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Isochron/West, Bulletin of Isotopic Geochronology, v. 9, pp. 1-33

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SUMMARY OF RADIOMETRIC AGES OF OREGON AND WASHINGTON ROCKS, THROUGH JUNE 1972

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This paper summarizes information pertaining to 384 radiometric ages of diverse rocks in the states of Oregon and Washington. The ages range from 1,510 m.y. (biotite gneiss in the northern Cascade Range, Washington) to a youthfulness of 3 m.y. (andesite lava in the Oregon Cascade Range). Some ages are anomalous; some of the same rock mass are discordant. Analytical methods were mostly for K-Ar but include Pb^{206}/U^{238}, Pb^{207}/U^{235}, Pb^{207}/Pb^{206}, lead-alpha, and fission track. The rocks sampled include mostly metamorphic and plutonic rocks, a lesser number of volcanic, and a few metasedimentary rocks.

The information was compiled from published reports, unpublished dissertations and manuscripts, and written communications through June 1972. Because of the widely varying sources of information the compilers believe that some dates have been overlooked and others may be in error. Undoubtedly a supplement to this list will have to be published within two years. Many dates have appeared in publications since July 1972, and several projects are presently underway in the states to obtain radiometric dates. If a reader detects an error or an oversight, please notify Paul E. Hammond, Department of Earth Sciences, Portland State University, P. O. Box 751, Portland, OR 97207.

The authors gratefully acknowledge the typing of the manuscript by Margaret C. Lewis and Nancy Pulliam and the funding of this project by the Department of Earth Sciences at Portland State University.

The age dates are grouped into eight geologic provinces (Fig. 1). The number of dates within each province is an indication of the efforts to obtain radiometric ages within recent years and not a measure of the reproducibility of geologic events. The number of dates is approximately inversely proportional to the size of the province. The southeastern Columbia Plateau and Willapa Hills (southern Coast Range) of Washington each contain one date. The high number of ages in the northern Cascade Range of Washington and Klamath Mountains of Oregon approaches the number of rock units so far delineated.

SAMPLE DESCRIPTIONS

Sample descriptions are listed by locality number which is keyed to the geologic provinces (Fig. 1) and spotted on the state geologic maps for Oregon (Fig. 2) and Washington (Fig. 3). The arrangement of the samples is according to age; the oldest rock unit of the province being listed first, the youngest last. When a rock unit has two or more ages, the sample giving the oldest age is listed first, followed by samples of decreasing age for the same rock unit. Each description includes reference source, analytical method(s), rock unit, and location; if all such data could be obtained. Locations given in township and range are based on Willamette Meridian and Baseline. Some sample sites are not shown on the state maps because the description of the location is indefinite or not given.

Ia. OLYMPIC MOUNTAINS–WASHINGTON

1. Snavely and others (1972) K-Ar (hornblende) 144±2.4 m.y.
Diorite (Point of Arches; Ozette Lake 15′ Quad., Clallam Co., WA).

2. Snavely and others (1972) K-Ar (hornblende) 59±3 m.y.
Dacite dike in marine sedimentary and volcanic rocks (Point of Arches; Ozette Lake 15′ Quad., Clallam Co., WA).

3. Tabor (1972) K-Ar (whole rock) 29 m.y.
Slate-phyllite (Mount Olympus 15′ Quad., Mt. Angels 15′ Quad., Mt. Christie 15′ Quad., and Mt. Steel 15′

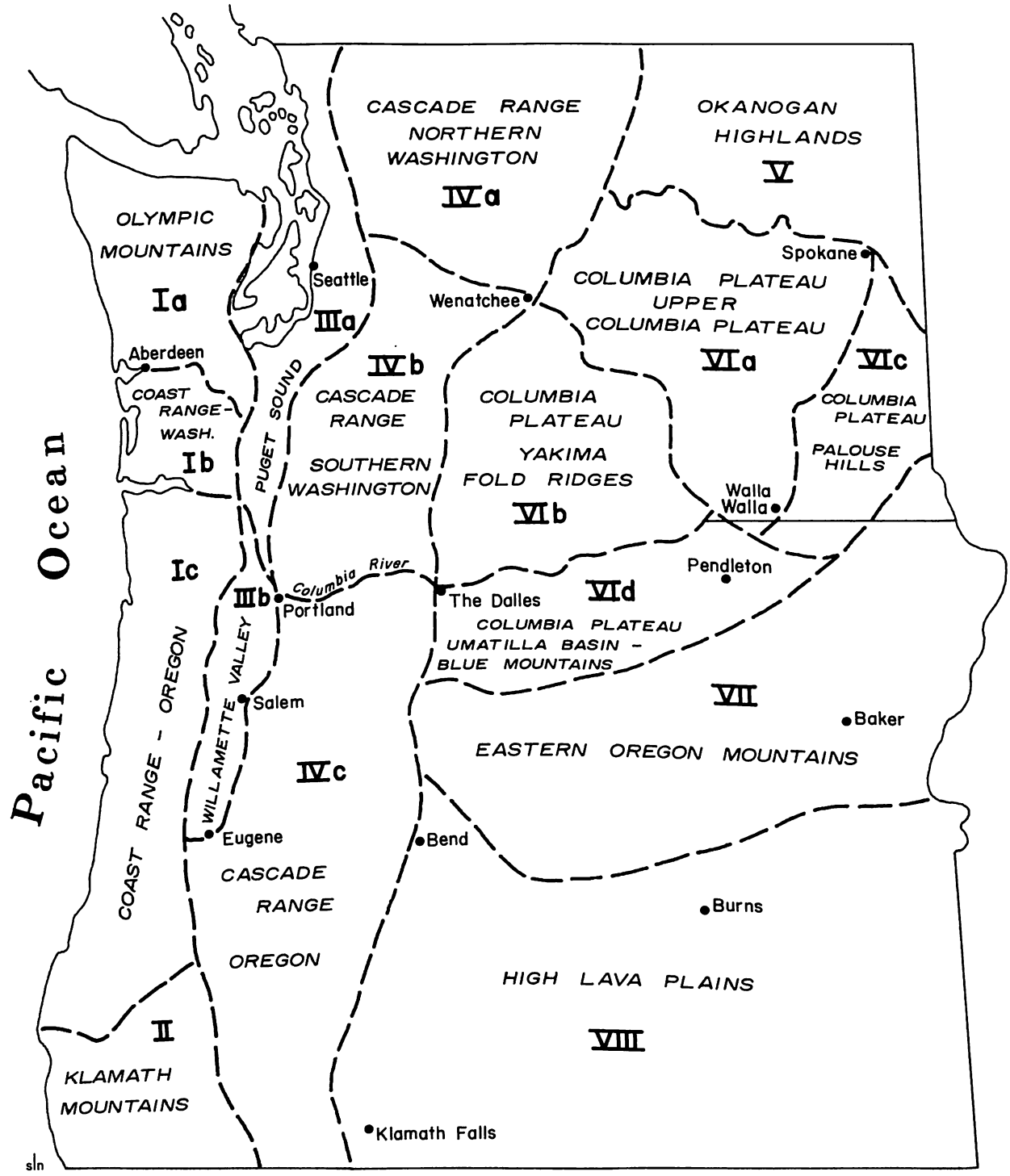
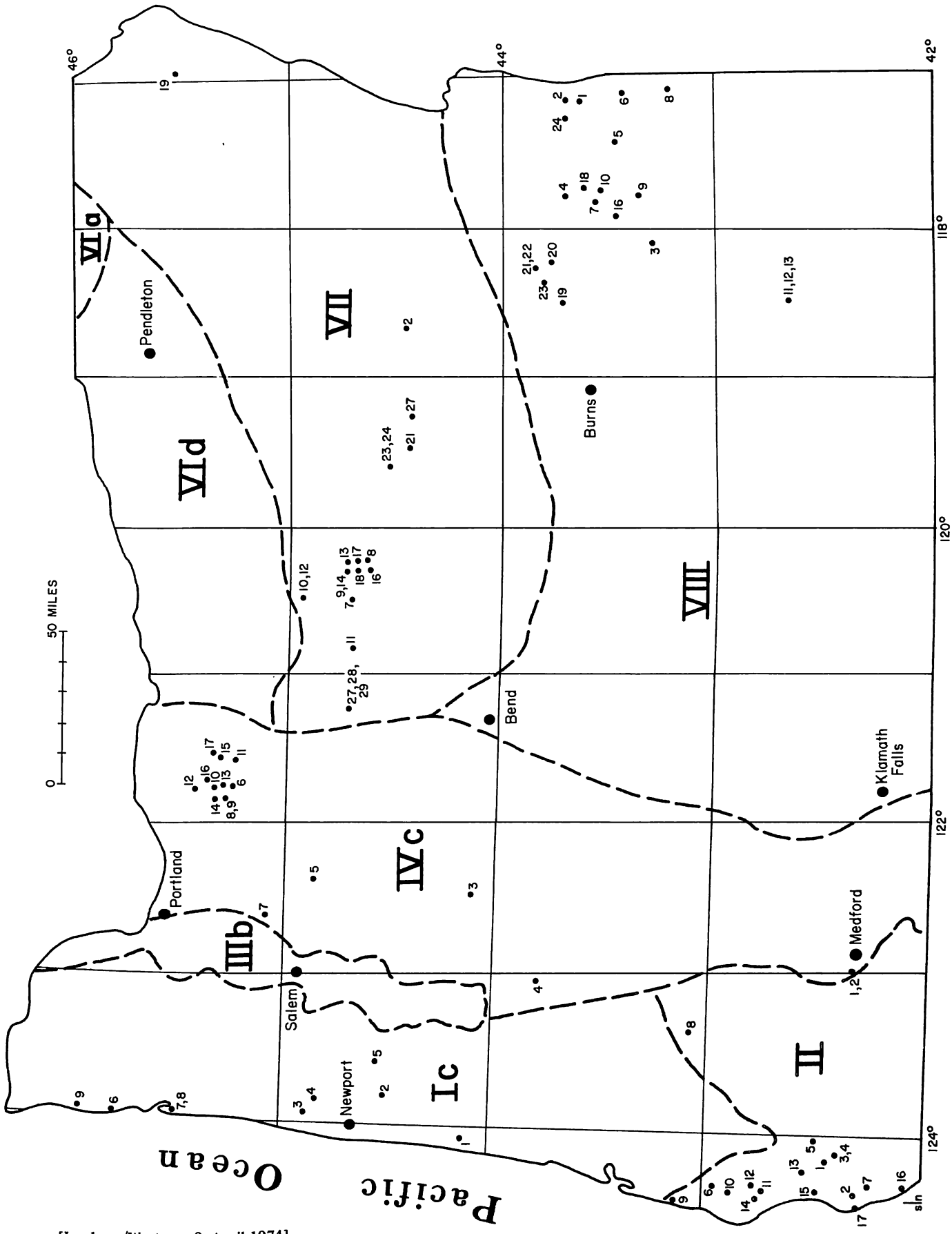


Figure 1. Geologic Provinces of Oregon and Washington



[Isochron/West, no. 9, April 1974]

Figure 2. Map of Oregon showing location of dated rocks. (Dashed lines outline geologic provinces; Roman numerals are keyed to Figure 1. Sample locations are indicated by dots; sample numbers and Roman numerals are keyed to sample descriptions.)

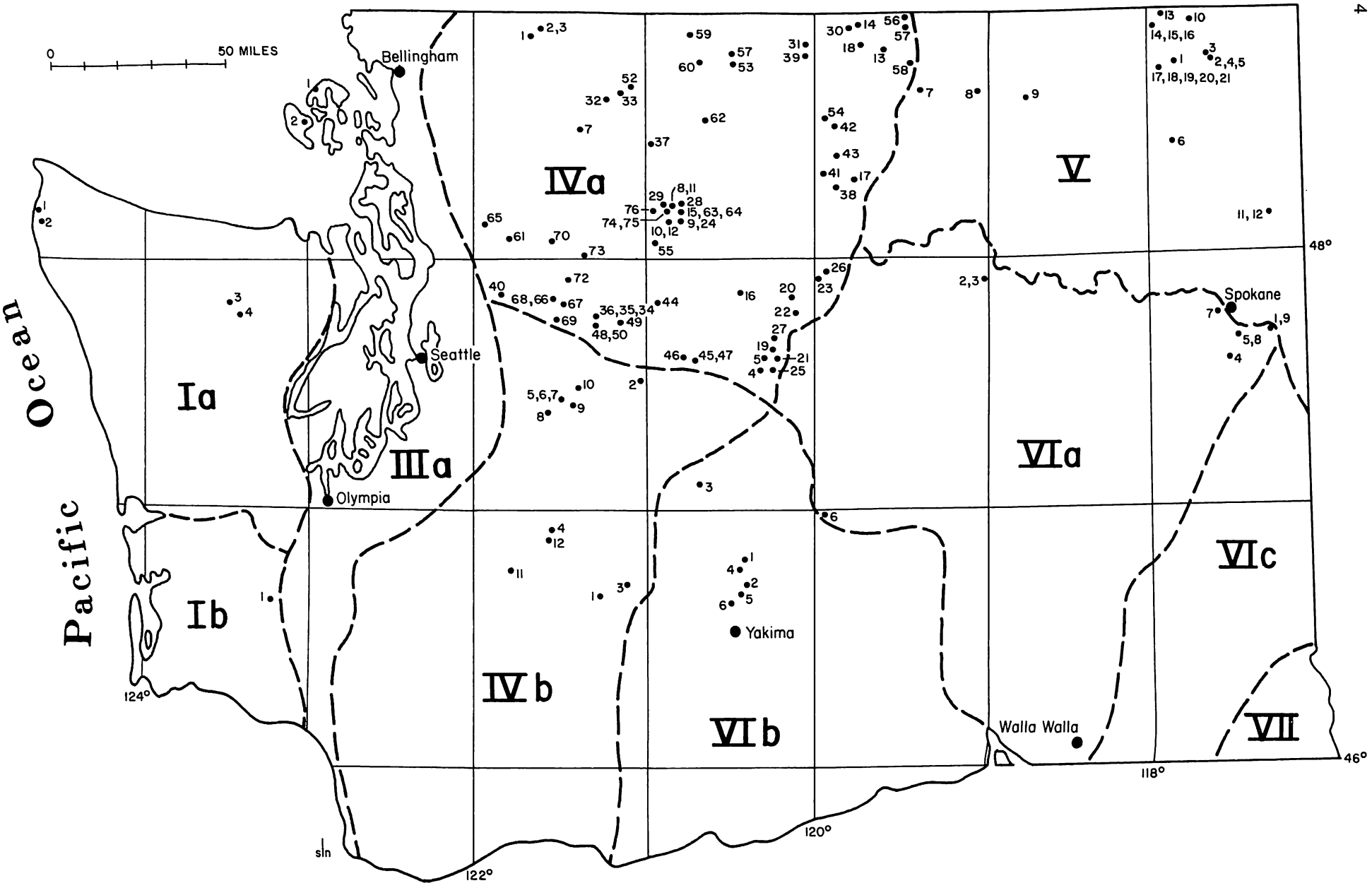


Figure 3. Map of Washington showing location of dated rocks. (Dashed lines outline geologic provinces; Roman numerals are keyed to Figure 1. Sample locations are indicated by dots; sample numbers and Roman numerals are keyed to sample descriptions.)

