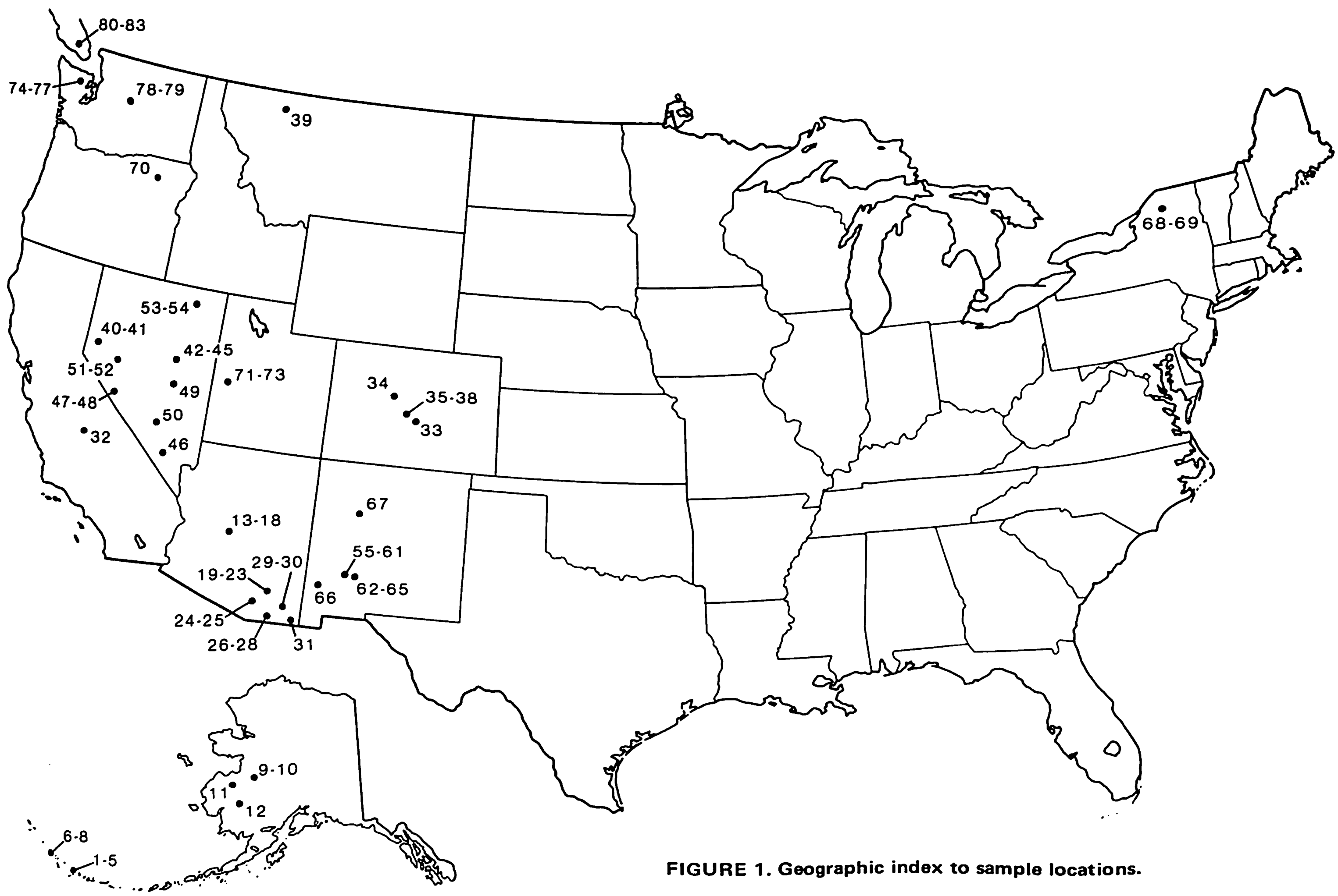

FIGURE 1. Geographic index to sample locations.

3. (continued)

Mehnert, and V. M. Merritt. *Comment:* Minimum age for the andesite.

(whole-rock) 6.2 ± 0.4 m.y.

4. *USGS(D)-A-A31* K-Ar

Basalt (NW shore of Amatignak Island, Aleutian Islands; 51°17′45″N, 179°07′10″W; Gareloi Island A-4 SE quad., AK). Pillowed basalt. *Analytical data:* K_2O = 1.91, 1.95%, $^*Ar^{40}$ = 0.6793 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 43%. *Collected by:* R. E. Anderson; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Age not evaluated.

(whole-rock) 24.3 ± 0.8 m.y.

5. *USGS(D)-A-S2* K-Ar

Andesite (SC shore of Skagul Island, Aleutian Islands; 51°35′25″N, 178°35′12″W; Ogliuga and Skagul Islands quad., AK). *Analytical data:* K_2O = 0.29, 0.29%; $^*Ar^{40}$ = 0.0219 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 11%. *Collected by:* R. E. Anderson; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Age not evaluated.

(plagioclase) 5.2 ± 0.9 m.y.

6. *USGS(D)-A-K18* K-Ar

Andesite (NW shore of Kiska Island, Aleutian Islands; 51°55′33″N, 177°19′55″E; Kiska C-2 NW quad., AK). Pyroxene-olivine andesite lava in the Vega Bay Formation. *Analytical data:* K_2O = 0.25, 0.25%; $^*Ar^{40}$ = 0.2023 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 49%. *Collected by:* R. E. Anderson; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* The age for this mineral is one of the oldest radiometric ages reported for this area and probably signifies the age of the "basement rocks".

(plagioclase) 55.3 ± 6.7 m.y.

7. *USGS(D)-WC-89-70* K-Ar

Andesite (SW shore of Kiska Island, Aleutian Islands; 51°50′50″N, 177°17′47″E; Kiska C-3 SE quad., AK). Pyroxene-olivine andesite in the Vega Bay Formation. *Analytical data:* K_2O = 0.32, 0.32%; $^*Ar^{40}$ = 0.0681 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 25%. *Collected by:* W. J. Carr; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Age not evaluated.

(plagioclase) 14.7 ± 1.2 m.y.

8. *USGS(D)-Ki-3* K-Ar

Basalt (S tip of Kiska Island, Aleutian Islands; 51°49′

47"N, 177°19'40"E; Kiska C-2 SW quad., AK). Dike cutting the Vega Bay Formation. *Analytical data:* K_2O = 0.96, 0.96%; $^*Ar^{40}$ = 0.2470 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 22%. *Collected by:* R. E. Anderson; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Age not evaluated.

(plagioclase) 17.8 ± 1.1 m.y.

9. *USGS(M)-62AHr-77* K-Ar
Rhyolite (62°45'00"N, 159°05'00"W; Holy Cross D-1 quad, AK). *Analytical data:* K_2O = 7.93, 7.95%; $^*Ar^{40}$ = 7.526 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 80%. *Collected by:* J. M. Hoare, *analyzed by:* M. A. Lanphere, H. C. Whitehead, and L. B. Schlocker. *Comment:* A rhyolite of very late Cretaceous or early Paleocene age.

(sanidine) 64.7 ± 3.0 m.y.

10. *USGS(M)-62AHr-79* K-Ar
Diorite (62°45'00"N, 159°05'00"W; Holy Cross D-1 quad., AK). *Analytical data:* K_2O = 0.62%; $^*Ar^{40}$ = 1.186 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 84%. *Collected by:* J. M. Hoare; *analyzed by:* M. A. Lanphere, J. D. Luetscher, W. C. Whitehead, and L. B. Schlocker. *Comment:* Early Cretaceous intrusion.

(hornblende) 128 ± 4 m.y.

11. *USGS(M)-63ACo-254* K-Ar
Quartz monzonite (61°53'00"N, 161°29'00"W; Russian Mission D-7 quad., AK). *Analytical data:* K_2O = 7.08, 7.36%; $^*Ar^{40}$ = 7.519 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 81%. *Collected by:* W. H. Condon; *analyzed by:* M. A. Lanphere, J. D. Luetscher, H. C. Whitehead, and L. B. Schlocker. *Comment:* Late Cretaceous intrusion.

(biotite) 70.9 ± 3.3 m.y.

