The occurrence of the thylacine in Papua New Guinea was first recorded by Van Deusen (1963). He reported a specimen recovered from an archaeological dig at Kiowa, 3 miles south east of Chuave in the Eastern Highlands, at an elevation of 1525 m. This mandible (AMNH 160284) was found in level nine of the dig; it was associated with fire ash which was dated using the C₁₄ method at 9920 ± 200 years before 1950 (Bulmer 1964). A later paper (Bulmer 1974), again refers to the thylacine and assigns it an age of between 6 and 9 000 years before present.

Thylacinus have also been found in New Guinea in 1975. M. Mountain of the Department of Anthropology, University of Papua New Guinea, working at a site previously called Niobe by J. P. White (1972), but which is now called Nombe and which is located 2 miles south of the Kiowa site, has found several specimens throughout the human occupation levels.

That thylacines should have roamed New Guinea during the late Tertiary is not surprising for although the animal is extinct, or almost so, in Tasmania, it certainly ranged widely over the Australian continent during the Pleistocene and is found, albeit as a somewhat rare item, in widely separated assemblages of fossil mammals. (Ride, 1964; Archer, 1974).

The similarities between animals found in Tertiary fossil mammal localities in central Australia and in later deposits or even among the living fauna of Papua New Guinea has been noted by several workers. Woodburne (1967) records, Crocodylus porosus, Kolopsis torus and Dorcopsoides fossilis, from a late Miocene site at Alcoota in central Australia, all of which have their nearest descendants in Australia and later faunas of Papua New Guinea. The meagre thylacine material from the Awe fauna, reported here does not allow a statement about possible relationships with Thylacinus potens from Alcoota, however it does add to the list of genera shared by the Alcoota and Awe faunas and once again underlines their similarities.

The text figure was drawn by R. W. Brown.

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Reinterpretation of Isotopic Ages from
The Halls Creek Mobile Zone, Northwestern Australia

R. W. Page

Data presented elsewhere in this issue (Page, Blake, & Mahon, 1976) provide some of the first ages from The Granites-Tanami Block. Unfortunately it did not prove possible to date or even adequately sample the weathered lower grade metasediments and metavolcanics of the Tanami complex, clearly the oldest exposed component of the block. For this reason age data pertaining to the Halls Creek Group, the suggested correlated of the Tanami complex in the Kimberley region to the northwest (Page et al., this volume, Fig. 1), are now reinterpreted in an attempt to arrive at a reasonable estimate of the age of these old rocks. In considering the available information on the geochronology of this part of Australia it is also pertinent to review the age of the Whitewater Volcanics, Castlereagh Hill Porphyry and Bow River Granite, which form a Lower Proterozoic comagmatic suite overlying and intruding the Halls Creek Group in the Halls Creek Mobile Zone.

The Age of the Halls Creek Group

This group is the basement throughout much of the east Kimberley region and crops out extensively in the Halls Creek Mobile Zone. It consists of tightly folded and complexly faulted low grade metasediments and metavolcanics, and was subdivided by Dow & Gemuts (1969) into four separate formations. The similarities in lithology, regional metamorphism and deformation between the Halls Creek Group and the Tanami complex suggest that these units are stratigraphically equivalent (Blake et al., 1975).

Rb-Sr studies on the Halls Creek Group and later intrusions were undertaken by Bofinger (1967a), and subsequently some of these results have been quoted (Bofinger, 1967b; Compston & Arriens, 1968; Dow & Gemuts, 1969; Gellatly, 1971), leading to the now widely held belief that the Group may be older than 2700 m.y., i.e. Archaean in age. The data are examined here to assess the validity of this age.

Limited Rb-Sr data obtained from three formations in the Halls Creek Group by Bofinger (1967a) yield the following anomalous age pattern:

Ding Dong Downs Volcanics—one intrusive or extrusive acid volcanic sample has a model Rb-Sr age of 2050 m.y.
Biscay Formation—two intrusive or extrusive acid volcanic samples have model ages of 1540 m.y. and 1490 m.y.