Quad., Clallam Co., and Jefferson Co., WA). Collector: R. W. Tabor; analyzer: K, Lois Schlocker; Ar, R. W. Tabor; method: K, Baird and Instrumentation Laboratories flame photometers with lithium internal standards; Ar, isotope dilution on Nier and Reynolds type mass spectrometers. Note: Age of low-grade regional metamorphism of early Tertiary sedimentary rocks. Defined by plot of 28 ages (14 samples) of recrystallized graywacke and slate, forming a curve which flattens to an asymptote at the above age. Determinations of 8 samples of slate-phyllite give same age.

4. Tabor (1972) K-Ar (whole rock) 17 m.y.
Breccia, mostly of mica phyllite (Mount Olympus 15′ Quad., Mt. Angels 15′ Quad., Mt. Christie 15′ Quad., and Mt. Steel 15′ Quad., Clallam Co., and Jefferson Co., WA). Collector: R. W. Tabor; analyzer: K, Lois Schlocker; Ar, R. W. Tabor; method: K, Baird and Instrumentation Laboratories flame photometers with lithium internal standards; Ar, isotope dilution on Nier and Reynolds type mass spectrometers. Note: Age of brecciation, introduction of hot solutions, and recrystallization of micas in early Tertiary rocks that had previously been low-grade metamorphosed at 29 m.y. Determinations based on analyses of 4 samples of breccia.

Ib. COAST RANGE (WILLAPA HILLS)–WASHINGTON

1. Turner (1970) K-Ar (plagioclase) 15.3±0.8 m.y.
No. KA 2138
Basalt (sec. 11, T. 13 N., R. 5 W.; ½ mi S of Doty in quarry 2750 ft N. 30 E. of SW corner of section at elevation of about 420 ft; Pe Ell 15′ Quad., Lewis Co., WA). Analyzer: K, Joachim Hampel; method: K, flame photometry on Zeiss PF 5 with a lithium internal standard; Ar, Evernden and Curtis (1965).

Ic. COAST RANGE–OREGON

1. Tatsumato and Snavely (1969) K-Ar 36.6±3.6 m.y.
No. SR63-45
Porphyritic basalt (SW ¼ sec. 14, T. 17 S., R. 12 W.; Cape Mountain; Heceta Head 15′ Quad., Lane Co., OR). Analyzer: R. Kistler.

2. Tatsumato and Snavely (1969) K-Ar 33.6 m.y.
No. SR59-46
Nepheline syenite (NE ¼ sec. 1, T. 13 S., R. 10 W.; Table Mountain; Tidewater 15′ Quad., Lincoln Co., OR). Analyzer: R. Kistler.

3. Tatsumato and Snavely (1969) K-Ar 32.6±0.98 m.y.
No. SR59-9
Biotite camptonite dike (NE ¼ sec. 20, T. 8 S., R. 10 W.; Siletz River; Euchre Mountain 15′ Quad., Lincoln Co., OR). Analyzer: R. F. Marvin, H. H. Mehnert, W. Mountjoy.

4. Tatsumato and Snavely (1969) K-Ar 30.2 m.y.
No. SR57-3
Granophyric gabbro sill (SW ¼ sec. 1, T. 9 S., R. 10 W.; Lambert Point; Euchre Mountain 15′ Quad., Lincoln Co., OR). Analyzer: J. D. Obradovich.

5. Tatsumato and Snavely (1969) K-Ar 29.7 m.y.
No. SR65-115
Pegmatite (SW ¼ sec. 20, T. 12 S., R. 7 W.; Mary's Peak; Mary's Peak 15′ Quad., Benton Co., OR). Analyzer: J. D. Obradovich.

6. Tatsumato and Snavely (1969) K-Ar 16.0±0.65 m.y.
No. SR59-17
Diorite sill (SW ½ sec. 18, T. 3 N., R. 10 W.; Neahkahnie Mountain; Nehalem 15′ Quad., Tillamook Co., OR). Analyzer: J. D. Obradovich.

7. Turner (1970) K-Ar (plagioclase) 15.2±0.6 m.y.
No. KA 2161
Basalt of Yakima type (sec. 19, T. 1 S., R. 10 W.; near Cape Meares, 1200 ft E of NW corner of section; Tillamook 15′ Quad., Tillamook Co., OR). Analyzer: K, J. Hampel; method: K, flame photometry on a Zeiss PF 5 with a lithium internal standard; Ar, Evernden and Curtis (1965).

8. Turner (1970) K-Ar (whole rock) 14.5±1 m.y.
No. KA 2140R
Basalt of Yakima type (sec. 18, T. 1 S., R. 10 W.; near Cape Meares about 300 ft E of NW corner of section at base of sea cliff 2 ft above contact with Astoria Formation; Tillamook 15′ Quad., Tillamook Co., OR). Analyzer: K, J. Hampel; method: K, flame photometry on a Zeiss PF 5 with a lithium internal standard; Ar, Evernden and Curtis (1965).

9. Turner (1970) K-Ar (plagioclase) 14.0±2.7 m.y.
No. KA 2134
Basalt of Yakima type (sec. 18, T. 5 N., R. 10 W.; near Ecola Point, 2400 ft S. 44 W. from the NW corner of sec. at 620 ft elevation; Tillamook Head 7½′ Quad., Clatsop Co., OR). Analyzer: K, J. Hampel; method: K, flame photometry on a Zeiss PF 5 with a lithium internal standard; Ar, Evernden and Curtis (1965).

II. KLAMATH MOUNTAINS

1a. Dott (1965) K-Ar (hornblende) 285±25 m.y.
No. 35-B
Saddle Mtn. diorite (T. 37 S., R. 12 W.; 1.5 mi WNW of Saddle Mountain; Collier Butte 15′ Quad., Curry Co., OR). Analyzer: Geochron, Inc.; method: K, flame photometry; Ar, Reynolds type mass spectrometer. Note: anomalously old date.

1b. Koch (1966) K-Ar (hornblende) 285±25 m.y.
No. 35-B & A0072
Saddle Mtn. diorite (T. 37 S., R. 12 W.; on slope WNW of Saddle Mountain; Collier Butte 15′ Quad., Curry Co., OR). Collector: W. D. Burt; analyzer: Geochron, Inc. Note: anomalously old date.

2. Dott (1965) K-Ar (whole rock) 215±5 m.y.
No. 16-28-5
Mafic dike in shear zone (SE ¼ NW ¼ sec. 3, T. 39 S., R. 14 W.; Cape Ferrelo 15′ Quad., Curry Co., OR). Analyzer: Geochron, Inc.; method: K, flame photometry; Ar, Reynold's type mass spectrometer. Note: anomalously old date.

3. Dott (1965) K-Ar (hornblende) 151±12 m.y.
No. CB-14
Collier Butte Diorite (T. 37 S., R. 12 W.; top of Collier Butte; Collier Butte 15′ Quad., Curry Co., OR). Analyzer: Geochron, Inc.; method: K, flame photometry; Ar, Reynold's type mass spectrometer.

4. Koch (1966) K-Ar (hornblende) 150 m.y.
No. CB-14(6B) & A0071
Collier Butte Diorite (near center, T. 37 S., R. 12 W.; on S slope Collier Butte; Collier Butte 15′ Quad., Curry Co., OR). Collector: W. D. Burt; analyzer: Geochron, Inc.

5. Coleman and Lanphere (1971) K-Ar (hornblende) 151±6 m.y.
No. 54-65A
Big Craggies klippe, hornblende-plagioclase-magnetite amphibolite (124°02.5′W, 42°24′N; SW ¼ sec. 6, T. 37 S., R. 11 W.; Collier Creek; Collier Butte 15′ Quad., Curry Co., OR). Analyzer: K, C. O. Ingamells and L. B. Schlocker; Ar, R. F. Marvin, H. H. Mehnert, and J. C. Von Essen.

6. Coleman and Lanphere (1971) K-Ar (phengite) 149±4 m.y.
No. 59-69 (glaucophane) 132±13 m.y.
Schist (124°18'W, 42°54.8'N; SE ¼ sec. 1, T. 31 S., R. 14 W.; above South Fork of Sixes River; Langlois 15' Quad., Curry Co., OR). Analyzer: K, C. O. Ingamells and L. B. Schlocker; Ar, R. F. Marvin, H. H. Mehnert and J. C. Von Essen.

7. Dott (1965) K-Ar (whole rock) 149±4 m.y.
No. 18-25-7
Dothan Formation, vitric andesite or dacite (SE ¼ SW ¼ sec. 20, T. 39 S., R. 13 W.; Cape Ferrelo 15' Quad., Curry Co., OR). Analyzer: Isotopes, Inc.; method: K, flame photometry, Ar, Reynold's type mass spectrometer.

8. Coleman and Lanphere (1971) K-Ar (phengite) 148±4 m.y.
No. 10-58 (glaucophane) 132±5 m.y.
Schist (123°24'W, 43°08.5', SE ½ sec. 10, T. 28 S., R. 6 W.; top of small hill 0.5 mi NNE of Winston Bridge; Roseburg 15' Quad., Douglas Co., OR). Analyzer: K, C. O. Ingamells and L. B. Schlocker; Ar, R. F. Marvin, H. H. Mehnert, and J. C. Von Essen.

9. Coleman and Lanphere (1971) K-Ar (phengite) 147±4 m.y.
No. 94-67 (glaucophane) 145±8 m.y.
Schist (124°25.8'W, 43°07'N; SW ¼ sec. 25, T. 28 S., R. 16 W.; Tupper Rock jetty quarry; Bandon 15' Quad., Coos Co., OR). Analyzer: K, C. O. Ingamells and L. B. Schlocker; Ar, R. F. Marvin, H. H. Mehnert and J. C. Von Essen.

10. Coleman and Lanphere (1971) K-Ar (phengite) 142±4 m.y.
No. 29-69 (actinolite) 141±6 m.y.
(glaucophane) 132±8 m.y.
Schist (124°15.5'W, 42°51'N; SE ¼ sec. 29, T. 31 S., R. 13 W.; near ridge crest 2 mi SE of Tent Prairie; Langlois 15' Quad., Curry Co., OR). Analyzer: K, C. O. Ingamells and L. B. Schlocker; Ar, R. F. Marvin, H. H. Mehnert, and J. C. Von Essen.

11a. Dott (1965) K-Ar (hornblende) 275±20 m.y.
No. Q-11
Pearse Peak Diorite (NE ¼ NE ¼ sec. 27, T. 33 S., R. 14 W.; Port Orford 15' Quad., Curry Co., OR). Analyzer: Geochron, Inc.; method: K, flame photometry; Ar, Reynold's type mass spectrometer. Note: anomalously old date.

11b. Koch (1966) K-Ar (hornblende) 275±20 m.y.
No. Q11 & A0070
Pearse Peak Diorite, quartz diorite (sec. 27, T. 33 S., R. 14 W.; along roadside at junction of sec. 22 & 27; Port Orford 15' Quad., Curry Co., OR). Collector: W. R. Kaiser; analyzer: Geochron, Inc. Note: anomalously old date.

12a. Dott (1965) K-Ar (biotite) 145±4 m.y.
No. ERR-1
Pearse Peak Diorite (NW ¼ SW ¼ sec. 15, T. 33 S., R. 14 W.; Port Orford 15' Quad., Curry Co., OR). Analyzer: University of Alberta; method: K, flame photometry; Ar, Reynold's type mass spectrometer.

12b. Koch (1966) K-Ar (biotite) 146±4 m.y.
No. ERR-1 & U. A. AK #428
Pearse Peak Diorite, quartz diorite (NW ¼ SW ¼ sec. 15, T. 33 S., R. 14 W.; along Elk River; Port Orford 15' Quad., Curry Co., OR). Collector: W. R. Kaiser; analyzer: H. Baadsgaard, Univ. of Alberta, Edmonton.

12c. Dott (1965) K-Ar (biotite) 141±7 m.y.
No. ERR-1
Pearse Peak Diorite (NW ¼ SW ¼ sec. 15, T. 33 S., R. 14 W.; Port Orford 15′ Quad., Curry Co., OR). Analyzer: Geochron, Inc.; method: K, flame photometry; Ar, Reynold's type mass spectrometer.