12. *USGS(M)-63ACo-414* K-Ar
Granite (61°01'30"N, 160°00'30"W; Russian Mission A-3 quad., AK). *Analytical data:* K_2O = 8.48, 8.55%; $^*Ar^{40}$ = 15.24 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 89%. *Collected by:* W. H. Condon; *analyzed by:* M. A. Lanphere, J. D. Luetscher, H. C. Whitehead, and L. B. Schlocker. *Comment:* Early Cretaceous intrusion.

(biotite) 120 ± 3 m.y.

ARIZONA

13. *USGS(W)-123* K-Ar and Rb-Sr
Granodiorite (34°21'30"N, 112°19'00"W; Mt. Union quad., Yavapai Co., AZ). Brady Butte Granodiorite. *K-Ar Analytical data:* K_2O = 7.97%; $^*Ar^{40}$ = 203.7 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 97%. *Rb-Sr Analytical data:* Sr = 46.5 ppm (T); $^*Sr^{87}$ = 1.90 ppm; $^*Sr^{87}/\Sigma Sr^{87}$ = 38%; initial 87/86Sr = 0.704; Rb^{87} = 107 ppm; *analyzed by:* H. H. Thomas, R. F. Marvin, and F. G. Walthall, (K-Ar); C. E. Hedge and F. G. Walthall, (Rb-Sr). *Comment:* The ages reported here are reduced ages. Initial crystallization of the Brady Butte Granodiorite occurred 1770 ± 10 m.y. ago (Anderson, Blacet, Silver, and Stern, 1971).

(biotite) 1235 ± 60 m.y. (K-Ar)
(biotite) 1240 ± 60 m.y. (Rb-Sr)

14. *USGS(W)-550* K-Ar
Granodiorite (34°18'00"N, 112°20'00"W; Mt. Union quad., Yavapai Co., AZ). Brady Butte Granodiorite. *Analytical data:* K_2O = 8.44%; $^*Ar^{40}$ = 224.2 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 100%; *analyzed by:* H. H. Thomas, R. F. Marvin, and P. Elmore. *Comment:* Reduced age. Initial crystallization of the Brady Butte Granodiorite occurred 1770 ± 10 m.y. ago (Anderson, Blacet, Silver, and Stern, 1971).

(biotite) 1270 ± 60 m.y.

15. *USGS(W)-CAA-2* K-Ar
Granodiorite (34°32'25"N, 112°07'00"W; NW¼ S3, T13N,R2E; Mingus Mtn. quad., Yavapai Co., AZ). *Analytical data:* K_2O = 7.84%; $^*Ar^{40}$ = 310.7 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 100%. *Collected by:* C. A. Anderson; *analyzed by:* H. H. Thomas, R. F. Marvin, and P. Elmore. *Comment:* Minimum age for granodiorite. An age of 1760 ± 15 m.y. for zircons has been obtained by uranium-lead method (Anderson, Blacet, Silver, and Stern, 1971).

(biotite) 1670 ± 80 m.y.

16. *USGS(W)-CAA-5* Rb-Sr
Quartz monzonite (½ mile W of Blancho Spring; 34° 15'25"N, 112°17'05"W; Mt. Union quad., Yavapai Co., AZ). *Analytical data:* Sr = 136 ppm (T); $^*Sr^{87}$ = 1.25 ppm; $^*Sr^{87}/\Sigma Sr^{87}$ = 12%; initial 87/86Sr = 0.704; Rb^{87} = 54.1 ppm. *Collected by:* C. A. Anderson; *analyzed by:* Z. E. Peterman. *Comment:* Minimum age for the quartz monzonite.

(whole-rock) 1610 ± 90 m.y.

17. *USGS(D)-CAA-6* K-Ar
Granodiorite (Iron Spring Road at Forbing Park; 34° 34'05"N, 112°29'25"W; Prescott quad., Yavapai Co., AZ). Prescott Granodiorite. *Analytical data:* K_2O = 8.62, 8.47%; $^*Ar^{40}$ = 250.2 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 99%. *Collected by:* C. A. Anderson; *analyzed by:* R. F. Marvin, H. H. Mehnert, and W. Mountjoy. *Comment:* Minimum age for Prescott Granodiorite.

(biotite) 1360 ± 40 m.y.

18. *USGS(W)-CAA-8* Rb-Sr
Granite (near intersection of U.S. Highways 89 and 89A; 34°36'50"N, 112°24'40"W; Wilhoit quad., Yavapai Co., AZ). Dells Granite. *Analytical data:* Sr = 12.0 ppm (T); $^*Sr^{87}$ = 1.61 ppm; $^*Sr^{87}/\Sigma Sr^{87}$ = 69%; initial 87/86Sr = 0.704; Rb^{87} = 85.5 ppm. *Collected by:* C. A. Anderson; *analyzed by:* Z. E. Peterman. *Comment:* Minimum age for Dells Granite; may be very close to time of crystallization.

(whole-rock) 1310 ± 50 m.y.

19. *USGS(D)-71D17* Fission-track
Quartz monzonite (Rincon Mountains; SE¼ SE¼ S26, T15S,R18E (unsurveyed); 32°07'00"N, 110°28'00"W; Happy Valley quad., Pima Co., AZ). Faintly gneissic biotite-muscovite quartz monzonite. *Analytical data:* (zircon): $P_s = 7.59 \times 10^6$ tracks/cm² (246); $P_i = 23.1 \times 10^6$ tracks/cm² (375); neutron flux density = 1.26×10^{15} n/cm²; U = 590 ppm; (apatite): $P_s = 0.0403 \times 10^6$ tracks/cm² (84); $P_i = 0.13 \times 10^6$ tracks/cm² (271); neutron flux density = 1.23×10^{15} n/cm²; U = 3.4 ppm. *Collected by:* H. Drewes; *analyzed by:* C. W. Naeser. *Comment:* Fission-track ages for zircon and apatite agree with K-Ar ages of 24.8 m.y. (muscovite) and 23.5 m.y. (biotite) given by Marvin and others (1973, sample 80, p. 20). They indicate a strong thermal event during late Oligocene—early Miocene, although the rock is probably 1400—1500 m.y. old.

(zircon) 24.6 ± 4.0 m.y.
(apatite) 23.3 ± 5.8 m.y.

20. *USGS(D)-73D52* K-Ar and Fission-track
Quartz monzonite (Rincon Mountains; fresh cut on trail at NE¼ NE¼ NW¼ S8,T15S,R18E; 32°09'00"N, 110°32'00"W; Rincon Valley quad., Pima Co., AZ). Gneissic quartz monzonite. *K-Ar analytical data:* K_2O = 6.42, 6.47%; $^*Ar^{40} = 2.338 \times 10^{-10}$ mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 71%. *Fission-track analytical data:* (apatite): $P_s = 0.0159 \times 10^6$ tracks/cm² (398); $P_i = 0.0459 \times 10^6$ tracks/cm² (1147); neutron flux density = 1.22×10^{15} n/cm²; U = 12.1 ppm; (zircon): $P_s = 2.7 \times 10^6$ tracks/cm²; $P_i > 60 \times 10^6$ tracks/cm²; neutron flux density = 1.25×10^{15} n/cm²; U = 1500 ppm. *Collected by:* H. Drewes; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt (K-Ar); C. W. Naeser (fission-track). *Comment:* Ages are similar to published K-Ar ages (Marvin and others, 1973, p. 20) for granodiorite and gneissic quartz monzonite in the Rincon Mountains. K-Ar age and apatite fission-track age suggest a strong thermal event during late Oligocene—early Miocene, although the rock is probably 1400—1500 m.y. old. Uranium content too high in zircon for accurate age determination. Drewes (1977) quoted a K-Ar age of 24.4 m.y. for this sample; new decay constants produce a slight age change.

(biotite) 25.0 ± 0.8 m.y. (K-Ar)
(apatite) 25.3 ± 2.9 m.y. (fission-track)
(zircon) 20—30 m.y.