Olympio Formation—three shale samples lie on a 1705 m.y. isochron, regarded as the time of faulting; the three point isochron has a high initial Sr\(^{87}/Sr^{86}\) of 0.725, and the oldest model age of any of the three samples is 2010 m.y.

Although these results are equivocal, they do provide a likely maximum Lower Proterozoic estimate for the age of the Halls Creek Group. There is no evidence from these data to suggest that the rocks could be as old as Archean.

Samples from the Tickalara Metamorphics and the concordant gneissic Mabel Downs Granodiorite, which are regarded as the metamorphosed equivalents of the Halls Creek Group (Dow & Gemuts, 1969), define an isochron of 1960 ± 30 m.y. with a low initial Sr\(^{87}/Sr^{86}\) of 0.701 ± 0.001. Bofinger (1967a) considered that this low value could only be explained by complete loss of radiogenic Sr\(^{87}\) from all the rocks at 1960 m.y., the time of metamorphism. This view was partly based on the belief that the Halls Creek Group must be much older than 1960 m.y., i.e. that the group is Archean. Another view to be considered, however, is that the metamorphics and gneissic granites had little or no crustal prehistory; that is, that the Halls Creek Group may not be much older than the 1960 m.y. metamorphism. Even if the 1960 m.y. isochron is the result of a mixing line giving an age that is too old, an initial ratio too low, it is unlikely the Tickalara metamorphics could have been derived from rocks much older than 2100 to 2200 m.y.

In summary, the available data on the Halls Creek Group and on its metamorphosed equivalents do not show any signs of an Archean prehistory; if anything they suggest that the group has a maximum age of 2200 m.y. and is possibly as young as 2050 m.y.

The most oft-quoted isotopic evidence for the age of the Halls Creek Group is based not on data from the group itself, but on an Rb-Sr analysis by Bofinger (1967a) of a pegmatite intruding the group. Duplicate model ages on this one pegmatite total rock sample are 2750 and 2720 m.y., but the highly radiogenically enriched muscovite from this rock gives an isochron age of only 1755 m.y. Another pegmatite with the same intrusive relationships has a model age of 2250 m.y. Yet the granites with which these pegmatites are at least spatially associated have a maximum model age of about 2100 m.y. These large discordances render the data extremely difficult to interpret, but certainly the single 2700 m.y. pegmatite result cannot be accepted at this stage as providing an adequate minimum age for the Halls Creek Group.

In conclusion it is considered that the available geochronological evidence points to a Lower Proterozoic rather than an Archean age for the Halls Creek Group. Given the suggested correlation, a similar age, of greater than 1960 m.y. but less than 2200 m.y., is inferred for the Tanami complex, the basement rocks in The Granites-Tanami region.

The Age of the Whitewater Volcanics, Castlereagh Hill Porphyry and Bow River Granite

Acid volcanics and intrusives of possibly similar Lower Proterozoic age to the Mount Winnecke Formation (1808 ± 15 m.y.) and Winnecke Granophyre (1802 ± 15 m.y.) of The Granites-Tanami region (Page et al., this volume) crop out in the Halls Creek Mobile Zone of the Kimberley region, 300 km west of the Mount Winnecke area. The Kimberley units are the Whitewater Volcanics, Castlereagh Hill Porphyry, and Bow River Granite, all three of which are considered to have been comagmatic (Dow & Gemuts, 1969).