12d. Koch (1966) K-Ar (biotite) 141±7 m.y.
No. ERR-1 & 80231
Pearse Peak Diorite, quartz diorite (NW ¼ SW ¼ sec. 15, T. 33 S., R. 14 W.; along Elk River; Port Orford 15′ Quad., Curry Co., OR). Collector: W. R. Kaiser; analyzer: Geochron, Inc.

13a. Dott (1965) K-Ar (whole rock) 138±10 m.y.
No. 62-173
Colebrook Formation, quartz-mica schist (NE ¼ NE ¼ sec. 3, T. 36 S., R. 13 W.; Collier Butte 15′ Quad., Curry Co., OR). Analyzer: Geochron, Inc.; method: K, flame photometry; Ar, Reynold's type mass spectrometer.

13b. Koch (1966) K-Ar (whole rock) 138±10 m.y.
No. 62-173 & R-0074
Colebrook Formation, schist (SE ¼, T. 35 S., R. 13 W.; along Rogue River at mouth of Quosatana Creek; Collier Butte 15′ Quad., Curry Co., OR). Collector: R. H. Dott, Jr.; analyzer: Geochron, Inc.

14a. Dott (1965) K-Ar (whole rock) 125±6 m.y.
No. C-1
Colebrook Formation, quartz-mica schist (NW ¼ NW ¼ sec. 20, T. 33 S., R. 14 W.; Port Orford 15′ Quad., Curry Co., OR). Analyzer: Geochron, Inc.; method: K, flame photometry; Ar, Reynold's type mass spectrometer.

14b. Koch (1966) K-Ar (whole rock) 125±6 m.y.
No. CS-1
No. R-0069
Colebrook Formation, schist (NW ¼ sec. 20, T. 33 S., R. 14 W.; at McGribble Road bridge over Bald Mountain Creek. Port Orford 15′ Quad., Curry Co., OR). Collector: W. R. Kaiser; analyzer: Geochron, Inc.

15a. Dott (1965) K-Ar (hornblende) 130±15 m.y.
No. 62-82
Mafic dike in peridotite (SW ¼ SE ¼ sec. 34, T. 36 S., R. 14 W.; Gold Beach 15′ Quad., Curry Co., OR). Analyzer: Geochron, Inc.; method: K, flame photometry; Ar, Reynold's type mass spectrometer.

15b. Koch (1966) K-Ar (hornblende) 130±15 m.y.
No. 62-82 & A0073
Diorite dike (SW ¼ SE ¼ sec. 34, T. 36 S., R. 14 W.; 2 mi NE of Grizzly Mountain. Gold Beach 15′ Quad., Curry Co., OR). Collector: R. H. Dott, Jr.; analyzer: Geochron, Inc.

16. Dott (1965) K-Ar (whole rock) 30±1 m.y.
No. Rhg
Rhyolite sill in the Dothan Formation, (SE ¼ NW ¼ sec. 36, T. 40 S., R. 14 W.; Cape Ferrelo 15′ Quad., Curry Co., OR). Analyzer: Isotopes, Inc.; method: K, flame photometry; Ar, Reynold's type mass spectrometer.

17. Dott (1965) K-Ar (whole rock) 28±1 m.y.
No. RD62-62
Mafic dike in Late Cretaceous rocks (NW ¼ NE ¼ sec. 5, T. 39 S., R. 14 W.; Cape Ferrelo 15′ Quad., Curry Co., OR). Analyzer: Isotopes, Inc.; method: K, flame photometry; Ar, Reynold's type mass spectrometer.

III. PUGET SOUND–WASHINGTON

1. Mattinson (1972a)

Pb^{206}/U^{238}	(zircon) 379 m.y.
Pb^{207}/U^{235}	(zircon) 389 m.y.
Pb^{207}/Pb^{206}	(zircon) 448±10 m.y.

Turtleback Complex, quartz diorite (122°55.1′W, 48°40.0′N; Orcas Island 15′ Quad., San Juan Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

2. Mattinson (1972a)

Pb^{206}/U^{238}	(zircon) 357 m.y.
Pb^{207}/U^{235}	(zircon) 365 m.y.
Pb^{207}/Pb^{206}	(zircon) 420±25 m.y.

Turtleback Complex, quartz diorite (123°02.6′W, 48°34.8′N; Friday Harbor 7½′ Quad., San Juan Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

IVa. CASCADE RANGE–NORTHERN WASHINGTON

1. Mattinson (1972a) No. 69-9

Pb^{206}/U^{238}	(zircon) 711 m.y.
	(sphene) 415 m.y.
Pb^{207}/U^{235}	(zircon) 912 m.y.
	(sphene) 415 m.y.
Pb^{207}/Pb^{206}	(zircon) 1452±20 m.y.
	(sphene) 410±85 m.y.

Yellow Aster Complex, pyroxene gneiss (121°40.4′W, 48°56.3′N; Mt. Shuksan 15′ Quad., Whatcom Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

2. Mattinson (1972a) No. 69-7

Pb^{206}/U^{238}	(zircon) 370 m.y.
	368 m.y.
Pb^{207}/U^{235}	(zircon) 376 m.y.
	374 m.y.
Pb^{207}/Pb^{206}	(zircon) 411±15 m.y.
	412±15 m.y.

Yellow Aster Complex, quartz diorite orthogneiss (121°40.2′W, 48°57.3′N; Mt. Shuksan 15′ Quad., Whatcom Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

3. Mattinson (1972a)

Pb^{206}/U^{238}	(zircon) 64 m.y.
Pb^{207}/U^{235}	(zircon) 75 m.y.
Pb^{207}/Pb^{206}	(zircon) 427±75 m.y.
Pb^{208}/Th^{232}	(zircon) 248 m.y.

Yellow Aster Complex, pegmatite gneiss (121°40.2′W, 48°57.3′N, Mt. Shuksan 15′ Quad., Whatcom Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

4. Mattinson (1972a) No. 68-8

Pb^{206}/U^{238}	(zircon) 425 m.y.
	471 m.y.
	405 m.y.
Pb^{207}/U^{235}	(zircon) 646 m.y.
	620 m.y.
	619 m.y.
Pb^{207}/Pb^{206}	(zircon) 1510±10 m.y.
	1422±10 m.y.
	1326±10 m.y.

Swakane biotite gneiss (120°17.9′W, 47°32.1′N; Chelan 30′ Quad., Chelan Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

5. Mattinson (1972a) Pb^{206}/U^{238} (zircon) 69 m.y.
69-4
Swakane pegmatite gneiss (120°15.2′W, 47°35.9′N; Chelan 30′ Quad., Chelan Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

6. Misch (1966) K-Ar a. (whole rock) 259±8 m.y.
b. (crossite) 218±40 m.y.
Shuksan metamorphics, crossite schist (location not given). Analyzer: a. J. L. Kulp, b. Geochron, Inc. Note: Age of the Shuksan metamorphism.

7. Mattinson (1972a) Pb^{206}/U^{238} (zircon) 222 m.y.
No. 68-18 Pb^{207}/U^{235} (zircon) 221 m.y.
Pb^{207}/Pb^{206} (zircon) 214±30 m.y.
Marblemount meta-quartz diorite (121°24.4′W, 48°34.8′N; Marblemount 15′ Quad., Skagit Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

8. Mattinson (1972a) Pb^{206}/U^{238} (zircon) 221 m.y.
No. 68-14 Pb^{207}/U^{235} (zircon) 222 m.y.
Pb^{207}/Pb^{206} (zircon) 230±15 m.y.
216±10 m.y.
Marblemount Belt quartz diorite gneiss (120°50.6′W, 48°13.0′N; Holden 15′ Quad., Chelan Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

9. Mattinson (1972a) Pb^{206}/U^{238} (zircon) 221 m.y.
No. 67-1 220 m.y.
Pb^{207}/U^{235} (zircon) 223 m.y.
221 m.y.
Pb^{207}/Pb^{206} (zircon) 243±10 m.y.
233±10 m.y.
Marblemount Belt quartz diorite gneiss (120°45.8′W, 48°09.2′N; Holden 15′ Quad., Chelan Co., WA). Collector: D. F. Crowder; analyzer: J. M. Mattinson.

10. Mattinson (1972a) Pb^{206}/U^{238} (zircon) 220 m.y.
No. 68-10 212 m.y.
Pb^{207}/U^{235} (zircon) 220 m.y.
218 m.y.
Pb^{207}/Pb^{206} (zircon) 278±15 m.y.
221±35 m.y.
215±15 m.y.
Marblemount Belt quartz diorite gneiss (120°51.2′W, 48°09.4′N; Holden 15′ Quad., Chelan Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

11. Mattinson (1972a) Pb^{206}/U^{238} (zircon) 219 m.y.
No. 68-13 Pb^{207}/U^{235} (zircon) 219 m.y.
Pb^{207}/Pb^{206} (zircon) 215±10 m.y.
Marblemount Belt quartz diorite gneiss (120°50.7′W, 48°13.3′N; Holden 15′ Quad., Chelan Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

12. Mattinson (1972a) Pb^{206}/U^{238} (zircon) 89 m.y.
No. 68-11
Marblemount Belt pegmatite (120°50.9′W, 48°08.6′N; Holden 15′ Quad., Chelan Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

13. Rinehart and Fox (1972) — K-Ar — (hornblende) 194±6 m.y.; (biotite) 179±5 m.y.
No. L-498-A
Loomis pluton, granodiorite (SE ¼ sec. 34, T. 39 N., R. 25 E.; along Toats Coulees Road close to BM 1490; Loomis 15′ Quad., Okanagan Co., WA). Collector: J. C. Engels; analyzer: J. C. Engels, U. S. G. S.

14. Hibbard (1971) — K-Ar — (actinolitic hornblende) 190.5±15.6 m.y.
No. CG 10
Chopaka pluton, gabbroic gneiss (119°47′W, 48°57′N; sec. 23, T. 40 N., R. 24 E.; Horseshoe Basin 15′ Quad., Okanogan Co., WA). Analyzer: Isotopes, Inc.

15. Mattinson (1972a) — Pb^{206}/U^{238} (zircon) 189 m.y.; Pb^{207}/U^{235} (zircon) 193 m.y.; Pb^{207}/Pb^{206} (zircon) 235±10 m.y.
No. 68-15
Gneissic rocks (120°46.4′W, 48°12.1′N; Holden 15′ Quad., Chelan Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

16. Mattinson (1972a) — Pb^{206}/U^{238} (zircon) 183 m.y.; Pb^{207}/U^{235} (zircon) 184 m.y.; Pb^{207}/Pb^{206} (zircon) 193±10 m.y.
No. 68-3
Chelan Complex quartz diorite gneiss, Tyee Ridge metamorphic septum (120°28.2′W, 47°51.8′N; Chelan 30′ Quad., Chelan Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

17. Menzer (1970) — Pb-alpha (zircon) 170±20 m.y.; Fission-track (sphene) 72±7 m.y.; (apatite) 56±6 m.y.
No. OK-2
Quartz dioritic gneiss (Loup Loup 15′ Quad.; Okanogan Co., WA). Collector: F. J. Menzer, Jr.; analyzer: Pb, T. W. Stern; fission-track, Charles Naeser; method: Pb-alpha, Gottfried and others (1959), fission-track, Naeser (1967), Naeser and Dodge (1969).

18. Rinehart and Fox (1972) — K-Ar — (hornblende) 170±5 m.y.; (biotite) 151±5 m.y.
No. L-591
Toats Coulee pluton, granodiorite (SW ¼ sec. 13, T. 39 N., R. 24 E.; 1 mi W of Loomis quad. boundary NE of junction of Toats Coulee and Ninemile Creek; Horseshoe Basin 15′ Quad., Okanogan Co., WA). Collector: J. C. Engels; analyzer: J. C. Engels, U. S. G. S.

19a. Jaffe and others (1959) — Pb-alpha — (zircon) 134 m.y.
No. FC-1
Chelan Complex, quartz diorite (about 3 mi N of Entiat; Chelan 30′ Quad., Chelan Co., WA). Collector: F. W. Cater; analyzer: U. S. G. S., authors; method: Larsen and others (1952).

19b. Larsen and others (1958) — Pb-alpha — (zircon) 134 m.y.
No. FC-1
Chelan Complex, tonalite (about 3 mi N of Entiat; Chelan 30′ Quad., Chelan Co., WA). Method: Larsen and others (1952), Waring and Worthing (1953).

20. Mattinson (1972a) — Pb^{206}/U^{238} (zircon) 132 m.y.; 111 m.y.; Pb^{207}/Pb^{206} (zircon) 183±10 m.y.
No. 68-1
Chelan Complex, trondhjemite (120°09.3′W, 47°51.7′N; Chelan 30′ Quad., Chelan Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

21a. Jaffe and others (1959) — Pb-alpha — (zircon) 121 m.y.
No. HC-1
Chelan Complex, tonalite (W side Upper Knapp Coulee; Chelan 30′ Quad., Chelan Co., WA). Collector: C. A.

Hopson; analyzer; U. S. G. S., authors; method: Larsen and others (1952).

21b. Larsen and others (1958) Pb-alpha (zircon) 121 m.y.
No. HC-1
Chelan Complex, tonalite (Upper Knapp Coulee; Chelan 30′ Quad., Chelan Co., WA). Method: Larsen and others (1952), Waring and Worthing (1953).

22. Mattinson (1972a) Pb^{206}/U^{238} (zircon) 113 m.y.
No. 68-2 (sphene) 71 m.y.
Pb^{207}/U^{235} (zircon) 113 m.y.
Pb^{207}/Pb^{206} (zircon) 107±25 m.y.
Chelan Complex, trondhjemite (120°06.2′W, 47°45.9′N; Chelan 30′ Quad., Chelan Co., WA). Collector: J.M. Mattinson; analyzer: J.M. Mattinson.