21. *USGS(D)-74D62* K-Ar, Rb-Sr and Fission-track
Granodiorite (Tanque Verde Mountains; C NE¼ SE¼ S16,T14S,R16E; 32°12'30"N, 110°42'30"W; Rincon Valley quad., Pima Co., AZ). *K-Ar analytical data:* (biotite): K_2O = 6.61, 6.73%; $^*Ar^{40} = 190.6 \times 10^{-10}$ mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 99%; (muscovite): K_2O = 7.67, 7.66%; $^*Ar^{40} = 236.8 \times 10^{-10}$ mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 99%. *Rb-Sr analytical data:* Rb = 253 ppm; Sr = 126 ppm (N); $^*Sr^{87}$ = 1.45 ppm; $^*Sr^{87}/Rb^{87}$ = 0.02026. *Fission-track analytical data:* $P_s = 0.15 \times 10^6$ tracks/cm² (313); $P_i = 0.414 \times 10^6$ tracks/cm² (862); neutron flux density = 1.20×10^{15} n/cm²; U = 11 ppm. *Collected by:* H. Drewes; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt (K-Ar); C. E. Hedge and K. Futa (Rb-Sr); C. W. Naeser (Fission-track). *Comment:* Intrusion occurred about 1400 m.y. ago. Fission-track age of apatite is similar to published ages (Marvin and others, 1973, p. 20) for rocks in the Rincon Mountains, and suggests a strong thermal event in the late Oligocene—early Miocene. Fission-track age for a zircon concentrate was indeterminate due to high uranium content. Drewes (1977) quoted K-Ar ages of 1330 m.y., 1400 m.y., and a Rb-Sr age of 1440 m.y. for this sample; new decay constants produce slight age changes.

(biotite) 1340 ± 60 m.y. (K-Ar)
(muscovite) 1415 ± 50 m.y.
(whole-rock) 1410 ± 50 m.y. (Rb-Sr)
(apatite) 26.1 ± 3.5 m.y. (fission-track)

22. *USGS(D)-74D57* K-Ar and Fission-track
Granodiorite (Tanque Verde Mountains; SW¼ NE¼ NW¼ S20,T14S,R16E; 32°12'00"N, 110°44'00"W; Rincon Valley quad., Pima Co., AZ). *K-Ar analytical data:* (biotite): K_2O = 7.90, 7.96%; $^*Ar^{40} = 240.5 \times 10^{-10}$ mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 100%; (muscovite): K_2O = 6.67, 6.66%; $^*Ar^{40} = 200.4 \times 10^{-10}$ mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 99%. *Fission-track analytical data:* (zircon): $P_s = 40 \times 10^6$ tracks/cm²; $P_i = 3.09 \times 10^6$ tracks/cm²; neutron flux density = 1.24×10^{15} n/cm²; U = 80 ppm; (apatite): $P_s = 0.565 \times 10^6$ tracks/cm² (1177); $P_i = 0.745 \times 10^6$ tracks/cm² (1552); neutron flux density = 1.15×10^{15} n/cm²; U = 20 ppm. *Collected by:* H. Drewes; *analyzed by:* R. F. Marvin, H. H. Mehnert and V. M. Merritt (K-Ar); C. W. Naeser (fission-track). *Comment:* K-Ar ages indicate probable time of intrusion of the granodiorite, whereas fission-track ages indicate effects of thermal annealing related to mid-Tertiary events. K-Ar ages of 1390 m.y. (biotite) and 1380 m.y. (muscovite) were quoted by Drewes (1977) for this sample; slight age changes due to use of new decay constants.

(biotite) 1395 ± 50 m.y. (K-Ar)
(muscovite) 1390 ± 50 m.y.
(zircon) approx. 800 m.y. (fission-track)
(apatite) 55.0 ± 4.2 m.y.

23. *USGS(D)-71D194* K-Ar
Quartz monzonite (Rincon Mountains; bottom of Espiritu Canyon in SW¼ S35,T13S,R19E; 32°15'30"N, 110°28'40"W; Reddington quad., Pima Co., AZ). Quartz monzonite stock. *Analytical data:* (biotite): K_2O = 9.03, 8.99%; $^*Ar^{40} = 3.609 \times 10^{-10}$ mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 78%; (muscovite): K_2O = 10.18, 10.17%; $^*Ar^{40} = 4.211 \times 10^{-10}$ mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 89%. *Collected by:* H. Drewes; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Ages agree with published ages (Marvin and

others, 1973, p. 20) for granodiorite and gneissic quartz monzonite plutons to the south in the Rincon Range. K-Ar ages suggest a strong thermal event during the late Oligocene, as the quartz monzonite is probably 1400–1500 m.y. old. Drewes (in press) quoted ages of 27.0 m.y. (biotite) and 27.9 m.y. (muscovite) for this sample; slight change in ages due to use of new decay constants.

(biotite) 27.6 ± 0.9 m.y.
(muscovite) 28.5 ± 0.6 m.y.

24. *USGS(D)-72D69* K-Ar
Quartz monzonite (W flank of Sierrita Mountains; NE¼ SE¼ SE¼ S15,T18S,R10E; 31°51'30"N, 111°18'00"W; Palo Alto Ranch quad., Pima Co., AZ). Quartz monzonite of Sierrita Mountains (Sierrita Granite of Lacy, 1959). *Analytical data:* K_2O = 7.82, 7.73%; $^*Ar^{40}$ = 17.33 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 70%. *Collected by:* H. Drewes; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Late Jurassic intrusive body. An age of 145 m.y. for this sample was quoted by Drewes and Cooper (1973); slight age change due to use of new decay constants.

(biotite) 149 ± 5 m.y.

25. *USGS(D)-74D84* K-Ar
Granodiorite (gully bottom at elevation 3450 ft (1050 m), NE¼ SE¼ NE¼, S18,T20S,R12E; 31°41' 00"N, 111°09'00"W; Tubac quad., Santa Cruz Co., AZ). Granodiorite stock. *Analytical data:* K_2O = 5.21, 5.15%; $^*Ar^{40}$ = 11.55 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 89%. *Collected by:* H. Drewes; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Jurassic stock. Age quoted by Drewes (1977).

(biotite) 149 ± 3 m.y.

26. *USGS(D)-74D91* K-Ar
Granodiorite (railroad cut along San Pedro River, 500 ft (152 m) SW of C of S12,T21S,R21E; 31°37'00"N, 110°10'00"W; Lewis Springs quad., Cochise Co., AZ). Plug consisting of fine-grained, reddish-brown granodiorite. *Analytical data:* K_2O = 8.67, 8.68%; $^*Ar^{40}$ = 9.741 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 90%. *Collected by:* H. Drewes; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Late Cretaceous plug. Drewes (in press) quotes an age of 74.6 m.y. for this sample; slight age change due to use of new decay constants.

(biotite) 76.3 ± 1.8 m.y.

27. *USGS(D)-74D102* K-Ar
Quartz monzonite (large wash in NE¼ SE¼ NE¼ S25, T19S,R24E; 31°45'00"N, 109°51'00"W; Pearce quad., Cochise Co., AZ). Gleeson Quartz Monzonite stock. *Analytical data:* (some chlorite present in the biotite) K_2O = 7.52, 7.57%; $^*Ar^{40}$ = 21.12 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 89%. *Collected by:* H. Drewes; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Agrees with 178 m.y. age reported by Anderson (1968) for Gleeson Quartz Monzonite. Drewes (in press) quotes an age of 181 m.y. for this sample; slight age change due to use of new decay constants.

(biotite) 185 ± 4 m.y.

28. *USGS(D)-74D143* K-Ar
Rhyolite (prospect at elevation 4750 ft (1450 m), NE¼ SE¼ NE¼ S36,T20S,R22E; 31°39'00"N, 110° 03'00"W; Tombstone quad., Cochise Co., AZ). Rhyolite porphyry plug. *Analytical data:* (sanidine): K_2O = 9.21, 9.19%; $^*Ar^{40}$ = 8.779 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 96%; (biotite): K_2O = 8.39, 8.40%; $^*Ar^{40}$ = 8.201 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 90%. *Collected by:* H. Drewes; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Upper Cretaceous rhyolite porphyry. Ages of 63.6 m.y. (sanidine) and 65.1 m.y. (biotite) were quoted by Drewes (in press) for this sample; slight changes in the ages are due to use of new decay constants.

(sanidine) 65.1 ± 1.6 m.y.
(biotite) 66.6 ± 1.6 m.y.