The Whitewater Volcanics consist of porphyritic rhylolitic ignimbrites, minor andesitic lavas, and, near the top, some interbedded volcanic conglomerate, sandstone, chert, and lapilli tuff. They have been isotopically dated by the Rb-Sr total rock method at 1823 ± 17 m.y. by Bofinger (1967a) and 1940 ± 110 m.y. by Bennett & Gellatly (1970). These ages are experimentally indistinguishable from each other at the stated 95 percent confidence levels using the statistical 't' test. The validity of the two isochrons needs to be carefully assessed, however, as some of the samples used came from sites more than 100 km apart. Both isochrons also include samples from associated high-level intrusive rocks. Because of these uncertainties, two additional statistical regressions of the earlier reported data have been made. The first regression involves only the volcanic samples collected from the Halls Creek Mobile Zone and dated by Bofinger; this gives an age of 1802 ± 35 m.y., and an initial Sr\(^{87}/Sr^{86}\) of 0.7165 ± 0.0050. The second involves seven volcanic samples from the Whitewater Volcanics cropping out in the King Leopold Mobile Zone further west in the Kimberley region, and yields an age of 1953 ± 109 m.y. and an initial Sr\(^{87}/Sr^{86}\) of 0.704 ± 0.0059. The difference in apparent ages is now further enhanced, but it is unlikely to be geologically meaningful, as both sets of rocks are mapped as part of the same formation.

Bennett & Gellatly (1970) noted that all the west Kimberley samples that make up the older isochron have relatively low Rb/Sr ratios (less than 10), whereas the eastern Kimberley samples have ratios of 14 to 104. If both sets of samples are combined, the resulting isochron shows an apparent curvature accompanied by an increase in extrapolated initial Sr\(^{87}/Sr^{86}\). This phenomenon has been cited previously by Fairbairn et al. (1966) and has been found in other Rb-Sr age studies of Precambrian acid volcanic rocks in New Brunswick, Canada (Cormier, 1969), in southeastern Missouri (Bickford & Mose, 1975) and in the Mount Isa province of northwestern Queensland (R. W. Page, unpublished data). The lavas of the Mount Winnecke Formation (Page et al., this volume) do not show this effect, probably because there has been no geological disturbance in this area since the time of emplacement of this igneous suite, 1800 m.y. ago. In the New Brunswick example, however, fossiliferous control demands acceptance of the oldest isochron given by volcanic rocks with the lowest Rb/Sr values. In the other two studies, comparison of the Rb-Sr data with U-Pb zircon data shows that the oldest Rb-Sr isochron that can be generated is, in these instances, only a minimum age for the time of crystallization. There is therefore good evidence to show that the Rb-Sr system in acid lavas is easily disturbed under mild metamorphic conditions, probably as a result of bulk loss of strontium. The extent to which individual samples are affected depends not only on the grade and duration of the event, but also most importantly on Sr content, as found by Bickford & Mose (1975). High-Sr, less alkali-rich samples are less affected by such geochemical changes than samples with a high Rb/Sr ratio. Given these analogies of open-system behaviour in acid lavas, it is likely that the steeper of the two Whitewater Volcanics Rb-Sr isochrons (1953 ± 109 m.y.) from samples with lower Rb/Sr ratios, is the better age determination for this unit. However, this age could still represent only a minimum value for the age of crystallization.

A reappraisal of field data (K. A. Plumb, pers. comm. 1975) shows that, without exception, the Sophie Downs and Bow River Granites of the east Kimberley region, and
similar granites in the west Kimberleys, intrude the Whitewater Volcanics or their high-level equivalents, and that the report of a dyke of Castlereagh Hill Porphyry intruding Bow River Granite (Dow & Gemuts, 1967, 1969; Plumb, 1968) was incorrect. The presently preferred age for the Whitewater Volcanics, 1953 ± 109 m.y., would therefore now be in accord with Bofinger’s (1967a) age of 1854 ± 14 m.y. for the pooled Rb-Sr data from the Sophie Downs and Bow River Granites, and with Bennett & Gellatly’s (1970) age of 1880 ± 50 m.y. for the similar west Kimberley granites.

From the available evidence it is concluded that, in spite of the present uncertainties regarding the isotopic data, the Whitewater Volcanics are older than the acid volcanics in the Mount Winnecke Formation. Clearly, further work, possibly employing U-Pb geochronology on zircons, needs to be done to adequately test this conclusion.

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References