23. Mattinson (1972a) Pb^{206}/U^{238} (zircon) 113 m.y.
No. 68-4 (sphene) 82 m.y.
Pb^{207}/U^{235} (zircon) 113 m.y.
Pb^{207}/Pb^{206} (zircon) 107±25 m.y.
Chelan Complex, quartz diorite gneiss (119°59.0′W, 47°49.0′N; Ritzville 1:250,000 sheet, Chelan Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

24a. Jaffe and others (1959) Pb-alpha (zircon) 107 m.y.
No. FW-60-55
Chelan Complex, gneissic hornblende quartz diorite (on the N side of Entiat River 3 mi S of Holden; Holden 15′ Quad., Chelan Co., WA). Collector: F. W. Cater; analyzer: U. S. G. S., authors; method: Larsen and others (1952).

24b. Larsen and others (1958) Pb-alpha (zircon) 107 m.y.
No. FW-60-55
Chelan Complex, tonalite (3 mi S of Holden; Holden 15′ Quad., Chelan Co., WA). Method: Larsen and others (1952), Waring and Worthing (1953).

25. Jaffe and others (1959) Pb-alpha (zircon) 104 m.y.
No. HC-2
Chelan Complex, tonalite (E side Lower Knapp Coulee; Chelan 30′ Quad., Chelan Co., WA). Collector: C. A. Hopson; analyzer: U. S. G. S., authors; method: Larsen and others (1952).

26. Mattinson (1972a) Pb^{206}/U^{238} (zircon) 101 m.y.
No. 68-5 100 m.y.
(sphene) 87 m.y.
Pb^{207}/Pb^{206} (zircon) 111±15 m.y.
Chelan Complex, quartz diorite (119°58.1′W, 47°48.8′N; Ritzville 1:250,000 sheet, Douglas Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

27a. Jaffe and others (1959) Pb-alpha (zircon) 87 m.y.
No. G-142
Chelan Complex, tonalite (3 mi from Entiat; Chelan 30′ Quad., Chelan Co., WA). Collector: D. Gottfried and W. L. Smith; analyzer: U. S. G. S., authors; method: Larsen and others (1952).

27b. Larsen and others (1958) Pb-alpha (zircon) 87 m.y.
No. G-142
Chelan Complex, tonalite (3 mi N of Entiat; Chelan 30′ Quad., Chelan Co., WA). Method: Larsen and others (1952), Waring and Worthing (1953).

28a. Jaffe and others (1959) Pb-alpha (zircon) 126 m.y.
No. DFC-107-55
Tonalite (E of Holden Schoolhouse; Holden 15′ Quad., Chelan Co., WA). Collector: D. F. Crowder; analyzer: U. S. G. S., authors; method: Larsen and others (1952).

28b. Larsen and others (1958) Pb-alpha (zircon) 126 m.y.
No. DFC-107-55
Tonalite (E of Holden Schoolhouse; Holden 15′ Quad., Chelan Co., WA). Method: Larsen and others (1952), Waring and Worthing (1953).

29a. Jaffe and others (1959) Pb-alpha (zircon) 111 m.y.
No. DFC-106-55
Granodiorite (1 mi W of Hart Lake; Holden 15′ Quad., Chelan Co., WA). Collector: D. F. Crowder; analyzer: U. S. G. S., authors; method: Larsen and others (1952).

29b. Larsen and others (1958) Pb-alpha (zircon) 111 m.y.
No. DFC-106-55
Granodiorite (1 mi W of Hart Lake; Holden 15′ Quad., Chelan Co., WA). Method: Larsen and others (1952), Waring and Worthing (1953).

30. Hibbard (1971) K-Ar (biotite) 106.5±6.8 m.y.
No. AC 39
Anderson Creek pluton, granodiorite (119°45′W, 48°57′N; sec. 24, T. 40 N., R. 24 E.; Horseshoe Basin 15′ Quad., Okanogan Co., WA). Analyzer: Isotopes, Inc.

31. Hawkins (1968) K-Ar (amphibole) 101.6±4.0 m.y.
No. 901-g
Spanish Camp Gneiss, amphibole biotite gneiss (Spanish Camp Guard Station; Concrete 1:250,000 sheet, Okanogan Co., WA). Analyzer: Geochron, Inc.

32. Mattinson (1972a) Pb^{206}/U^{238} (zircon) 98 m.y.
No. 69-10 (apatite) 46 m.y.
Pb^{207}/U^{235} (zircon) 112 m.y.
Pb^{207}/Pb^{206} (zircon) 428±10 m.y.
Skagit biotite gneiss (121°13.7′W, 48°41.4′N; Diablo Dam 7½′ Quad., Whatcom Co., WA). Collector: J. M. Mattinson; analyzer: J. Mattinson.

33. Mattinson (1972a) Pb^{206}/U^{238} (zircon) 90 m.y.
No. 69-12 57 m.y.
Skagit pegmatite gneiss (121°10.2′W, 48°42.4′N; Diablo Dam 7½′ Quad., Whatcom Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

34. Yeats and McLaughlin (1968) Rb-Sr (biotite) 94.2±16 m.y.
Beckler Peak stock (sec. 28, T. 26 N., R. 12 E.; Skykomish 7½′ Quad., King Co., WA).

35. Engels and Crowder (1971) K-Ar (biotite) 90.0±2.8 m.y.
No. JE12A-67
Beckler Peak stock, biotite granodiorite (center sec. 28, T. 26 N., R. 12 E.; 1.5 mi E of Foss River on U. S. Route 2; Skykomish 7½′ Quad., King Co., WA). Collector: J. C. Engels; method: Ar, isotope dilution on a 6-inch 60° Nier-type mass spectrometer, K, on Baird and Instrumentation Laboratories flame photometers with a lithium internal standard.

36. Engels and Crowder (1971) — K-Ar — (biotite) 89.9±2.7 m.y.
No. RWT 18-68 — K-Ar — (hornblende) 89.3±2.7 m.y.
Fission-track — (apatite) 42±5 m.y.
Fission-track — (allanite) 84±12 m.y.
98±14 m.y.
Fission-track — (epidote) 83±20 m.y.

Beckler Peak stock, hornblende-biotite tonalite (SW ¼ sec. 21, T. 26 N., R. 12 E.; logging road on S side of Beckler Peak; Skykomish 7½′ Quad., King Co., WA). Collector: R. W. Tabor; method: Ar, isotope dilution on a 6-inch 60° Nier-type mass spectrometer, K, on Baird and Instrumentation Laboratories flame photometers with a lithium internal standard.

37. Mattinson (1972a) — Pb^{206}/U^{238} — (zircon) 92 m.y.
No. 68-12 — Pb^{207}/U^{235} — (zircon) 92 m.y.
Pb^{207}/Pb^{206} — (zircon) 110±10 m.y.
92±15 m.y.

Eldorado Orthogneiss (120°59.8′W, 48°27.2′N; Goode Mountain 7½′ Quad., Chelan Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

38. Menzer (1970) — Fission-track — (apatite) 94±12 m.y.
No. OK-4

Quartz monzonite (Loup Loup 15′ Quad.; Okanogan Co., WA). Collector: F. J. Menzer, Jr.; analyzer: Charles Naeser; method: Naeser (1967), Naeser and Dodge (1969).

39. Hawkins (1968) — K-Ar — (biotite) 94.0±2.5 m.y.

Cathedral Batholith, granodiorite (on Chewack River about ½ mi N of 30 Mile Guard Station; Concrete 1:250,000 sheet, Okanogan Co., WA). Analyzer: Geochron, Inc.

40a. Jaffe and others (1959) — Pb-alpha — (zircon) 92 m.y.
No. G-146

Tonalite (near Halford; Sultan 7½′ Quad., Snohomish Co., WA). Collector: D. Gottfried and W. L. Smith; analyzer: U. S. G. S., authors; method: Larsen and others (1952).

40b. Larsen and others (1958) — Pb-alpha — (zircon) 92 m.y.
No. G-146

Tonalite (3 mi SE of Halford; Sultan 7½′ Quad., Snohomish Co., WA). Method: Larsen and others (1952), Waring and Worthing (1953).

41. Menzer (1970) — Fission-track — (apatite) 92±9 m.y.
No. OK-6 — (zircon) 90±9 m.y.

Trondhjemitic gneiss (Loup Loup 15′ Quad.; Okanogan Co., WA). Collector: F. J. Menzer, Jr.; analyzer: Charles Naeser; method: Naeser (1967), Naeser and Dodge (1969), Naeser and Faul (1969).

42. Menzer (1970) — Pb-alpha — (zircon) 90±20 m.y.
No. OK-1 — Fission-track — (apatite) 89±9 m.y.
(sphene) 84±8 m.y.

Granodiorite (Tiffany Mtn. 15′ Quad.; Okanogan Co., WA). Collector: F. J. Menzer, Jr.; analyzer: Pb, T. W. Stern, fission-track, Charles Naeser; method: Pb-alpha, Gottfried and others (1959), fission-track, Naeser (1967), Naeser and Dodge (1969).

43. Menzer (1970) — Pb-alpha — (zircon) 90±10 m.y.
No. OK-3 — Fission-track — (apatite) 76±8 m.y.

Trondhjemitic gneiss (Loup Loup 15′ Quad.; Okanogan Co., WA). Collector: F. J. Menzer, Jr.; analyzer: Pb, T. W. Stern, fission-track, Charles Naeser; method: Pb-alpha, Gottfried and others (1959), fission-track, Naeser (1967), Naeser and Dodge (1969).

44. Engels and Crowder (1971) — K-Ar — (biotite) 80.3±2.4 m.y.
No. JE 14-67 — K-Ar — (hornblende) 92.7±3.3 m.y.
Fission-track — (apatite) 62±4 m.y.
Mt. Stuart granodiorite, hornblende-biotite granodiorite (NE ¼ sec. 1, T. 26 N., R. 13 E.; on U. S. Route 2 E of Stevens Pass, just E of junction of Nason and Stevens Creeks; Wenatchee Lake 15′ Quad., Chelan Co., WA). Collector: J. C. Engels; method: Ar, isotope dilution on a 6-inch Nier-type mass spectrometer, K, on Baird and Instrumentation Laboratories flame photometers with lithium internal standards.

45. Engels and Crowder (1971) — K-Ar — (biotite) 87.7±2.6 m.y.
No. JE 21-67 — K-Ar — (hornblende) 87.8±2.7 m.y.
K-Ar — (colorless amphibole) 92.0±10.7 m.y.
Fission-track — (apatite) 65±4 m.y.
Mt. Stuart granodiorite, biotite-hornblende tonalite (SE ¼ sec. 29, T. 24 N., R. 17 E.; Icicle Creek Road; Leavenworth 15′ Quad., Chelan Co., WA). Collector: J. C. Engels; method: Ar, isotope dilution on a 6-inch Nier-type mass spectrometer, K, on Baird and Instrumentation Laboratories flame photometers with lithium internal standards.

46. Engels and Crowder (1971) — K-Ar — (biotite) 85.5±2.6 m.y.
No. JE 20-67 — K-Ar — (hornblende) 90.9±3.1 m.y.
Fission-track — (apatite) 71±5 m.y.
Mt. Stuart granodiorite, biotite-hornblende tonalite (NE corner sec. 24, T. 24 N., R. 16 E.; on Icicle Creek just E of Bridge Creek; Chiwaukum Mts. 15′ Quad., Chelan Co., WA). Collector: J. C. Engels; method: Ar, isotope dilution on a 6-inch 60° Nier-type mass spectrometer, K, on Baird and Instrumentation Laboratories flame photometers with lithium internal standards.

47. Engels and Crowder (1971) — K-Ar — (biotite) 85.8±2.6 m.y.
No. JE 22-67 — K-Ar — (hornblende) 87.2±2.6 m.y.
Fission-track — (apatite) 57±4 m.y.
Fission-track — (allanite) 94±9 m.y.
Mt. Stuart granodiorite, hornblende-biotite tonalite (center sec. 27, T. 24 N., R. 17 E.; Icicle Creek Road; Leavenworth 15′ Quad., Chelan Co., WA). Collector: J. C. Engels; method: Ar, isotope dilution on a 6-inch 60° Nier-type mass spectrometer, K, on Baird and Instrumentation Laboratories flame photometers with lithium internal standards.

48. Yeats and McLaughlin (1968) — Rb-Sr — (biotite) 86±14 m.y.
Mount Stuart pluton (sec. 29, T. 26 N., R. 12 E.; Skykomish 7½′ Quad., King Co., WA).

49. Engels and Crowder (1971) — K-Ar — (biotite) 82.5±2.5 m.y.
No. JE 13-67 — K-Ar — (hornblende) 83.4±2.7 m.y.
Fission-track — (apatite) 28±3 m.y.
Mt. Stuart granodiorite, hornblende-biotite tonalite (SE ¼ sec. 29, T. 26 N., R. 13 E.; on U. S. Route 2 at intersection with road to Scenic; Scenic 7½′ Quad., King Co., WA). Collector: J. C. Engels; method: Ar, isotope dilution on a 6-inch 60° Nier-type mass spectrometer, K, on Baird and Instrumentation Laboratories flame photometers with lithium internal standards.

50. Yeats and McLaughlin (1968) — K-Ar — (biotite) 80±5 m.y.
77±5 m.y.
Mount Stuart pluton (sec. 29, T. 26 N., R. 12 E.; Skykomish 7½′ Quad., King Co., WA).

51. Tabor and others (1968) — K-Ar — (biotite) 87.7±2.6 m.y.
85.3±2.6 m.y.
K-Ar — (hornblende) 68.0±2.6 m.y.
Pasayten dike, quartz diorite (Concrete 1:250,000 sheet, Okanogan Co., WA; Wildcat Mountain). Analyzer: J. C. Engels.