29. *USGS(D)-74D161* K-Ar
Andesite (at elevation 4640 ft (1420 m) on NE side of Pat Hills: NW¼ SW¼ NW¼ S35,T16S,R27E; 32°00' 00"N, 109°34'00"W; Dos Cabezas quad., Cochise Co., AZ). Epidote-hornblende andesite. *Analytical data:* (minor amount of epidote in hornblende concentrate—K_2O for epidote = 0.05%), K_2O = 0.66, 0.66%; $^*Ar^{40}$ = 0.3308 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 54%. *Collected by:* H. Drewes; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* An Oligocene andesite. Epidote probably derived by deuteric action. Drewes (in press) quotes an age of 33.7 m.y. for this sample; slight age change due to use of new decay constants.

(hornblende) 34.5 ± 1.5 m.y.

30. *USGS(D)-74D151* K-Ar
Granodiorite (Swisshelm Mountains; cliff in SW¼ NW¼ SW¼ S14,T20S,R27E; 31°41'00"N, 109°34'00"W; Swisshelm quad., Cochise Co., AZ). Granodiorite stock. *Analytical data:* K_2O = 8.32, 8.32%; $^*Ar^{40}$ = 4.114 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 58%. *Collected by:* H. Drewes; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Oligocene stock. Drewes (in press) quotes an age of 33.2 m.y. for this sample; slight age change is due to use of new decay constants.

(biotite) 34.0 ± 0.8 m.y.

31. *USGS(D)-72D6* K-Ar
Basalt (W wall of Paramore Crater in San Bernadino Valley; SE¼ NE¼ SW¼ S34,T21S,R31E; 31°33'35"N, 109°10'20"W, Apache quad., Cochise Co., AZ). *Analytical data:* K_2O = 2.09, 2.10%; $^*Ar^{40}$ = 0.0295 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 27%. *Collected by:* H. Drewes; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Pleistocene basalt flow.

31. (continued)
Age quoted by Drewes (in press).

(plagioclase) 1.0 ± 0.1 m.y.

CALIFORNIA

32. *USGS(D)-HLV-100* K-Ar
Basalt (along Big Creek about 2 km E of California Highway 168; SW¼ S16,T8S,R26E MDSM; 37°13′05″N, 119°08′23″W; Huntington Lake quad., Fresno Co., CA). Basalt neck intrudes granodiorite of Red Lake, bordered by 50–100 foot-wide glassy aureole. *Analytical data:* K_2O = 2.485%; $^*Ar^{40}$ = 0.3549 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 59%. *Collected by:* P. C. Bateman; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Age indicates time of intrusion of basalt neck.

(whole-rock) 9.9 ± 0.5 m.y.

COLORADO

33. *R-3502* K-Ar
Andesite (SW¼ S33,T50N,R9E; outcrop in first large gully SE of Tenderfoot Hill (Spiral Drive) on E side of Salida; Cameron Mountain quad., Chaffee Co., CO). Black, porphyritic basaltic andesite with 20% phenocrysts of calcic plagioclase and clinopyroxene; Tallahassee Creek Conglomerate. *Analytical data:* (-40+100 mesh) K_2O = 3.249%; $^*Ar^{40}$ = 1.663 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 22%. *Collected by:* C. E. Chapin, New Mexico Bureau of Mines; *analyzed by:* Geochron Laboratories, Krueger Enterprises, Inc., Cambridge, Mass. *Comment:* Age fits well with established geochronologic framework of Thirtynine Mile Volcanic Field. Basaltic-andesite flows and boulder alluvium of the Tenderfoot Hill area directly overlie the Wall Mountain Tuff (35–36 m.y.) and occupy a paleovalley extending eastward to the Tallahassee Creek area where the paleovalley is overlain by Thirtynine Mile Andesite (34 m.y.).

(whole-rock) 35.2 ± 1.5 m.y.

34. *USGS(D)-A* K-Ar
Ash (S22,T8S,R87W; 30°20′47″N, 107°06′02″W; Basalt quad., Pitkin Co., CO). Rhyolite ash-flow. *Analytical data:* K_2O = 8.81, 8.81%; $^*Ar^{40}$ = 4.655 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 94%. *Collected by:* C. G. Cunningham and R. H. Moench; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Oligocene ash-flow.

(biotite) 36.3 ± 0.9 m.y.

35. K-Ar
Quartz monzonite (Mt. Princeton area, Sawatch Range; NE¼ S28,T15S,R79W; Poncha Springs quad., Chaffee Co., CO). Mount Princeton Quartz Monzonite. *Analytical data:* K_2O = 3.915, 3.915%; $^*Ar^{40}$ = 2.186 and 2.053 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 80% and 80%. *Comment:* It appears that Mount Princeton Quartz Monzonite in this area was emplaced during the Oligocene. Subsequent igneous activity, from 26 to 22 m.y. ago, resulted in rhyolite dikes, small quartz monzonite plutons, and rhyolite domes (Raspberry Gulch Rhyolite of Olson and Dellechaie, 1976). This later activity occurred at about the same time that the Spanish Peaks and other plutons were forming in Colorado. Age of this sample of Mount Princeton Quartz Monzonite is quoted as being 36 m.y. by Olson and Dellechaie (1976); age changed slightly due to use of new decay constants. Location and analytical data released by Frank Dellechaie, Amax Exploration, Inc., Denver, Colorado.

(whole-rock) 37 ± 2 m.y.

36. K-Ar
Rhyolite (Mt. Princeton area, Sawatch Range; NE¼ S28,T15S,R79W; Poncha Springs quad., Chaffee Co., CO). Rhyolite dike. *Analytical data:* K_2O = 3.795, 3.81%; $^*Ar^{40}$ = 1.410 and 1.481 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 83% and 40%. *Comment:* Minimum age of rhyolite dikes cutting Mount Princeton batholith. Rhyolite age of this sample is quoted as being 25.4 m.y. by Olson and Dellechaie (1976); age changed slightly due to use of new decay constants. Location and analytical data released by Frank Dellechaie, Amax Exploration, Inc., Denver, Colorado.

(whole-rock) 26.2 ± 1.0 m.y.

37. K-Ar
Quartz monzonite (Mt. Princeton area, Sawatch Range; SW¼ S34,T15S,R79W; Poncha Springs quad., Chaffee Co., CO). *Analytical data:* K_2O = 4.40, 4.40%; $^*Ar^{40}$ = 1.522 and 1.620 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 83% and 86%. *Comment:* Quartz monzonite plutons are of Oligocene age. An age of 24 m.y. for this sample was quoted by Olson and Dellechaie (1976); age changed slightly due to use of new decay constants. Location and analytical data released by Frank Dellechaie, Amax Exploration, Inc., Denver, Colorado.

(whole-rock) 25 ± 1 m.y.

38. K-Ar
Rhyolite (Raspberry Gulch, E side of Sawatch Range: NE¼ S10,T51N,R7E; Poncha Springs quad., Chaffee Co., CO). Raspberry Gulch Rhyolite of Olson and Dellechaie (1976), a rhyolite dome. *Analytical data:* K_2O = 5.18, 5.16%; $^*Ar^{40}$ = 1.696 and 1.660 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 58% and 61%. *Comment:* Rhyolite dome is of Miocene age. Age quoted by Olson and Dellechaie (1976). Location and analytical data released by Frank Dellechaie, Amax Exploration, Inc., Denver, Colorado.

(whole-rock) 22 ± 1 m.y.

MONTANA

39. *USGS(D)-PL4* K-Ar
Meta-andesite (Glacier National Park; 48°46′05″N, 113°47′01″W; Aherns Pass quad., Flathead Co., MT).

Purcell Lava, Belt Supergroup. *Analytical data:* K_2O = 3.54, 3.56%; $*Ar^{40}$ = 9.386 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 92%. *Collected by:* R. L. Earhart; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Other studies have shown the Purcell Lava to be about one billion years old, and thus the Jurassic age of this sample is in error. In most instances, altered igneous material is not suitable for age-determination, except in an indirect manner (see Earhart, 1975).

(plagioclase) 175 ± 6 m.y.

