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URANIUM-THORIUM-LEAD ISOTOPIC AGES OF METAMORPHIC MONAZITE FROM THE NORTHERN SNAKE RANGE, NEVADA

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During petrographic study of metamorphosed Prospect Mountain Quartzite from eastern White Pine County, Nevada, scattered grains of monazite were observed in most of the samples. Inasmuch as this quartzite was formed from late Precambrian and Early Cambrian sands, we considered the possibility that the monazite might be detrital, even though the sands are mineralogically rather mature (Lee, Van Loenen, Brandt, and Doering, 1980) and monazite (hardness 5) is not especially resistant to abrasion. However, after examining the heavy mineral fractions recovered from 16 samples of Prospect Mountain Quartzite collected over an area of about 3,500 sq. km. in eastern Nevada (Lee, Van Loenen, Brandt, and Doering, 1980, fig. 1), we concluded that the monazite is of metamorphic rather than detrital origin. The common form is an egg-shaped crystal derived from faceted tablets parallel to (100). The crystals are subhedral to euhedral. Such forms of a hardness 5 mineral suggest that they grew in place and have not been subjected to a cycle of sedimentation. Overstreet (1967, p. 16–20) argues persuasively for the crystallization of monazite during the metamorphism of such sediments as those discussed here.

Monazite is especially well-developed in the Early Cambrian Prospect Mountain Quartzite that makes up most of the drainage basin of Hampton Creek in the northern Snake Range (see the map of Hose and Blake, 1976), where the rocks have been subjected to staurolite-grade metamorphism. More than 100 grams of monazite were recovered from a placer deposit near the mouth of Hampton Creek at lat 39°14′45″N and long 114°3′50″W. The grains in this monazite fraction all look alike. They are similar to the form described above, having undergone little abrasion. We believe this placer monazite to be representative of the monazite present in the quartzite of the Hampton Creek drainage basin.

If we are correct in concluding that the monazite in the quartzite of Hampton Creek crystallized at the time the rock was metamorphosed, and if the placer mineral is indeed representative of the metamorphic monazite, then the age data in table 1 relate to the time of metamorphism. The micas coexisting with monazite in the metasediments of the Hampton Creek area were subjected to thermal stress (degassed) about 20 m.y. ago, presumably at the time of latest movement on the overlying Snake Range decollement (Lee, Marvin, and Mehnert, 1980). The ages in table 1 suggest a metamorphic event that predates the most recent activity on the Snake Range decollement. Possibly the staurolite-grade metamorphism in the Hampton Creek area occurred 80–100 m.y. ago.

We present the data in table 1 as a possible clue to the history of this area. However, in view of the uncertainties attending isotopic ages of monazites in general, and of the placer monazite described here in particular, our conclusions must be regarded as tentative pending future studies in this area.

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Table 1. Uranium-thorium-lead isotopic ages of placer sample 300-DL-64 monazite from the northern Snake Range, Nevada.

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Concentration (ppm)			Atom Percent Abundance				Ages (m.y.)			
U	Th	Pb	^{204}Pb	^{206}Pb	^{207}Pb	^{208}Pb	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{207}Pb/^{206}Pb$	$^{208}Pb/^{232}Th$
1604	29,360	220.9	.0685	33.56	2.59	63.77	82.5	81.7	59.5	103.8

Decay Constants: $^{238}U = 1.55 \times 10^{-10}\ Yr^{-1}$
$^{235}U = 9.85 \times 10^{-10}\ Yr^{-1}$
$^{232}Th = 4\ 95 \times 10^{-11}\ Yr^{-1}$

Atomic Ratios: $^{238}U/^{235}U = 137.88$
^{204}Pb, ^{206}Pb, ^{207}Pb, ^{208}Pb =
1.352, 25.285, 21.131, 52.232