52. Mattinson (1972a) — Pb^{206}/U^{238} (zircon) 66 m.y.; Pb^{207}/U^{235} (zircon) 67 m.y.; Pb^{207}/Pb^{206} (zircon) 79±10 m.y.
No. 68-16
Skagit gneissic quartz diorite (121°05.6′W, 48°42.5′N; Ross Dam 7½′ Quad., Whatcom Co., WA). Collector: J. M. Mattinson; analyzer: J. M. Mattinson.

53. Tabor and others (1968) — K-Ar — (hornblende) 86.1±2.6 m.y.
Rock Creek dike, granodiorite (in Chuchuwanteen Creek drainage, on S side; Concrete 1:250,000 sheet, Okanogan Co., WA). Analyzer: J. C. Engels.

54. Menzer (1970) — Fission-track — (sphene) 78±8 m.y.
No. OK-5
Granodioritic gneiss (Tiffany Mtn. 15′ Quad.; Okanogan Co., WA). Collector: F. J. Menzer, Jr.; analyzer: Charles Naeser; method: Naeser (1967), Naeser and Dodge (1969).

55. Cater and Crowder (1967) — K-Ar — (biotite and muscovite) 59.2±2.2 m.y.; 57.1±2.3 m.y.; 56.2±2.4 m.y.
Clark Mountain plutons, biotite quartz diorite (S of Napeequa River in SW part of quad.; Holden 15′ Quad., Chelan Co., WA). Note: Dates are from J. D. Obradovich in a written communication (1965) to Cater and Crowder.

56. Rinehart and Fox (1972) — K-Ar — (hornblende) 52.1±2.3 m.y.
No. L-147
Hornblende-bearing dacite plug (SE ¼ sec. 24, T. 40 N., R. 26 E.; 1 mi S of Similkameen River; Loomis 15′ Quad., Okanogan Co., WA). Analyzer: J. Obradovich, U. S. G. S.

57. Rinehart and Fox (1972) — K-Ar — (hornblende) 51.4±2.6 m.y.
No. L-590
Hornblende-bearing dacite plug (SE ¼ sec. 12, T. 40 N., R. 26 E.; ½ mi N of Similkameen River; Loomis 15′ Quad., Okanogan Co., WA). Analyzer: J. Obradovich, U. S. G. S.

58. Rinehart and Fox (1972) — K-Ar — (hornblende) 49.1±1.8 m.y.
No. L-657
Hornblende-bearing dacite flow (NW ¼ sec. 21, T. 38 N., R. 27 E.; flow capping Whitestone Mountain, about 4 mi SE of Enterprise; Oroville 15′ Quad., Okanogan Co., WA). Analyzer: J. Obradovich, U. S. G. S.

59. Tabor and others (1968) — K-Ar — (biotite) 49.8±1.5 m.y.; (hornblende) 49.5±1.5 m.y.
Castle Peak stock, granodiorite (Concrete 1:250,000 sheet, Whatcom Co., WA). Analyzer: J. C. Engels.

60. Tabor and others (1968) — K-Ar — (biotite) 47.9±1.4 m.y.
Monument Peak Stock, granite (on Black Mountain; Concrete 1:250,000 sheet, Okanogan Co., WA). Analyzer: J. C. Engels.

61. Yeats and Engels (1970, 1971) — K-Ar — (biotite) 47.6±1.4 m.y.; (muscovite) 48.0±1.7 m.y.
No. RWT 20-68
Mount Pilchuck stock, granodiorite (sec. 29, T. 30 N., R. 8 E.; on Mount Pilchuck trail; Granite Falls 15′ Quad., Snohomish Co., WA). Collector: R. W. Tabor; analyzer: Lois Schlocker; method: K, Instrumentation Laboratories flame photometer with a lithium internal standard.

62. Tabor and others (1968) — K-Ar — (biotite) 46.6±1.2 m.y.
Golden Horn batholith (T. 35 N., R. 18 E.; short distance S of Cutthroat Creek; Concrete 1:250,000 sheet, Okanogan Co., WA). Collector: P. Misch; analyzer: J. C. Engels.

63. Cater and Crowder (1967) K-Ar (biotite) 45±2 m.y.
Duncan Hill pluton quartz diorite, (just S of Holden; Holden 15′ Quad., Chelan Co., WA). Analyzer: H. H. Thomas, R. F. Marvin, P. L. D. Elmore, and H. Smith, U. S. G. S.

64. Cater and Crowder (1967) K-Ar (hornblende) 44.8±2 m.y.
Duncan Hill pluton quartz diorite (Holden 15′ Quad., Chelan Co., WA). Analyzer: J. C. Engels, U. S. G. S.

65. Yeats and Engels (1970, 1971) K-Ar (hornblende) 43.3±1.4 m.y.
No. RWT 12-68
Granite Falls stock, biotite-hornblende quartz diorite (center sec. 7, T. 30 N., R. 7 E.; Granite Falls fish ladder; Granite Falls 15′ Quad., Snohomish Co., WA). Collector: R. W. Tabor; analyzer: Lois Schlocker; method: K, Instrumentation Laboratories flame photometer with a lithium internal standard.

66. Yeats and McLaughlin (1968) Rb-Sr (biotite) 40±2 m.y.
Index pluton (sec. 34, T. 27 N., R. 10 E.; Halford quarry; Index 15′ Quad., Snohomish Co., WA).

67. Yeats and Engels (1971) K-Ar (hornblende) 32.5±2.5 m.y.
No. JE 10-67
Index batholith, biotite-hornblende granodiorite (sec. 2, T. 26 N., R. 10 E; Halford quarry; Baring 7½′ Quad., King Co., WA). Collector: J. C. Engels; analyzer: Lois Schlocker; method: K, Instrumentation Laboratories flame photometer with a lithium internal standard.

68. Yeats and McLaughlin (1968) Rb-Sr (biotite) 35±5 m.y.
33±5 m.y.

Index pluton (sec. 19, T. 27 N., R. 10 E.; Index quarry; Index 15′ Quad., Snohomish Co., WA).

69a. Yeats and Engels (1970) K-Ar (biotite) 32.5±1.2 m.y.
(hornblende) 32.5±2.5 m.y.

Index Batholith, granodiorite.

69b. Yeats and Engels (1971) K-Ar (biotite) 32.5±1.2 m.y.
Index Batholith, granodiorite. Analyzer: Lamont Geological Observatory, Columbia University; method: isotope dilution. Note: this date was reported by Yeats and Engels with permission of Peter Misch.

70. Yeats and Engels (1970, 1971) K-Ar (biotite) 34.3±1.4 m.y.
No. PM 32 (hornblende) 34.2±1.8 m.y.
Squire Creek stock, biotite-hornblende quartz diorite (center sec. 13, T. 31 N., R. 9 E.; Silverton 15′ Quad., Snohomish Co., WA). Collector: P. Misch; analyzer: Lois Schlocker; method: K, Instrumentation Laboratories flame photometer with a lithium internal standard.

71. Misch (1966) K-Ar (?) 30 m.y.
Perry Creek intrusive (near 49th parallel near Glacier Peak and W of the Chilliwack River; Whatcom Co., WA). Analyzer: J. L. Kulp. Note: the Perry Creek intrusive is one phase of the Chilliwack Batholith; Baadsgaard and others (1961) have a 18 m.y. date on the Chilliwack Batholith north of the border. Insufficient data given to locate on map of Washington (Fig. 2).

72. Yeats and Engels (1970, 1971) K-Ar (biotite) 26.3±0.8 m.y.
No. RWT 16-68 (hornblende) 25.0±1.5 m.y.
Grotto batholith, biotite-hornblende quartz diorite (SE ¼ sec. 20, T. 28 N., R. 11 E.; North Fork of Skykomish River where road crosses it NE of Index; Monte Cristo 7½′ Quad., Snohomish Co., WA). Collector: R. W. Tabor; analyzer: Lois Schlocker; method: K, Instrumentation Laboratories flame photometer with a lithium internal standard.

73. Yeats and Engels (1970, 1971) K-Ar (biotite) 24.2±1.1 m.y.
No. RWT 13-68 (hornblende) 23.9±1.0 m.y.
Monte Cristo stock, biotite-hornblende quartz diorite (SW ¼ sec. 34, T. 30 N., R. 11 E.; Elliot Creek logging road E of mouth of Pearsall Creek; Sloan Peak 7½′ Quad., Snohomish Co., WA).

74. Tabor and Crowder (1969) K-Ar (biotite) 22.5 m.y.
Pb-alpha (zircon) 30±20 m.y.
Cloudy Pass Batholith, granogabbro (just N of Railroad Creek Trail 0.25 mi NE of BM 3989 near Hart Lake; Holden 15′ Quad., Chelan Co. WA). Collector: D. F. Crowder; analyzer: K-Ar, Harold Thomas, Richard Marvin, and John Obradovich, Pb-alpha, T. W. Stern.

75a. Cater (1969) K-Ar 22±2.2 m.y.
20±2 m.y.
Pb-alpha 30±20 m.y.
20±20 m.y.
Cloudy Pass batholith. Analyzer: K-Ar, Herman Thomas and Richard Marvin, U. S. G. S., Pb-alpha, T. W. Stern, U. S. G. S.

75b. Tabor and Crowder (1969) K-Ar (biotite) 22.1±2.2 m.y.
No. DFC-1e-60 Pb-alpha (zircon) 30±20 m.y.
20±20 m.y.
Cloudy Pass batholith, granogabbro (from talus below BM 5248 on Railroad Creek Trail near Crown Point Falls; Holden 15′ Quad., Chelan Co., WA). Collector: D. F. Crowder; analyzer: K-Ar, Harold Thomas, Richard Marvin, and John Obradovich; Pb-alpha, T. W. Stern.

76. Tabor and Crowder (1969) K-Ar (biotite) 20.4±2.0 m.y.
No. DFC-179-61
Swakane biotite gneiss, thermally metamorphosed (altitude 6500 ft on stream 0.5 mi N of Plummer Mountain; Holden 15′ Quad., Chelan Co., WA). Collector: D. F. Crowder; analyzer: Harold Thomas, Richard Marvin, and John Obradovich. Note: Mattinson (1972a) has Pb/U dates on the Swakane biotite gneiss, see number IVa. 4.

77. Misch (1966) K-Ar (biotite) 20 m.y.
Cascade Pass quartz diorite (location not given). Analyzer: J. L. Kulp.

IVb. CASCADE RANGE–SOUTHERN WASHINGTON

1. Mattinson (1972b) (zircon) 156 m.y.
(zircon) 154 m.y.
Plagioclase-quartz-epidote-calcite-chlorite pegmatite in Indian Creek Amphibolite, of Ellingson (1972). (T. 14 N., R. 12 E.; White Pass 15′ Quad.; Yakima Co., WA). Note: Age of amphibolite facies metamorphism.

2. Bikerman (written communication, 1971) K-Ar (plagioclase) 50±4 m.y.
No. PEH-5-68
Fortune Creek granodiorite (NE ¼, NE ½ sec. 23, T. 23 N., R. 14 E.; Kachess Lake 15′ Quad., Kittitas Co., WA). Collector: P. E. Hammond; analyzer: M. Bikerman.

3. Bikerman (written communication, 1971) K-Ar (plagioclase) 30±3 m.y.
No. PEH-6-68
Fifes Peak andesite (sec. 17, T. 14 N., R. 14 E.; Tieton Basin 7½′ Quad., Yakima Co., WA). Collector: P. E. Hammond; analyzer: M. Bikerman.

4. Jaffe and others (1959) Pb-alpha (zircon) 62 m.y.
No. G-155

Snoqualmie batholith (Tatoosh pluton), granodiorite (along N slope Goat Island Mountain, Mount Rainier National Park; Pierce Co., WA). Collector: D. Gottfried and W. L. Smith; analyzer: U. S. G. S., authors; method: Larsen and others (1952).

5. Bikerman (written communication, 1971) K-Ar (biotite) 20±2 m.y.
No. PEH-2-68
Snoqualmie batholith (SW ¼ NW ¼ sec. 18, T. 22 N., R. 11 E.; Snoqualmie Pass Highway E of Olallie Cr.; Snoqualmie Pass 15′ Quad., King Co., WA). Collector: P. E. Hammond; analyzer: M. Bikerman.

6. Baadsgaard and others (1961) K-Ar (biotite) 18 m.y.
Snoqualmie batholith, granodiorite (near South Fork of Snoqualmie River; Snoqualmie Pass 15′ Quad., King Co., WA).

7. Lipson and others (1961) K-Ar 17 m.y.
Snoqualmie batholith (121°28′W, 47°23′N; roadcut E of Seattle; Snoqualmie Pass 15′ Quad., King Co., WA).

8. Bikerman (written communication, 1971) K-Ar (biotite) 16.5±2 m.y.
No. PEH-3-68
Snoqualmie batholith (SW ¼ NE ¼ sec. 31, T. 22 N., R. 10 E.; Bandera 15′ Quad., King Co., WA). Collector: P. E. Hammond; analyzer: M. Bikerman.

9. Curtis and others (1961) K-Ar (biotite) 17.7 m.y.
17.0 m.y.
16.3 m.y.
Snoqualmie batholith (location not given but believed to be about the same as no. 7).

10. Erikson (1969) Fission-track (apatite) 15.5±1.5 m.y.
Snoqualmie batholith, granodiorite (one-half mi from contact with the Mt. Hinman stock; Snoqualmie Pass 15′ Quad., Kittitas Co., WA).

11. Fiske and others (1963) K-Ar (biotite) 14.7±1 m.y.
No. AK No. 398
Tatoosh granodiorite (46°47′N, 121°46′W; road cut 300 ft S of E abutment of the Nisqually River bridge, Mount Rainier National Park; Pierce Co., WA). Analyzer: R. E. Folinsbee, Univ. of Alberta.