NEVADA

40. *USGS(M)-WC-1-560* K-Ar

Granodiorite (drill core at 560-foot depth; 39°18′18″N, 119°46′12″W; Washoe City quad., Washoe Co., NV). Somewhat altered, medium-grained, hypidiomorphic granular biotite granodiorite; Sierra Nevada batholith. *Analytical data:* K_2O = 8.920, 8.940%; $*Ar^{40}$ = 10.209 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 93%. *Collected by:* J. H. Sass; *analyzed by:* R. W. Tabor and L. B. Schlocker. *Comment:* Age is a minimum for the time of intrusion. Alteration may have significantly lowered the age.

(biotite) 77.7 ± 1.0 m.y.

41. *USGS(M)-RWT-129-73* K-Ar

Hornfels (39°19′24″N, 119°46′48″W; Washoe City quad., Washoe Co., NV). Coarse-grained biotite hornfels; completely recrystallized from fine-grained low-grade Mesozoic(?) phyllite; collected about 200 meters from granodiorite batholith. *Analytical data:* K_2O = 9.12, 9.08, 9.06%; $*Ar^{40}$ = 11.48 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 86%. *Collected by:* R. W. Tabor; *analyzed by:* R. W. Tabor and L. B. Schlocker. *Comment:* May be intrusive age of batholith; agrees with similar ages for a granodiorite pluton in the southern Carson Range.

(biotite) 85.7 ± 0.9 m.y.

42. *USGS(D)-PS64B-31* K-Ar

Dacite (Pancake Range; 39°14′54″N, 115°47′05″W; Moody Peak quad., White Pine Co., NV). *Analytical data:* K_2O = 8.43, 8.57%; $*Ar^{40}$ = 13.9 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 94%; *analyzed by:* R. F. Marvin, H. H. Mehnert, and W. Mountjoy. *Comment:* Age of intrusive dacite. Nolan, Merriam, and Blake (1974) quote an age of 108 m.y. for this sample; slight age change is due to new decay constants.

(biotite) 110 ± 5 m.y.

43. *USGS(M)-B67-48* K-Ar

Basalt (Pancake Range, 39°14′25″N, 115°47′28″W; Moody Peak quad., White Pine Co., NV). Magpie Hill Basalt. *Analytical data:* K_2O = 0.83%; $*Ar^{40}$ = 0.249 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 48%. *Collected by:* M. C. Blake; *analyzed by:* E. H. McKee. *Comment:* Age of extrusion. Nolan, Merriam, and Blake (1974) quote an age of 20.2 m.y. for this sample; the slight age change is due to new decay constants.

(plagioclase) 20.7 ± 0.8 m.y.

44. *USGS(D)-PS64B-14* K-Ar

Quartz diorite (Rogers Tunnel Dump, Eureka district; 39°29′50″N, 115°59′23″W; Pinto Summit quad., Eureka Co., NV). Quartz diorite plug of Ruby Hill. *Analytical data:* K_2O = 8.31%; $*Ar^{40}$ = 12.5 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 96%; *analyzed by:* R. F. Marvin, H. H. Mehnert, and W. Mountjoy. *Comment:* Age of intrusion. A reported 60 m.y. Pb-alpha age is too young. Nolan, Merriam, and Blake (1974) quote an age of 99.5 m.y. for this sample; the slight age change is due to new decay constants.

(biotite) 102 ± 3.0 m.y.

45. *USGS(D)-BP64B-1* K-Ar

Quartz monzonite (near Wood Cone Peak; 39°23′00″N, 116°10′00″W; Bellevue Peak quad., Eureka Co., NV). Porphyritic quartz monzonite of Wood Cone Peak. *Analytical data:* K_2O = 8.37, 8.35%; $*Ar^{40}$ = 4.14 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 80%. *Collected by:* M. C. Blake; *analyzed by:* R. F. Marvin, H. H. Mehnert, and W. Mountjoy. *Comment:* Age of intrusion.

(biotite) 34.1 ± 1.5 m.y.

46. *USGS(D)-UE6e-1344.5(B)* K-Ar and Fission-track

Volcanic ash (drill core 409.8 m beneath surface of Yucca Flat; N814000, E688200 Nevada Central coordinates; 36°59′00″N, 116°00′30″W; Yucca Lake quad., Nye Co., NV). *K-Ar analytical data:* (-60+150 mesh sanidine-1): K_2O = 7.25, 7.26%; $*Ar^{40}$ = 1.809 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 84%; (-60+100 mesh sanidine-2; sample up-graded): K_2O = 7.61, 7.56%; $*Ar^{40}$ = 1.399 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 76%; (-100+150 mesh sanidine-3; sample up-graded): K_2O = 7.95, 7.97%; $*Ar^{40}$ = 3.579 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 91%. *Fission-track analytical data:* (zircon-1, six grains): P_s = 1.63 x 10^6 tracks/cm² (386); P_i = 10.50 x 10^6 tracks/cm² (1240); neutron flux density = 1.33 x 10^{15} n/sq.cm; U = 253 ppm; (zircon-2, one grain): P_s = 16.5 x 10^6 tracks/cm² (253); P_i = 0.65 x 10^6 tracks/cm²; neutron flux density = 1.33 x 10^{15} n/cm²; U = 16 ppm. *Collected by:* A. T. Fernald; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt (K-Ar); C. W. Naeser (fission-track). *Comment:* The three K-Ar ages illustrate the result of contamination in some tuffs, especially water-laid tuffs. The age of this tuff should be about 9.5 m.y. according to stratigraphic control. However, the finest-sized material gave 31 m.y. and the coarset gave 12.8 m.y. These ages indicate that a variable-sized, older K-feldspar has contaminated the tuff. Since the contaminant is an older K-feldspar in a K-feldspar separate, it is nearly impossible to obtain a mono-chronomatic sample. The fission-track ages similarly show the effects of contamination by old detrital zircons (the age for zircon-2 is from a single

46. (continued)
detrital grain).

(sanidine-1) 17.2 ± 0.6 m.y. (K-Ar)
(sanidine-2) 12.8 ± 0.4 m.y.
(sanidine-3) 31.0 ± 0.7 m.y.
(zircon-1) 12.4 ± 1.4 m.y. (fission-track)
(zircon-2) 1700 ± 1000 m.y.

47. *USGS(D)-73-RCB-7* K-Ar
Trachybasalt (Rattlesnake Canyon on SW side of Garfield Flat; S30,T6N,R33E; 38°20'54"N, 118°20'50"W; Moho Mountain quad., Mineral Co., NV). Olivine trachybasalt. *Analytical data:* K_2O = 3.25, 3.23%; $*Ar^{40}$ = 0.2682 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 61%. *Collected by:* R. C. Bucknam; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Age of extrusion. Age quoted as 5.6 m.y. by Ekren, Bucknam, Carr, Dixon, and Quinlivan (1976) for this sample; slight age change due to use of new decay constants.

(whole-rock) 5.7 ± 0.2 m.y.

48. *USGS(D)-3-67F* K-Ar
Quartz monzonite porphyry (S side of Rattlesnake Flat in T5N,R32E; 38°18'43"N, 118°26'00"W; Rattlesnake Flat quad., Mineral Co., NV). *Analytical data:* K_2O = 8.00, 7.95%; $*Ar^{40}$ = 10.89 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 93%. *Collected by:* R. C. Bucknam; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Age probably indicates time of intrusion. This rock has chilled contacts against a coarse-grained granitic rock which is correlated with similar rock about 6 km to the SW, dated at 101 m.y. (hornblende) and 86 m.y. (biotite) by Evernden and Kistler (1970).

(biotite) 92.4 ± 2.2 m.y.

49. *USGS(D)-LFL-66-GLD-71* K-Ar
Quartz latite (Monitor Range, in T10N,R48E; 38°44'00"N, 116°36'00"W; Green Monster Canyon quad., Nye Co., NV). Quartz latitic welded-tuff (Tuff of the Monitor Range). *Analytical data:* K_2O = 7.645% (K_2O by isotope dilution); $*Ar^{40}$ = 3.008 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 76%. *Collected by:* G. L. Dixon; *analyzed by:* R. F. Marvin, H. H. Mehnert, and W. T. Henderson. *Comment:* The tuff of the Monitor Range is divided into two units. The top unit consists of three ash-flows; the lower unit consists of a rhyolite tuff and a quartz latite tuff. The age of the latter is quoted as 26.5 m.y. by Ekren, Bath, Dixon, Healey, and Quinlivan (1974); the slight age change for this sample is due to use of new decay constants.

