

NEW K-AR DATES FOR THE PRECAMBRIAN OF PINAL, GILA, YAVAPAI AND COCONINO COUNTIES, ARIZONA

By

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In a recent paper Damon and Giletti (1961) reviewed the available information concerning the Precambrian basement rocks of the Colorado Plateau and adjacent areas. The reader may refer to this paper for a more detailed discussion and for additional references. In the following discussion, we will merely make new data available to the Arizona-New Mexico geologic fraternity. It is our intention to discuss in detail these and other results at a later date.

In a short note in the Bulletin of the Geological Society of America, Giletti and Damon (1961) stated that, through the year 1960, "no published evidence indicates an age greater than 1550 m.y. for any Arizona rocks." Since that time, Silver and Deutsch have reported an age

of 1660 m.y. for the Johnny Lyon granodiorite (1961), and more recently Silver (1961) has presented evidence for the occurrence of the major metamorphism of the Pinal schist in the Dragoon quadrangle (Cochise County) at very near 1700 m.y. Lanphere and Wasserburg (1962) report Rb/Sr ages of about 1800 m.y. on muscovites and potash feldspars from pegmatites in the Precambrian rocks of the Grand Wash cliffs south of Lake Mead, Arizona. Furthermore, Damon, et al. (1962) have obtained K-Ar ages of 1680 m.y. on Precambrian metamorphics in the Caborca-Altar area of Sonora, which is about 150 km. southwest of the border town of Nogales. In Table I of this paper, a K-Ar date of 1660 m.y. is reported for the Madera granite in the Pinal Mountains of Gila County. Thus, there is

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Sample No.	Type of Rock, Location and Mineral	K %	Radiogenic Argon $\times 10^{-8}$ moles/gm.	Atmospheric Argon %	$\frac{40}{Ar} \frac{40}{K}$	Apparent Age m.y.
1	Oracle granite, near Campo Bonito Mine, Oracle, Pinal Co., biotite (PED-2-58)	6.83	2.58	3.2	0.125	1,420
2	Pegmatite in Oracle granite, 1 mile east of Oracle, Pinal Co., muscovite (PED-3-58)	8.28	3.12	2.4	0.125	1,420
3	Madera granite, Pinal Mtns., Gila Co., biotite (PED-2-59)	7.24	3.43	0.4	0.157	1,660
4	Ruin granite, south slope of Sierra Ancha Mtns., 3.7 miles east of Roosevelt Lake, Gila Co., biotite (PED-32-61)	5.32	{ 2.11 * 2.16 2.17	{ 0.8 1.4 10.9	0.135	1,500
5	Diabase sill in Apache series, Sierra Ancha Mtns., 0.2 miles north of Reynold Creek Ranger Station, Gila Co., biotite (PED-31-61)	6.41	1.78	0.8	0.0922	1,140
6	Chino Creek granite, 7.3 miles south of Seligman, Yavapai Co., biotite (PED-25-59)	6.96	2.40	1.6	0.114	1,330
7	Pegmatite in Brahma schist (Vishnu series) Kaibab Trail, Grand Canyon, Coconino Co., muscovite (PED-7-57)	8.86	3.30	0.3	0.123	1,410
8	Brahma schist (Vishnu series), Bright Angel Trail, Grand Canyon, Coconino Co., biotite (PED-11-57)	7.38	2.32	7.3	0.104	1,240

* Incomplete fusion

now abundant evidence that the metamorphism and batholithic intrusion of the Older Precambrian of Arizona took place, at least in part, prior to 1550 m.y. ago. In fact, because of the susceptibility of argon and strontium in micas to loss by thermal diffusion at moderate temperatures, all K-Ar and Rb-Sr dates on mica should be considered as minimum dates which may, in some cases, closely approximate the time of mica crystallization. In other cases, the argon (or strontium) loss may be severe. For example, it should be noted that the K-Ar date for muscovite from a pegmatite intruded into the Brahma schist is significantly older than for biotite extracted from the Brahma schist. We interpret this as a differential response of the two minerals to a post-crystallization thermal event. If this interpretation is correct, the true age of both the schist and pegmatite exceeds 1410 m.y. The perturbing thermal event may be no more than burial at depths not exceeding 7 km. (Damon, 1961).

It is interesting that the biotite sample from the inlier of granite just north of Chino Creek in Coconino County yields a K-Ar age intermediate between the ages for the pegmatitic muscovite and biotite from the Brahma schist in the Grand Canyon of the Colorado River. The Chino Creek inlier is about 75 km. southwest of the collection point for the Grand Canyon samples.

Identical ages (1420 m.y.) were obtained for both pegmatitic muscovite and biotite samples obtained from the Oracle granite terrain north of the Mogul fault. Near the shear zone of the fault and to the south of the fault, the Oracle granite suffers drastic argon losses such that biotite yields Tertiary apparent ages, which approximately date the time of faulting and up-doming and not the age of genesis of the mineral or the rock in which it is found (Damon, et al., 1962).

Biotite from the Ruin granite, which intrudes the Precambrian sediments of the Salt River Canyon, has been dated at 1500 m.y. One of the authors, D. E. Livingston, has initiated a geologic-geochemical study of these Pre-

Cambrian sediments in the Salt River Canyon, and is attempting to establish the age of sedimentary deposition by whole-rock Rb-Sr dating.

Lastly, we have included a biotite K-Ar date for the diabase sill which intrudes the Troy formation in the Sierra Ancha Mountains. Most of the Apache group must be older than this date of 1140 m.y. for the diabase. Thus, there appears to be an immense hiatus between the Apache sediments and deposition of the Cambrian Bolsa quartzite. Silver (1960) obtained a similar date by the lead isotopic method for zircon extracted from the diabase.

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