12. Fiske and others (1963) K-Ar (biotite) 13±1 m.y.
No. AK No. 429
Tatoosh granodiorite (small quarry in White River valley at foot of Goat Island Mountain, Mount Rainier National Park; 46°53′N, 121°31′W; Pierce Co., WA). Analyzer: R. E. Folinsbee, Univ. of Alberta.

IVc. CASCADE RANGE–OREGON

1. Jaffe and others (1959) Pb-alpha (zircon with apatite) 425 m.y.
No. FGW-3-54
Granodiorite (Medford 15′ Quad., Jackson Co., OR). Collector: F. G. Wells; analyzer: U. S. G. S., authors; method: Larsen and others (1952).

2. Jaffe and others (1959) Pb-alpha (zircon) 103 m.y.
No. FGW-12-53
Granodiorite (Medford 15′ Quad., Jackson Co., OR). Collector: F. G. Wells; analyzer: U. S. G. S., authors; method: Larsen and others (1952).

3. Jaffe and others (1959) Pb-alpha (zircon) 37 m.y.
No. DLP-55

Biotite granite (1.4 mi below Nimrod on U. S. Highway 28; Blue River 15′ Quad., Lane Co., OR). Collector: D. L. Peck; analyzer: U. S. G. S., authors; method: Larsen and others (1959).

4. Evernden and James (1964) K-Ar (plagioclase) 31.0 m.y.
No. KA 1282
Tuff (¼ mi N of Goshen on Highway 58 near junction with Highway 99, UCMP loc. 5207; East Eugene 7½′ Quad., Lane Co., OR). Collector: G. T. James.

5. Jaffe and others (1959) Pb-alpha (zircon) 23 m.y.
No. DLP-55-10-4a
Hornblende diorite (8 mi above Detroit Dam; Mill City 15′ Quad., Marion Co., OR). Collector: D. L. Peck; analyzer: U. S. G. S., authors; method: Larsen and others (1952).

6. Wise (1969) K-Ar (whole rock) 11.6±1.2 m.y.
No. 42
No. R0719
Still Creek intrusion, porphyritic diorite (NW ¼ sec. 35, T. 3 S., R. 8 E.; Government Camp 7½′ Quad., Clackamas Co., OR). Analyzer: Geochron, Inc.

7. Evernden and James (1964) K-Ar (plagioclase) 10.8 m.y.
No. KA1205
Molalla Fm., tuff (near Molalla at UCMP loc. P3919; Molalla 15′ Quad., Clackamas Co., OR). Collector: G. T. James.

8. Bikerman (1970) K-Ar (hornblende) 8.4±.6 m.y.
No. Ito 509
Laurel Hill pluton, quartz diorite (T. 3 S., R. 8 E.; on Highway 26; Government Camp 7½′ Quad., Clackamas Co., OR). Collector: H. Ito; analyzer: U. S. G. S. Menlo Park; method: Dalrymple and Lanphere (1969).

9. Bikerman (1970) K-Ar (hornblende) 8.0±.6 m.y.
No. Ito 512
Laurel Hill pluton, quartz diorite (T. 3 S., R. 8 E.; on Highway 26; Government Camp 7½′ Quad., Clackamas Co., OR). Collector: H. Ito; analyzer: U. S. G. S. Menlo Park; method: Dalrymple and Lanphere (1969).

10. Wise (1969) K-Ar (hornblende) 7±2 m.y.
No. A0726
Rhododendron Fm., andesite clast in breccia bed (Lost Creek; Government Camp 7½′ Quad., Clackamas Co., OR). Analyzer: Geochron, Inc.

11. Wise (1969) K-Ar (whole rock) 7.0±0.8 m.y.
No. 40
No. R0725
Porphyritic andesite (SE ¼ sec. 5, T. 2 S., R. 10 E.; top flow of section near Polallic Campground; Badger Lake 7½′ Quad., Hood River Co., OR). Analyzer: Geochron, Inc.

12. Wise (1969) K-Ar (whole rock) 5.8±0.8 m.y.
No. 33
No. R0724
Zigzag Mountain lavas, porphyritic hypersthene andesite (near Lolo Pass along logging road; Bull Run Lake 7½′ Quad., Clackamas Co., OR). Analyzer: Geochron, Inc.

13. Wise (1969) K-Ar (whole rock) 5.5±0.7 m.y.
No. 72

No. R0722
Olivine-augite andesite (top flow, N end Horseshoe Ridge; Government Camp 7½′ Quad., Clackamas Co., OR). Analyzer: Geochron, Inc.

14. Bikerman (1970) K-Ar (whole rock) $5.0 \pm \frac{0.5}{1.0}$ m.y.
Andesite dike (T. 3 S., R. 8 E.; on Highway 26; Government Camp 7½′ Quad., OR). Collector: M. Bikerman; analyzer: K. John Anania; method: K, atomic absorption spectrophotometry, Ar, MS-10 mass spectrometer.

15. Wise (1969) K-Ar (whole rock) 4.1±0.6 m.y.
No. 49 & R0720
Gunsight Butte sequence, pyroxene andesite (SE ¼ sec. 9, T. 3 S., R. 10 E.; third flow from bottom of sequence; Badger Lake 7½′ Quad., Hood River Co., OR). Analyzer: Geochron, Inc.

16. Wise (1969) K-Ar (whole rock) 3.2±0.3 m.y.
No. 97
No. R0723
Porphyritic pyroxene andesite (N side Yocum Ridge below Sandy Glacier; Cathedral Ridge 7½′ Quad., Clackamas Co., OR). Analyzer: Geochron, Inc.

17. Wise (1969) K-Ar (whole rock) 3.0±0.2 m.y.
No. 70
No. R0721
Platy aphanitic andesite (NE ¼ sec. 3, T. 3 S., R. 10 E.; W end Lookout Mtn.; Badger Lake 7½′ Quad., Hood River Co., OR). Analyzer: Geochron, Inc.

V. OKANOGAN HIGHLANDS–WASHINGTON

1. Yates and Engels (1968) K-Ar (biotite) 100.0±2.8 m.y.
No. 11B
Spirit pluton, nonporphyritic granodiorite (T. 38 N., R. 40 E.; Colville 30′ Quad., Stevens Co., WA). Method: K, on Baird flame photometer with a lithium internal standard; Ar, isotope dilution and a 6′60° sector mass spectrometer.

2. Yates and Engels (1968) K-Ar (muscovite) 96.0±3.0 m.y.
No. 13 (biotite) 91.0±3.0 m.y.
Spirit pluton, quartz monzonite dike (near Smackout Pass; Deep Lake 7½′ Quad., Pend Oreille Co., WA). Analyzer: R. W. Kistler; method: K, on Baird flame photometer with a lithium internal standard; Ar, isotope dilution and a 6′60° sector mass spectrometer.

3. Yates and Engels (1968) K-Ar (hornblende) 94.0±3.0 m.y.
No. 12H
Spirit pluton, quartz diorite (near Smackout Pass; Deep Lake 7½′ Quad., Pend Oreille Co., WA). Analyzer: K, on Baird flame photometer with a lithium internal standard; Ar, isotope dilution and a 6′60° sector mass spectrometer.

4. Yates and Engels (1968) K-Ar (muscovite) 99.1±3.2 m.y.
No. 14M
Kaniksu batholith, pegmatite (near Huckleberry Mountain; Colville 30′ Quad., Pend Oreille Co., WA). Method: K, on Baird photometer with a lithium internal standard; Ar, isotope dilution and 6′60° sector mass spectrometer.

5. Yates and Engels (1968) K-Ar (biotite) 92.2±3.0 m.y.
No. 14B

Kaniksu batholith, quartz diorite (near Huckleberry Mountain; Colville 30′ Quad., Pend Oreille Co., WA). Method: K, on Baird photometer with a lithium internal standard; Ar, isotope dilution and a 6′60° sector mass spectrometer.

6a. Jaffe and others (1959) — Pb-alpha — (zircon) 99 m.y.
No. G-115
Granodiorite (near Arden; Stevens Co., WA). Collector: D. Gottfried, W. L. Smith; analyzer: U. S. G. S., authors; method: Larsen and others (1952).

6b. Larsen and others (1958) — Pb-alpha — (zircon) 99 m.y.
No. G-115
Quartz monzonite (near Arden; Stevens Co., WA). Method: Larsen and others (1952), Waring and Worthing (1953).

7a. Jaffe and others (1959) — Pb-alpha — (zircon) 95 m.y.
No. G-124
Colville Batholith, gneissic granodiorite, border phase (State Highway 4, near Tonasket; Tonasket 15′ Quad., Okanogan Co., WA). Collector: D. Gottfried, W. L. Smith; analyzer: U. S. G. S., authors; method: Larsen and others (1952).

7b. Larsen and others (1958) — Pb-alpha — (zircon) 95 m.y.
No. G-124
Tonalite (2 mi E of Tonasket; Tonasket 15′ Quad., Okanogan Co., WA). Method: Larsen and others (1952), Waring and Worthing (1953).

8a. Jaffe and others (1959) — Pb-alpha — (zircon) 92 m.y.
No. G-125
Colville batholith, porphyritic gneissic granodiorite, border phase (near Mt. Annie and Anglin; Aeneas Valley 15′ Quad., Okanogan Co., WA). Collector: D. Gottfried, W. L. Smith; analyzer: U. S. G. S., authors; method: Larsen and others (1952).

8b. Larsen and others (1958) — Pb-alpha — (zircon) 92 m.y.
No. G-125
Granodiorite (2 mi S of Anglin; Aeneas Valley 15′ Quad., Okanogan Co., WA). Method: Larsen and others (1952), Waring and Worthing (1953).

9. Axelrod (1966) — K-Ar — (biotite) 55±1.7 m.y.
Klondike Mountain Formation, Tom Thumb Member, biotite tuff (118°44′W, 48°33′N; T. 36 N., R. 32 E.; S edge of Republic on State Highway 4; Republic 15′ Quad., Ferry Co., WA). Collector: C. J. Smiley; analyzer: Geochron, Inc.

10. Yates and Engels (1968) — K-Ar — (hornblende) 51.7±1.5 m.y.
No. 5H
Lamprophyre dike (near gaging station on Columbia River; Boundary 15′ Quad., Stevens Co., WA). Method: K, on Baird flame photometer with a lithium internal standard; Ar, isotope dilution and a 6′60° sector mass spectrometer.

11. Miller (1971) — K-Ar — (hornblende) 51.0±5 m.y.; (biotite) 48.1±1 m.y.
No. 2
Silver Point quartz monzonite (about 9 mi WSW of Newport; Newport 30′ Quad., Pend Oreille Co., WA). Analyzer: J. C. Engels.

12. Miller (1971) K-Ar (hornblende) 46.8±1.7 m.y.
No. 1 (biotite) 46.7±1.3 m.y.
Silver Point quartz monzonite (about 10 mi WNW of Newport; Newport 30′ Quad., Pend Oreille Co., WA). Analyzer: J. C. Engels.

13. Yates and Engels (1968) K-Ar (biotite) 50.7±1.5 m.y.
No. 3B
Coryell batholith, monzonite satellite dike (on Big Sheep Creek; Colville 30′ Quad., Stevens Co., WA). Method: K, on Baird flame photometer with a lithium internal standard; Ar, isotope dilution and a 6′60° sector mass spectrometer.

14. Yates and Engels (1968) K-Ar (biotite) 50.4±1.5 m.y.
No. 4B
Coryell batholith, monzonite satellite dike (near Flagstaff Mountain; Colville 30′ Quad., Stevens Co., WA). Method: K, on Baird flame photometer with a lithium internal standard; Ar, isotope dilution and a 6′60° sector mass spectrometer.

15. Yates and Engels (1968) K-Ar (hornblende) 50.5±1.5 m.y.
No. 2H
Hornblende andesite in a mafic lava flow (on Belshazzar Mountain; Colville 30′ Quad., Stevens Co., WA). Method: K, on Baird flame photometer with a lithium internal standard; Ar, isotope dilution and a 6′60° sector mass spectrometer.

16. Yates and Engels (1968) K-Ar (biotite) 50.4±1.5 m.y.
No. 1B
Biotite andesite (on Belshazzar Mountain; Colville 30′ Quad., Stevens Co., WA). Method: K, on Baird flame photometer with a lithium internal standard; Ar, isotope dilution and a 6′60° sector mass spectrometer.

17. Yates and Engels (1968) K-Ar (biotite) 49.9±1.5 m.y.
No. 6B
O'Brien Creek Fm., "minette" (about 1 mi S of Phelan Lake; Colville 30′ Quad., Stevens Co., WA). Method: K, on Baird flame photometer with a lithium internal standard; Ar, isotope dilution and a 6′60° sector mass spectrometer.

18. Yates and Engels (1968) K-Ar (biotite) 49.7±1.5 m.y.
No. 7B
O'Brien Creek Fm., shonkinite (Colville 30′ Quad., Stevens Co., WA). Method: K, on Baird flame photometer with a lithium internal standard; Ar, isotope dilution and a 6′60° sector mass spectrometer.

19. Yates and Engels (1968) K-Ar (biotite) 41.6±1.2 m.y.
No. 8B
O'Brien Creek Fm., tuffaceous sandstone (Williams Lake area; Colville 30′ Quad., Stevens Co., WA). Method: K, on Baird flame photometer with a lithium internal standard; Ar, isotope dilution and a 6′60° sector mass spectrometer.

20. Yates and Engels (1968) K-Ar (biotite) 40.2±1.3 m.y.
No. 9B
O'Brien Creek Fm., tuffaceous sandstone (Williams Lake area; Colville 30′ Quad., Stevens Co., WA). Method: K, on Baird flame photometer with a lithium internal standard; Ar, isotope dilution and a 6′60° sector mass spectrometer.