(biotite) 27.1 ± 0.7 m.y.

50. *USGS(D)-0-1-51* K-Ar
Rhyolite (Bullfrog Hills; 36°55'42"N, 116°46'21"W; Bullfrog quad., Nye Co., NV). Rhyolite of Burton Mountain. *Analytical data:* K_2O = 8.78, 8.77%; $*Ar^{40}$ = 1.407 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 62%. *Collected by:* P. P. Orkild; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* This calculated age is a maximum age for the rhyolite; field relations suggest that the rhyolite is significantly younger than the underlying Ammonia Tanks Member (11.4 m.y.) of Timber Mountain Tuff.

(biotite) 11.1 ± 0.4 m.y.

51. *USGS(D)-MC-74-BE-882* K-Ar
Granodiorite (elevation 5453 ft (1661 m) on Copper Mountain, 6.5 km SW of Deadhorse Well; 38°52'00"N, 118°27'00"W; Walker Lake 2° map, Mineral Co., NV). Granodiorite of Copper Mountain. *Analytical data:* (biotite): K_2O = 7.36, 7.43%; $*Ar^{40}$ = 17.93 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 93%; (hornblende): K_2O = 0.49, 0.51%; $*Ar^{40}$ = 1.189 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 86%. *Collected by:* E. B. Ekren; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Age of intrusion.

(biotite) 161 ± 4 m.y.
(hornblende) 158 ± 7 m.y.

52. *USGS(D)-MC-74-BE-762A* K-Ar
Vitrophyre (3.5 km SE of Hot Springs and 17.2 km E of Deadhorse Well; 38°53'00"N, 118°08'00"W; Walker Lake 2° map, Mineral Co., NV). Basal vitrophyre of a welded tuff. *Analytical data:* K_2O = 8.90, 8.87%; $*Ar^{40}$ = 3.338 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 89%. *Collected by:* E. B. Ekren; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Age of extrusion.

(sanidine) 25.9 ± 0.9 m.y.

53. *USGS(W)-65-NC-80* Pb-alpha
Granite (SW¼ NE¼ S7,T45N,R57E; 41°48'30"N, 115°35'00"W; Rowland quad., Elko Co., NV). Coffeepot stock. *Analytical data:* alpha/mg-hr = 394; Pb = 19.3 ppm. *Collected by:* R. R. Coats; *analyzed by:* T. W. Stern, and H. Westley. *Comment:* Cretaceous granite.

(zircon) 120 ± 10 m.y.

54. *USGS(W)-65-NC-5* Pb-alpha
Granodiorite (NE¼ SW¼ S9,T46N,R61E; 41°53'00"N, 115°04'30"W; Elk Mountain quad., Elko Co., NV). Hornblende-biotite granodiorite. *Analytical data:* alpha/mg-hr = 387; Pb = 15.7 ppm. *Collected by:* R. R. Coats; *analyzed by:* T. W. Stern, and H. Westley. *Comment:* Cretaceous granodiorite.

(zircon) 100 ± 10 m.y.

NEW MEXICO

55. *USGS(D)-T-10* K-Ar
Rhyolite (32°57'12"N, 108°12'25"W; Twin Sisters quad., Grant Co., NM). Porphyritic vitrophyric rhyolite dike. *Analytical data:* K_2O = 8.33, 8.39%; $*Ar^{40}$ = 3.787 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 76%. *Collected by:* T. L. Finnell; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* An Oligocene dike. Finnell (1976) quotes an age of 30.5

m.y. for this sample; the slight age change is due to use of new decay constants.

(biotite) 31.2 ± 1.0 m.y.

56. *USGS(D)-T-44* K-Ar
Ash-flow (32°57′10″N, 108°12′29″W; Twin Sisters quad., Grant Co., NM). Rhyolitic ash-flow, Tuff of Jaybird Canyon. *Analytical data:* K_2O = 7.83, 7.83%; $^*Ar^{40}$ = 3.523 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 54%. *Collected by:* T. L. Finnell; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Oligocene ash-flow.

(biotite) 31.0 ± 1.0 m.y.

57. *USGS(D)-T-47* K-Ar
Rhyolite (32°56′50″N, 108°11′48″W; Twin Sisters quad., Grant Co., NM). Porphyritic vitrophyric rhyolitic dike(?). *Analytical data:* K_2O = 8.28, 8.30%; $^*Ar^{40}$ = 3.796 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 86%. *Collected by:* T. L. Finnell; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Oligocene dike. Finnell (1976) quotes an age of 30.8 m.y. for this sample; the slight age change is due to use of new decay constants.

(biotite) 31.5 ± 1.0 m.y.

58. *USGS(D)-T-13* K-Ar
Tuff (32°53′22″N, 108°10′00″W; Twin Sisters quad., Grant Co., NM). Bloodgood Canyon Rhyolite of Elston (1968, 1973), a welded zone of white to pale-red rhyolitic ash-flow tuff containing quartz and abundant chatoyant sanidine phenocrysts. *Analytical data:* (sanidine): K_2O = 4.72, 4.71%; $^*Ar^{40}$ = 1.805 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 88%; (biotite): K_2O = 6.30, 6.34%; $^*Ar^{40}$ = 2.747 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 71%. *Collected by:* T. L. Finnell; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Upper Oligocene ash-flow tuff. Finnell (1976) quotes ages of 25.8 m.y. (sanidine) and 29.2 m.y. (biotite) for this sample; slight age changes due to use of new decay constants.

(sanidine) 26.4 ± 0.9 m.y.
(biotite) 30.0 ± 1.0 m.y.

59. *USGS(D)-T-35* K-Ar
Vitrophyre (32°53′34″N, 108°13′48″W; Twin Sisters quad., Grant Co., NM). Lower member of the Tadpole Ridge Formation of Elston (1968, 1973); a black to reddish-orange welded basal vitrophyre containing bronze biotite and oligoclase-andesine phenocrysts. *Analytical data:* K_2O = 8.11, 8.17%; $^*Ar^{40}$ = 3.771 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 74%. *Collected by:* T. L. Finnell; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Oligocene ash-flow. Finnell (1976) quotes an age of 31.1 m.y. for this sample; the slight age change is due to use of new decay constants.

(biotite) 31.9 ± 1.1 m.y.

60. *USGS(D)-T-48* K-Ar
Tuff (32°56′05″N, 108°10′39″W; Twin Sisters quad., Grant Co., NM). Upper member of the Tadpole Ridge Formation of Elston (1968, 1973); welded quartz latitic ash-flow tuff containing oligoclase-andesine, sanidine, and bronze biotite phenocrysts. *Analytical data:* K_2O = 6.86, 6.86%; $^*Ar^{40}$ = 3.157 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 87%. *Collected by:* T. L. Finnell; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Oligocene ash-flow tuff. Finnell (1976) quotes an age of 30.9 m.y. for this sample; the slight age change is due to use of new decay constants.

(biotite) 31.7 ± 1.1 m.y.

61. *USGS(D)-MB-6-66* K-Ar
Tuff (Cherry Creek area, S24,T16S,R14W; 32°54′00″N, 108°14′30″W; Twin Sisters quad., Grant Co., NM). Rhyolitic ash-flow tuff, upper member of the Tadpole Ridge Formation of Elston (1968, 1973). *Analytical data:* K_2O = 7.35%; $^*Ar^{40}$ = 3.41 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 56%; *analyzed by:* personnel of the Geochronology Laboratories, University of Arizona, Tucson, Arizona. They describe the sample as a "quartz latite" (Damon and others, 1967, p. 63–69). *Comment:* Finnell (1976) quotes an age of 31.2 m.y. for this sample; the slight age change is due to use of new decay constants.

(biotite) 32.0 ± 0.9 m.y.

62. *USGS(D)-SL-57-73* K-Ar
Rhyolite (Dry Gallinas Campground near Iron Creek in T16S,R10W; 32°53′15″N, 107°50′50″W; San Lorenzo quad., Grant Co., NM). Rhyolite porphyry plug in which sanidine phenocrysts have a satiny chatoyancy. *Analytical data:* (biotite): K_2O = 7.58, 7.49%; $^*Ar^{40}$ = 3.908 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 84%; (sanidine-1): K_2O = 7.36, 7.48%; $^*Ar^{40}$ = 3.593 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 87%; (sanidine-2): K_2O = 7.36, 7.48%, $^*Ar^{40}$ = 3.746 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 93%. *Collected by:* D. C. Hedlund; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Oligocene intrusive plug.

(biotite) 35.7 ± 1.2 m.y.
(sanidine-1) 33.3 ± 1.2 m.y.
(sanidine-2) 34.7 ± 0.8 m.y.

63. *USGS(D)-SL-210-74* K-Ar
Latite (roadcut 0.64 km S of Emory Pass on New Mexico Highway 90; 32°54′20″N, 107°46′02″W; San Lorenzo quad., Sierra Co., NM). Hornblende latite in the Rubio Peak Formation. *Analytical data:* (oxyhornblende with a surface coating of ferric oxide) K_2O = 0.64, 0.64%; $^*Ar^{40}$ = 0.3473 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 53%. *Collected by:* D. C. Hedlund; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Age of Rubio Peak Formation is late Eocene or early Oligocene. Hedlund (1976) quotes an

63. (continued)
age of 36.4 m.y. for this sample; the slight age change is due to use of new decay constants.

(hornblende) 37.3 ± 2.3 m.y.

64. *USGS(D)-SL-39A-74* K-Ar
Andesite (top of small hill at elevation 6000 ft (1830 m) on Bounds Ranch, S10,T18S,R11W; 32°45'05"N, 107°57'40"W; San Lorenzo quad., Grant Co., NM). Andesite porphyry in the Rubio Peak Formation. Mafic minerals are highly altered. *Analytical data:* (rather altered andesine—An43-45) K_2O = 0.66, 0.66%; $^*Ar^{40}$ = 0.3199 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 69%. *Collected by:* D. C. Hedlund; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Although still indicating an Oligocene age, this is a minimum age for the Rubio Peak Formation, which is probably closer to 36–37 m.y. old. Hedlund (1976) quotes an age of 32.6 m.y. for this sample; the slight age change is due to use of new decay constants.

(plagioclase) 33.4 ± 2.1 m.y.

65. *USGS(D)-HL-24-72* K-Ar
Quartz monzonite (Copper Flat, Animas Mining district; 32°53'05"N, 107°31'36"W; Hillsboro quad., Sierra Co., NM). Mineralized quartz monzonite from the Copper Flat stock. *Analytical data:* K_2O = 7.38, 7.35%; $^*Ar^{40}$ = 8.131 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 92%. *Collected by:* D. C. Hedlund; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Minimum age of quartz monzonite and possible age of mineralization. Hedlund (1975) quotes an age of 73.4 m.y. for this sample; the slight change in the age is due to new decay constants.

(biotite) 75.1 ± 2.5 m.y.

66. *USGS(D)-CB-268-B-75* K-Ar
Tuff (high-line right of way at elevation 6060 ft (1850 m), N of New Mexico State Highway 90 in SE¼ NW¼ S10,T21S,R16W; 32°29'55"N, 108°28'45"W; C-Bar Ranch quad., Grant Co., NM). Tuff of C-Bar Canyon; densely-welded quartz latite ash-flow tuff. *Analytical data:* K_2O = 7.94, 7.99%; $^*Ar^{40}$ = 4.001 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 79%. *Collected by:* D. C. Hedlund; *analyzed by:* R. F. Marvin, H. H. Mehnert, and V. M. Merritt. *Comment:* Oligocene tuff.

(biotite) 34.6 ± 0.8 m.y.

67. *USGS(W)-HBNM* Pb-alpha
Sandstone (Haystack Mountain; 35°22'00"N, 107°55'00"W; Bluewater quad., Valencia Co., NM). Sandstone of the Westwater Canyon Member of the Morrison Formation (Upper Jurassic). *Analytical data:* (Zircons variable; euhedral to moderately well-rounded); alpha/mg-hr = 134; Pb = 26.8 ppm. *Collected by:* R. A. Cadigan; *analyzed by:* T. W. Stern. *Comment:* Zircons probably derived from Precambrian terrane; they do not date the time of deposition.

(zircon) 480 ± 55 m.y.

NEW YORK

68. *USGS(W)-268* Rb-Sr
Pegmatite (580 m NW of Little Bow on Little Bow Road; 44°21'00"N, 75°31'00"W; Natural Dam quad., St. Lawrence Co., NY). Granitic pegmatite. *Analytical data:* Sr = 95.4 ppm (N); $^*Sr^{87}$ = 0.58; initial 87/86Sr = 0.703; Rb^{87} = 37.5 ppm. *Collected by:* H. M. Bannerman; *analyzed by:* C. E. Hedge and F. G. Walthall. *Comment:* Probably near age of intrusion.

(K-feldspar) 1080 ± 150 m.y.

69. *USGS(W)-HB-V-1* Rb-Sr
Gneiss (Rock Island Road, 150 m S of Oswegatchie River; 44°23'50"N, 75°27'28"W; Richville quad., St. Lawrence Co., NY). Quartz-microcline-tourmaline gneiss. *Analytical data:* Sr = 53.4 ppm (N); $^*Sr^{87}$ = 0.44 ppm; initial 87/86Sr = 0.703; Rb^{87} = 26.5 ppm. *Collected by:* H. M. Bannerman; *analyzed by:* C. E. Hedge and F. G. Walthall. *Comment:* Age implies that gneiss belongs to Grenville-age province.

(whole-rock) 1160 ± 130 m.y.

OREGON

70. *USGS(D)-72FP69* K-Ar
Diorite (NW¼ NW¼ S6,T9S,R44E; along Highway 86 at J. N. Bishop Spring; 44°48'00"N, 117°19'00"W; Sparta quad., Baker Co., OR). *Analytical data:* K_2O = 7.73, 7.73%; $^*Ar^{40}$ = 25.77 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 96%. *Collected by:* F. G. Poole; *analyzed by:* R. F. Marvin, H. H. Mehnert, and L. B. Schlocker. *Comment:* A Triassic diorite.

(biotite) 218 ± 5 m.y.

UTAH

71. *USGS(D)-N-R-S* K-Ar
Tuff (Ton's Knoll, Conger Range; 39°08'10"N, 113°47'50"W; Conger Range quad., Millard Co., UT). Welded ash-flow tuff of the Needles Range Formation. *Analytical data:* (biotite): K_2O = 8.32%; $^*Ar^{40}$ = 3.678 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 81%; (hornblende): K_2O = 0.995%; $^*Ar^{40}$ = 0.4423 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 56%. *Collected by:* R. K. Hose; *analyzed by:* J. D. Obradovich. *Comment:* Age of ash-flow unit, Needles Range Formation.

(biotite) 30.4 ± 1.2 m.y.
(hornblende) 30.6 ± 1.2 m.y.

72. *USGS(D)-O-R-S* K-Ar
Tuff (E end of Cowboy Pass, Confusion Range; 39°19'37"N, 113°41'30"W; Conger Mountain quad., Millard Co., UT). Welded ash-flow tuff of the Needles Range Formation. *Analytical data:* (biotite): K_2O = 7.82%; $^*Ar^{40}$ = 3.259 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 57%; (hornblende): K_2O = 0.850%; $^*Ar^{40}$ = 0.3672 x 10^{-10} mol/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 65%. *Collected by:* R. K. Hose; *analyzed by:* J. D. Obradovich. *Comment:*

Age of ash-flow unit, Needles Range Formation.

(biotite) 28.7 ± 1.1 m.y.
(hornblende) 29.8 ± 1.2 m.y.

73. *USGS(D)-T-R-S* K-Ar
Tuff (E end of Cowboy Pass, Confusion Range; 39° 19'50"N, 113°40'10"W; Conger Mountain quad., Millard Co., UT). Welded ash-flow tuff of the Needles Range Formation. *Analytical data:* K_2O = 0.829%; $*Ar^{40}$ = 0.3267 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 48%. *Collected by:* R. K. Hose; *analyzed by:* J. D. Obradovich. *Comment:* Age of ash-flow unit, Needles Range Formation.

(hornblende) 27.2 ± 1.1 m.y.