21. Yates and Engels (1968) K-Ar (hornblende) 49.8±1.5 m.y.
No. 10H

Sanpoil volcanics, rhyodacite (Colville 30′ Quad., Stevens Co., WA). Method: K, on Baird flame photometer with a lithium internal standard; Ar, isotope dilution and a 6′60° sector mass spectrometer.

VIa. UPPER COLUMBIA PLATEAU, COLUMBIA PLATEAU–WASHINGTON

1. Gray and Kittleman (1967) K-Ar (whole rock) 20.6±0.7 m.y.
No. UO-13Kar
Yakima Basalt (SE cor. sec. 24, T. 25 N., R. 44 E.; about 650 ft. SE of Ideal Cement Company quarry; Green Acres 15′ Quad., Spokane Co., WA). Collector: P. L. Weis; analyzer: Isotopes, Inc.

2. Gray and Kittleman (1967) K-Ar (whole rock) 16.8±0.5 m.y.
No. UO-1000KAr
Yakima Basalt (NE ¼ sec. 11, T. 28 N., R. 30 E.; at Grand Coulee in road cut on NW side of State Highway 10A; Ritzville 1:250,000 sheet, Grant Co., WA). Collector: L. R. Kittleman, J. Gray; analyzer: Isotopes, Inc.

3. Gray and Kittleman (1967) K-Ar (whole rock) 15.7±0.4 m.y.
No. UO-101KAr
Yakima Basalt (NE ¼ sec. 11, T. 28 N., R. 30 E.; at Grand Coulee in road cut on NW side of State Highway 10A; Ritzville 1:250,000 sheet, Grant Co., WA). Collector: J. Gray, L. R. Kittleman; analyzer: Isotopes, Inc.

4. Evernden and James (1964) K-Ar (whole rock) 14.5 m.y.
No. KA 1236
Yakima Basalt (8 mi S of Spokane on U. S. Highway 195, UCMP loc. 3940; Spokane SW 7½′ Quad., Spokane Co., WA). Collector: G. T. James.

5. Gray and Kittleman (1967) K-Ar (whole rock) 13.8±0.5 m.y.
No. UO-105KAr
Yakima Basalt (NW ¼ sec. 25, T. 25 N., R. 42 E.; cut on the E side of the Spokane, Portland and Seattle RR right-of-way in SW Spokane; Spokane NW 7½′ Quad., Spokane Co., WA). Collector: J. Gray, L. R. Kittleman; analyzer: Isotopes, Inc.

6. Evernden and James (1964) K-Ar (plagioclase) 13.4 m.y.
No. KA 1300
Yakima Basalt ("Sandy Point" near Vantage; Vantage 7½′ Quad., WA). Collector: G. T. James, E. Klucking.

7. Gray and Kittleman (1967) K-Ar (whole rock) 13.0±0.5 m.y.
No. UO-102KAr
Late Yakima Basalt (SW ¼ sec. 7 or NW ¼ sec. 18, T. 26 N., R. 42 E.; Deep Creek Canyon within 0.5 to 0.75 mi of the confluence of Deep Creek with Spokane River; Airway Heights 7½′ Quad., Spokane Co., WA). Collector: J. Gray, L. R. Kittleman; analyzer: Isotopes, Inc.

8. Gray and Kittleman (1967) K-Ar (whole rock) 12.1±0.6 m.y.
No. UO-103KAr
Late Yakima Basalt (NE ¼ sec. 26, T. 25 N., R. 42 E.; road cut on SW side of 16th St. in SW Spokane; Spokane NW 7½′ Quad., Spokane Co., WA). Collector: J. Gray, L. R. Kittleman; analyzer: Isotopes, Inc.

9. Gray and Kittleman (1967) K-Ar (whole rock) 7.9±0.9 m.y.
No. UO-105KAr
Basalt dike (NE ¼ SE ¼ sec. 24., T. 25 N., R. 44 E.; Ideal Cement Company quarry SE of Veradale; Green Acres 15′ Quad., Spokane Co., WA). Collector: J. Gray, L.R. Kittleman; analyzer: Isotopes, Inc.

VIb. YAKIMA FOLD RIDGES, COLUMBIA PLATEAU–WASHINGTON

1. Holmgren (1970) K-Ar (whole rock) 16.9±1.1 m.y.
No. FRL-1175 16.5±0.8 m.y.
15.5±0.6 m.y.

Yakima Basalt, Museum Flow, basalt (sec. 33, T. 16 N., R. 19 E.; 1/8 mi S of Wymer Bridge, about 17 mi N of Yakima at intersection of U. S. Highway 97 and southern baseline of section 33; Wymer 7½′ Quad., Kittitas Co., WA). Analyzer: R. E. Denison; method: K, KTPB gravitation method; Ar, isotope dilution with a mass spectrometer.

2. Holmgren (1970) K-Ar (whole rock) 16.8±0.8 m.y.
No. FRL-1171 16.4±0.5 m.y.
16.4±1.0 m.y.
16.2±0.8 m.y.

Yakima Basalt, Roza Flow (SE ¼ NW ¼ sec. 9, T. 14 N., R. 19 E.; 300 ft S of S end of abandoned U. S. Highway 97 tunnel at Roza Gap 9 mi N of Yakima, from the colonade, 35 ft. from the base of flow; Pomona 15′ Quad., Yakima Co., WA). Analyzer: R. E. Denison; method: K, KTPB gravitation method; Ar, isotope dilution with a mass spectrometer.

3. Holmgren (1970) K-Ar (whole rock) 16.6±0.6 m.y.
No. FRL-1174 16.1±0.6 m.y.

Yakima Basalt, "Flow E" (SE ¼ SW ¼ sec. 28, T. 19 N., R. 17 E.; 10.7 mi N of Ellensburg, about ¼ mi SW of Thorp Road-Highway 97-10 junction, adjacent to Northern Pacific Railroad halfway between entrance and exit of an irrigation tunnel, from a poorly developed column, 20 ft from the top of flow; Thorp 15′ Quad., Kittitas Co., WA). Analyzer: R. E. Denison; method: K, KTPB gravitation method; Ar, isotope dilution with a mass spectrometer.

4. Holmgren (1970) K-Ar (whole rock) 15.2±0.7 m.y.
No. FRL-1170 15.1±0.4 m.y.

Yakima Basalt, "Flow 6" (center NE ¼ SE ¼ sec. 9, T. 15 N., R. 19 E.; 15 mi N of Yakima, adjacent to U. S. Highway 97 on S flank of Mt. Baldy, Umtanum Anticline; Wymer 7½′ Quad., Kittitas Co., WA). Analyzer: R. E. Denison; method: K, KTPB gravitation method; Ar, isotope dilution with a mass spectrometer.

5. Holmgren (1970) K-Ar (whole rock) 13.3±1.3 m.y.
No. FRL-1172 13.1±1.3 m.y.
12.3±2.2 m.y.

Yakima Basalt, Pomona Flow (SW ¼ NE ¼ sec. 17, T. 14 N., R. 19 E.; rock quarry 8 mi N of Yakima and about 1/8 mi W from where U. S. Highway 97 drops down to Selah Springs Creek, about 40 ft from the top of the flow; Pomona 7½′ Quad., Yakima Co., WA). Analyzer: R. E. Denison; method: K, KTPB gravitation method; Ar, isotope dilution with a mass spectrometer.

6. Evernden and James (1964) K-Ar (plagioclase) 10.0 m.y.
No. KA 1245

Ellensburg Fm., andesitic tuff (near Selah, UCMP loc. PA19; Selah 15′ Quad., Yakima Co., WA). Collector: G. T. James.

VII. EASTERN OREGON MOUNTAINS

1. Taubeneck (1962) K-Ar (biotite) 149±5 m.y.

Wallowa Batholith, granite (about one mi W of Petes Point, 9,675 ft elevation, Cornucopia 15′ Quad., Wallowa Co., OR). Analyzer: Kulp, Columbia Univ.

2. Thayer and Brown (1964) K-Ar 145 m.y.
Quartz diorite (in Dixie Creek, 15 mi ENE of John Day; Grant Co., OR).

3. Thayer and Brown (1964) K-Ar 120 m.y.
Quartz diorite (SE of Ironside Mountain, 44 mi ESE of John Day; Malheur Co., OR). Analyzer: U. S. G. S. Note: insufficient data given to locate on map of Oregon (Fig. 3).

4. Jaffe and others (1959) Pb-alpha (zircon) 102 m.y.
No. Ta-1
Bald Mountain Batholith, quartz diorite (Sumpter 30′ Quad., OR). Collector: W. Taubeneck; analyzer: U. S. G. S., authors; method; Larsen and others (1952). Note: Location not given.

5. Thayer and Brown (1964) Pb-alpha (zircon) 99 m.y.
Bald Mountain Batholith, granodiorite (about 1 mi W of Anthony Lakes, Sumpter 30′ Quad., Baker Co., OR). Analyzer: Kulp, Columbia Univ.

6. Taubeneck (1962) K-Ar (biotite) 95±3 m.y.
Wallowa Batholith, late intrusion of cordierite trondhjemite (about one-half mi E of Pine Lakes, Cornucopia 15′ Quad., Baker Co., OR). Analyzer: Kulp, Columbia Univ.

7. Swanson and Robinson (1968) K-Ar (sanidine) 41.0±1.2 m.y.
Clarno Fm, porphyritic rhyolite (NE ¼ NW ¼ sec. 6, T. 10 S., R. 19 E.; 1 mi NNE of Horse Haven Mine; Bend 1:250,000 sheet, Jefferson Co., OR). Analyzer: Joan C. Engels, J. C. Von Essen, Lois Schlocker.

8. Evernden and others (1964) K-Ar (whole rock) 37.5 m.y.
No. KA 818
Clarno Fm., pyroxene andesite (SW ¼ sec. 8, T. 11 S., R. 21 E.; 6 mi NW of Mitchell; Mitchell 15′ Quad., Wheeler Co., OR). Collector: R. Hay.

9. Evernden and others (1964) K-Ar (sanidine) 36.5±0.9 m.y.
No. KA 824A
Clarno Fm., bentonitic claystone (SW cor. sec. 2, T. 11 S., R. 20 E.; 6 mi NW of Mitchell; Bend 1:250,000 sheet, Wheeler Co., OR). Collector: R. Hay.

10. Evernden and James (1964) K-Ar (plagioclase) 34.0 m.y.
No. KA 1204
Clarno Fm., tuff (near Clarno, UCMP loc. PA33; Clarno 15′ Quad., OR). Collector: G. T. James.

11. Swanson and Robinson (1968) K-Ar (sanidine) 36.4±11 m.y.
John Day Fm., welded tuff (NE ¼ NE ¼ sec. 10, T. 10 S., R. 16 E.; 2.2 mi SW of Ashwood; Bend 1:250,000 sheet, Jefferson Co., OR). Analyzer: J. C. Engels, J. C. Von Essen, Lois Schlocker.

12. Evernden and James (1964) K-Ar (sanidine) 32.0 m.y.
No. KA 1384
John Day Fm., bentonite bed, tuff (1 mi E of Clarno on road to Pine Creek; Clarno 15′ Quad., Wheeler Co., OR). Collector: R. Hay.

13. Evernden and others (1964) K-Ar (whole rock, basalt-trachybasalt) 31.5 m.y.
No. KA 845
John Day Fm., tuff (NW cor. sec. 9, T. 10 S., R. 21 E.; 11 mi NW of Mitchell, 115 ft above the base of formation; Mitchell 15′ Quad., Wheeler Co., OR). Collector: R. Hay.

14. Evernden and others (1964) K-Ar (sanidine) 31.1 m.y.
John Day Fm., tuff (NW ¼ NE ¼ sec. 1, T. 11 S., R. 20 E.; about 25 mi W of Picture Gorge; Bend 1:250,000 sheet, Wheeler Co., OR). Collector: R. Hay.

15. Curtis and others (1961) K-Ar (authigenic sanidine) 25.7 m.y.
John Day Fm., tuff (John Day Basin, location not given).

16. Evernden and others (1964) K-Ar (obsidian) 25.5 m.y.
No. KA 648
John Day Fm., tuff (SW ¼ sec. 31, T. 10 S., R. 21 E.; about 7 mi NW of Mitchell, 1100 to 1135 ft above the base of formation; Bend 1:250,000 sheet, Wheeler Co., OR). Collector: R. Hay.

17. Evernden and others (1964) K-Ar (K-albite) 24.9 m.y.
No. KA 649 A
John Day Fm., tuff (SW cor. sec. 29, T. 10 S., R. 21 E.; about 6 mi NW of Mitchell, about 1550 ft above base of formation; Mitchell 15′ Quad., Wheeler Co., OR). Collector: R. Hay.

18. Evernden and others (1964) K-Ar (sanidine) 23.3 m.y.
No. KA 489
John Day Fm., tuff (NE ¼ SE ¼ sec. 13, T. 10 S., R. 20 E.; about 12 mi NNW of Mitchell, 835 ft. above base of formation; Bend 1:250,000 sheet, Wheeler Co., OR). Collector: R. Hay.

19. Watkins and Baksi (1968) K-Ar 16.6 m.y.
Picture Gorge Basalt (T. 1 N., R. 47 E.; Imnaha 15′ Quad., Wallowa Co., OR).

20. Enlows and Davenport (1971) K-Ar 15.8 m.y.
Mascall Fm., ignimbrite (near confluence of Deer Cr. and South Fork of John Day River, Canyon City 1:250,000 sheet). Collector: R. E. Davenport. Analyzer: Geochron. Note: insufficient data given to locate on map of Oregon (Fig. 3).