WASHINGTON

74. *USGS(M)-RWT-59-72A* and *RWT-59-72B* K-Ar
Phyllite (Olympic Mountains; 47°35'54"N, 123° 16'48"W; Mt. Steel quad., Jefferson Co., WA). Sample from local shear zone; fine-grained, cataclastic, quartz-veined, graphitic phyllite with relict clastic texture. *Analytical data:* (A) (-100 mesh) K_2O = 2.250, 2.247%; $*Ar^{40}$ = 1.0437 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 64%; (B) (-60+100 mesh) K_2O = 1.110, 1.108%; $*Ar^{40}$ = 1.0358 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 42%. *Collected by:* R. W. Tabor; *analyzed by:* R. W. Tabor and L. B. Schlocker. *Comment:* (A)—Age is close to age of regional metamorphism; (B)—Age is a combination of provenance age and metamorphic age.

(whole-rock) 32.0 ± 0.6 m.y. (A)
(whole-rock) 63.7 ± 1.2 m.y. (B)

75. *USGS(M)-OC-149(BA)* and *OC-149-(BB)* K-Ar
Metagraywacke (Olympic Mountains; 47°40'36"N, 123°23'36"W; Mt. Steel quad., Jefferson Co., WA). Elwka lithic assemblage, metagraywacke-mica semi-schist. *Analytical data:* (BA) (-100 mesh) K_2O = 1.530, 1.527%; $*Ar^{40}$ = 0.5965 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 51%; (BB) (-60+100 mesh) K_2O = 1.337, 1.335%; $*Ar^{40}$ = 0.5844 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 53%. *Collected by:* R. W. Tabor; *analyzed by:* R. W. Tabor and L. B. Schlocker. *Comment:* Ages are probably close to age of metamorphism, based on plotting age versus degree of metamorphism. See Tabor (1972).

(whole-rock) 26.9 ± 0.5 m.y. (BA)
(whole-rock) 30.1 ± 0.6 m.y. (BB)

76. *USGS(M)-RWT-70-72A* and *RWT-70-72B* K-Ar
Phyllite (Olympic Mountains; 47°43'24"N, 123° 20'06"W; Mt. Steel quad., Jefferson Co., WA). Phyllite breccia. *Analytical data:* (A) (-60+100 mesh) K_2O = 2.760%; $*Ar^{40}$ = 0.7269 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 65%; (B) (-100 mesh) K_2O = 2.740%; $*Ar^{40}$ = 0.6564 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 63%. *Collected by:* R. W. Tabor; *analyzed by:* R. W. Tabor and L. B. Schlocker. *Comment:* Age indicates time of local metamorphic event, associated with shearing.

(whole-rock) 18.2 ± 1.2 m.y. (A)
(whole-rock) 16.6 ± 1.1 m.y. (B)

77. *USGS(M)-RWT-285-71A* and *RWT-285-71B* K-Ar
Phyllite (Olympic Mountains; 47°41'36"N, 123° 40'30"W; Mt. Christie quad., Jefferson Co., WA). Fine-grained, graphitic, mica-quartz phyllite breccia with quartz segregations. *Analytical data:* (A) (-100 mesh) K_2O = 3.330%; $*Ar^{40}$ = 0.9008 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 68%; (B) (-60+100 mesh) K_2O = 3.195%; $*Ar^{40}$ = 0.9397 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 76%. *Collected by:* R. W. Tabor; *analyzed by:* R. W. Tabor and L. B. Schlocker. *Comment:* Age indicates time of local metamorphic event, associated with shearing.

(whole-rock) 18.7 ± 1.3 m.y. (A)
(whole-rock) 20.3 ± 1.4 m.y. (B)

78. *USGS(M)-RWT-151-76* K-Ar
Quartz diorite (47°28'30"N, 121°02'42"W; Kachess Lake quad., Kittitas Co., WA). Medium-grained, hypidiomorphic granular, hornblende quartz diorite; Fortune Creek stock. *Analytical data:* (-150+200 mesh) K_2O = 0.305, 0.297, 0.312, 0.298%; $*Ar^{40}$ = 0.3534 and 0.3814 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 52, 56%. *Collected by:* R. W. Tabor; *analyzed by:* R. W. Tabor and L. B. Schlocker. *Comment:* The Fortune Creek stock intrudes the ultramafic Ingalls Complex of Frost (1973) and may also be satellitic to the Mt. Stuart batholith, which has a probable K-Ar age of 88 m.y. (Engels and Crowder, 1971). The stock has been considered Eocene in age, based on K-Ar plagioclase age of 50 ± 4 m.y. (Laursen and Hammond, 1974, p. 18).

(hornblende) 82.3 ± 3.6 m.y.

79. *USGS(M)-75-207* K-Ar
Hornblendite (47°38'54"N, 120°36'54"W; Leavenworth quad., Chelan Co., WA). Dike of porphyritic aphanitic hornblendite. *Analytical data:* K_2O = 0.585, 0.585, 0.586, 0.589%; $*Ar^{40}$ = 0.3817, 0.3645, and 0.3424 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 56, 58, 20%. *Collected by:* R. W. Tabor and J. T. Whetten(?); *analyzed by:* R. W. Tabor and L. B. Schlocker. *Comment:* Dike intrudes sandstone which has been dated at a nearby locality as about 44 m.y. by fission-track method (Whetten, 1976).

(hornblende) 42.5 ± 2.6 m.y.

CANADA
British Columbia

80. *USGS(M)-RWT-345-71* K-Ar
Diorite (48°26'54"N, 123°55'18"W; Sooke 92 B/5 quad., southern Vancouver Island, B. C., Canada). Hornblende diorite, part of a light colored phase of contact migmatite, presumably part of gabbro of the Sooke Formation contact zone. *Analytical data:* K_2O

81. (continued)
= 0.125, 0.138, 0.133, 0.120%; $*Ar^{40}$ = 0.0894 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 32%. *Collected by:* R. W. Tabor; *analyzed by:* R. W. Tabor and L. B. Schlocker. *Comment:* Age is minimum for the metamorphic event in this area.

(hornblende) 47.5 ± 3.1 m.y.

81. *USGS(M)-RWT-344-71* K-Ar
Quartz diorite (48°26'48"N, 123°55'36"W; Sooke 92 B/5 W quad., southern Vancouver Island, B. C., Canada). Isolated outcrop of highly-altered hypidiomorphic granular biotite-hornblende quartz diorite in the area of the Sooke Formation. *Analytical data:* K_2O = 0.260, 0.260%; $*Ar^{40}$ = 0.2035 and 0.2113 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 39, 38%. *Collected by:* R.W. Tabor; *analyzed by:* R. W. Tabor and L. B. Schlocker. *Comment:* Age is probably a minimum age for the regional metamorphic event effecting the plutonic complex. The gabbro complex is supposed to intrude lower-to-middle Eocene Metchosin volcanics of Clapp (1910). If this age is correct, the volcanics are misdated; possibly the gabbro complex is related to the volcanics.

(hornblende) 54.6 ± 1.3 m.y.

82. *USGS(M)-RWT-348B-71* K-Ar
Gabbro (48°22'24"N, 123°40'48"W; Sooke 92 B/5 E quad., southern Vancouver Island, B. C., Canada). Sooke Formation, uralitic-pyroxene gabbro. *Analytical data:* K_2O = 1.53, 1.58, 1.55, 1.56, 1.56, 1.52, 1.56%; $*Ar^{40}$ = 0.8841 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 18%. *Collected by:* R. W. Tabor; *analyzed by:* R. W. Tabor and L. B. Schlocker. *Comment:* This is a minimum age for the uralitization.

(uralitic hornblende) 39.2 ± 1.6 m.y.

83. *USGS(M)-RWT-347-71* K-Ar
Gabbro (48°21'35"N, 123°39'30"W; Sooke 92 B/5 E quad., southern Vancouver Island, B. C., Canada). Sooke Formation; coarse-grained, ophitic, uralitized pyroxene gabbro. *Analytical data:* K_2O = 0.130, 0.127, 0.125, 0.126%; $*Ar^{40}$ = 0.0878 x 10^{-10} mol/gm; $*Ar^{40}/\Sigma Ar^{40}$ = 26%. *Collected by:* R. W. Tabor; *analyzed by:* R. W. Tabor and L. B. Schlocker. *Comment:* This is a minimum age for uralitization (metamorphic event).

(uralitic hornblende) 47.4 ± 1.7 m.y.

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