21. Evernden and others (1964) K-Ar (whole rock) 15.4 m.y.
No. KA 1203
Columbia River Basalt (13 mi E of Dayville on Highway 26; Aldrich Mtn. 15′ Quad., Grant Co., OR). Collector: G. R. James.

22. Watkins and Baksi (1968) K-Ar 15.2±0.3 m.y.
Picture Gorge Basalt (location not given).

23. Watkins and Baksi (1968) K-Ar 14.6±0.4 m.y.
Picture Gorge Basalt (119°35′W, 44°30′N; T. 12 S., R. 26 E.; Picture Gorge 15′ Quad., Grant Co., OR).

24. Baksi (1972) K-Ar (whole rock) 14.5 m.y.
Picture Gorge Basalt (top of section; Picture Gorge 15′ Quad., Grant Co., OR). Method: fusion of about 100 mesh size ground rock.

25. Enlows and Davenport (1971) 9.2 m.y.
Danforth Fm., ignimbrite (along South Fork Crooked River; Crook Co., OR). Note: Personal communication by G. L. Walker, (1969). Insufficient data given to locate on map of Oregon (Fig. 2).

26. Enlows and Davenport (1971) 6 m.y.
Upper Danforth or Rattlesnake Fm., ignimbrite (along Cottonwood Cr. S of South Fork John Day River, Canyon City 1:250,000 sheet, Grant Co., OR). Collector: R. E. Davenport. Analyzer: Geochron. Average of several analyses. Note: insufficient data given to locate on map of Oregon (Fig. 3).

27. Evernden and others (1964) K-Ar (sanidine) 6.4 m.y.
No. KA 1206
Rattlesnake Fm., rhyolite (10.6 mi E of Dayville on Highway 26; Aldritch Mtn. 15′ Quad., Grant Co., OR). Collector: G. T. James.

28. Evernden and James (1964) K-Ar (plagioclase) 5.3 m.y.
No. KA 1280
Deschutes Fm., tuff (Vanora Grade, UCMP loc. P. 3720; T. 10 S., R. 13 E.; Jefferson Co., OR). Collector: G. T. James.

29. Evernden and James (1964) K-Ar (plagioclase) 4.3 m.y.
No. KA 1223
Deschutes Fm., tuff (Vanora Grade, UCMP loc. P. 3720; T. 10 S., R. 13 E.; Jefferson Co., OR). Collector: G. T. James.

VIII. HIGH LAVA PLAINS–OREGON

1. Kittleman (written communication, 1972) K-Ar (whole rock) 24.6±1.8 m.y.
No. UO-122KAr
Owyhee Basalt, basal flow (NW ¼ sec. 28, T. 22 S., R. 45 E.; 1.2 mi SE of right abutment of Owyhee Dam; Mitchell Butte (1905), Malheur Co., OR). Collector: L. R. Kittleman; analyzer: Isotopes, Inc.

2a. Kittleman (written communication, 1972) K-Ar (whole rock) 15.2±1.1 m.y.
No. UO-117KAr
Owyhee Basalt (SW ¼ sec. 1, T. 22 S., R. 45 E.; E end of Tunnel Canyon; Mitchell Butte (1905), Malheur Co., OR). Collector: L. R. Kittleman; analyzer: Isotopes, Inc.

2b. Kittleman (written communication, 1972) K-Ar (whole rock) 14.4±0.7 m.y.
No. UO-117KAr
Owyhee Basalt (SW ¼ sec. 1, T. 22 S., R. 45 E.; E end of Tunnel Canyon; Mitchell Butte (1905), Malheur Co., OR). Collector: L. R. Kittleman; analyzer: Geochron, Inc.

3. Evernden and James (1964) K-Ar (whole rock) 21.3 m.y.
No. KA 1230
Alvord Creek Formation, basalt (N fork of Alvord Creek near Alvord Ranch on E flank of Steens Mountains. UCMP loc. 601N; Adel 1:250,000 sheet, Harney Co., OR). Collector: G. T. James.

4. Kittleman (written communication, 1972) K-Ar (whole rock) 21.0±2.2 m.y.
No. UO-131KAr
Tims Peak Basalt (NW ¼ NE ¼ sec. 34, T. 21 S., R. 40 E.; plateau E of Tims Peak; Boise 1:250,000 sheet, Malheur Co., OR). Collector: L. R. Kittleman; analyzer: Geochron, Inc.

5. Kittleman (written communication, 1972) K-Ar (sanidine) 19.7±1.0 m.y.
No. UO-114KAr
Deer Butte Fm., Holdout Mem., volcanic sandstone (SW ¼ sec. 23, T. 24 S., R. 43 E.; NE side of Quartz Mtn.; Mitchell Butte (1905) 30′ Quad., Malheur Co., OR). Collector: L. R. Kittleman; analyzer: Geochron, Inc.

6. Kittleman (written communication, 1972) K-Ar (glass shard) 18.5±1.7 m.y.
No. UO-128KAr (sanidine) 15.4±0.9 m.y.
Sucker Creek Fm., vitric tuff (S ½ SW ¼ sec. 28, T. 24 S., R. 46 E.; Succor Creek just S of Succor Creek Gorge; Mitchell Butte (1905) 30′ quad., Malheur Co., OR). Collector: L. R. Kittleman; analyzer: Geochron, Inc.

7. Kittleman (written communication, 1972) K-Ar (plagioclase) 17.5±0.6 m.y.
No. UO-120KAr
Littlefield Rhyolite (SW ¼ sec. 35, T. 23 S., R. 40 E.; Millers Cow Camp near Littlefield Ranch; Boise 1:250,000 sheet, Malheur Co., OR). Collector: L. R. Kittleman; analyzer: Isotopes, Inc.

8. Evernden and James (1964) K-Ar (plagioclase) 16.7 m.y.
No. KA 1285
Payette Fm., basalt (9 mi N of Sheaville, UCMP loc. 3745; Boise 1:250,000 sheet, Malheur Co., OR). Collector: G. T. James; analyzer: J. F. Evernden; method: K, flame-photometric analysis on a Perkin-Elmer flame photometer using a propane-air flame with a lithium internal standard.

9. Kittleman (written communication, 1972) K-Ar (whole rock) 15.6±0.9 m.y.
No. UO-125KAr(11)
Antelope Flat Basalt (NW ¼ sec. 24, T. 25 S., R. 41 E.; stock reservoir 2 mi SE of Antelope Flat; Boise 1:250,000 sheet, Malheur Co., OR). Collector: L. R. Kittleman; analyzer: Geochron, Inc.

10a. Evernden and James (1964) K-Ar (sanidine) 15.1 m.y.
No. KA 1029
Tuff (T. 23 S., R. 40 E.; Red Ridge Basin; Boise 1:250,000 sheet, Malheur Co., OR). Collector: J. A. Shotwell.

10b. Kittleman (written communication, 1972) K-Ar (glass shard) 15.1 m.y.
No. KA 1029
Butte Creek Volcanic Sandstone (SW cor. sec. 11, T. 23 S., R. 40 E.; Red Ridge Basin, UO loc. 2495; Boise 1:250,000 sheet, Malheur Co., OR). Collector: L. R. Kittleman; analyzer: Berkeley.

11. Baksi and others (1967) K-Ar (whole rock)

No. 68-6	15.5±0.4 m.y.
No. 68-5	15.3±1.4 m.y.
No. 68-4	15.2±0.9 m.y.
No. 68-1	15.0±1.1 m.y.
	15.0±0.5 m.y.
No. 70-3	15.0±0.4 m.y.
	14.7±0.5 m.y.
No. 70-5	15.0±0.4 m.y.

Steens Basalt (118°33′W, 42°40′N; Adel 1:250,000 sheet, Harney Co., OR). Note: samples taken below the polarity transition.

12. Baksi and others (1967) K-Ar (whole rock)

No. 61-6	15.5±0.4 m.y.
	14.9±0.4 m.y.
No. 51-2	15.4±0.4 m.y.
No. 51-5	15.4±0.4 m.y.
	15.2±0.4 m.y.
No. 61-7	15.0±0.4 m.y.
	15.0±0.4 m.y.
No. 61-1	15.0±1.8 m.y.
	14.9±1.6 m.y.
No. 51-6	14.9±2.0 m.y.
	14.8±0.3 m.y.
No. 51.1	14.8±0.5 m.y.

Steens Basalt (118°33′W, 42°40′N; Adel 1:250,000 sheet, Harney Co., OR). Note: samples taken in the flows in polarity transition.

13. Baksi and others (1967) K-Ar (whole rock)
No. 11-3 15.3±0.3 m.y.
15.1±0.3 m.y.
No. 11-4 15.2±0.3 m.y.
14.9±0.3 m.y.
No. 11-7 15.1±0.4 m.y.
No. 17-4 15.1±0.3 m.y.
15.0±0.4 m.y.
14.9±0.3 m.y.
No. 17-6 14.8±0.4 m.y.
Steens Basalt (118°33'W, 42°40'N; Adel 1:250,000 sheet, Harney Co., OR). Note: samples taken above polarity transition.

14. Evernden and others (1964) K-Ar (plagioclase) 14.7 m.y.
No. KA 1251
Steens Basalt (Steens Mountains; Adel 1:250,000 sheet, Harney Co., OR). Collector: C. A. Repenning. Note: insufficient data given to locate on map of Oregon (Fig. 3).

15. Evernden and others (1964) K-Ar (whole rock) 14.5 m.y.
No. KA 1165
Steens Basalt (Steens Mountains; Adel 1:250,000 sheet, Harney Co., OR). Collector: C. A. Repenning. Note: insufficient data given to locate on map of Oregon (Fig. 3).

16. Kittleman (written communication, 1972) K-Ar (whole rock) 13.2±0.6 m.y.
No. UO-126KAr(II)
Basalt (NW ¼ NE ¼ sec. 26, T. 24 S., R. 39 E.; vicinity of Monumental Rock; Boise 1:250,000 sheet Malheur Co., OR). Collector: L. R. Kittleman; analyzer: Geochron, Inc.

17. Evernden and James (1964) K-Ar (whole rock) 13.1 m.y.
No. KA 1256
Trout Creek Formation, basaltic tuff (Angel Mine No. 2 in Trout Creek Valley, UCMP loc. 107; Adel 1:250,000 sheet, Harney Co., OR). Collector: G. T. James. Note: insufficient data given to locate on map of Oregon (Fig. 3).

18. Kittleman (written communication, 1972) K-Ar (whole rock) 12.1±0.5 m.y.
No. UO-130KAr
Shumuray Ranch Basalt (SW ¼ NW ¼ sec. 11, T. 23 S., R. 40 E.; Red Ridge N of Red Ridge Basin; Boise 1:250,000 sheet, Malheur Co., OR). Collector: L. R. Kittleman; analyzer: Geochron, Inc.

19. Evernden and James (1964) K-Ar (whole rock) 12.1 m.y.
No. KA 1240
Juntura Formation, basalt (10 mi E of Buchanan on U. S. Highway 20, UCMP loc. P4120; Burns 1:250,000 sheet, Harney Co., OR). Collector: G. T. James.

20. Kittleman (written communication, 1972) K-Ar (glass shards) 11.3±0.6 m.y.
No. UO-133KAr
Juntura Formation, vitric tuff (NW ¼ sec. 13, T. 21 S., R. 37 E.; about 2 mi W of Juntura; Burns 1:250,000 sheet, Malheur Co., OR). Collector: L. R. Kittleman; analyzer: Geochron, Inc.

21. Kittleman (written communication, 1972) K-Ar (whole rock) 10.8±1.2 m.y.
No. UO-129KAr
Drinkwater Basalt (center sec. 34, T. 20 S., R. 36 E.; summit of Drinkwater Pass on escarpment N of Highway 20; Burns 1:250,000 sheet, Harney Co., OR). Collector: L. R. Kittleman; analyzer: Geochron, Inc.

22a. Evernden and James (1964) K-Ar (sanidine) 8.9 m.y.
No. KA 1225
Drewsey Formation, welded tuff (summit of Drinkwater Pass; Burns 1:250,000 sheet, Harney Co., OR). Collector: J. A. Shotwell.

22b. Kittleman (written communication, 1972) K-Ar (sanidine) 8.9 m.y.
No. KA 1225
Drewsey Formation, ash-flow (center sec. 34, T. 20 S., R. 36 E.; summit of Drinkwater Pass, from basal flow section on escarpment N of U. S. Highway 20; Burns 1:250,000 sheet, Harney Co., OR). Collector: L. R. Kittleman; analyzer: Berkeley.

23. Kittleman (written communication, 1972) K-Ar (80% plagioclase 8.5±1.0 m.y.
No. UO-132KAr 15% sanidine)
Drewsey Formation, bentonic volcanic sandstone (SW ¼ sec. 9, T. 21 S., R. 35 E.; N side of U. S. Highway 20 about 1.5 mi E of Stinking Water Creek; Burns 1:250,000 sheet, Harney Co., OR). Collector: L. R. Kittleman analyzer: Geochron, Inc.

24. Kittleman (written communication, 1972) K-Ar (whole rock) 7.6±0.5 m.y.
No. UO-123KAr
Grassy Mountain Formation, basalt (sec. 24, T. 21 S., R. 44 E.; Lone Willow Spring; Mitchell Butte (1905) Quad., Malheur Co., OR). Collector: L. R. Kittleman; analyzer: Geochron, Inc.

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Type Faces: Camera-ready copy composed on IBM MT
Text 10 pt. Press Roman leaded two points
Subheads 11 pt. and 8 pt. Press Roman

Presswork: Text printed on 38" single color Miehle and 22½" MGD
Cover printed on 22½" MGD

Paper: Body on 60# white offset
Cover on 65# Russett

Ink: IPI Speed King jet halftone black