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Discussion: Delamerian unconformities in Tasmania

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Webby (1978), while presenting an informative review of the geological history in Tasmania, has suggested that the Haulage unconformity at Mount Lyell is the result of an important structural event, a suggestion apparently partly supported by Williams (1978). As these papers will be referred to extensively it seems appropriate to try to correct what I suspect are mis-readings of geological data. At first sight such matters appear to be of minor importance but are in fact vital to the correct interpretation of the history of volcanism, deformation, fluid circulation, and mineralization. Deposits like Rosebery and Mount Lyell are among the largest of their kind in the world and hence are worthy of detailed investigation.

Webby (1978) has suggested the Haulage movement (i.e. that producing the Haulage unconformity) is the second phase of the Delamerian Orogeny which started in Tasmania with the Jukesian movement (see also Solomon & Griffiths, 1974). He shows the Haulage movement (his Fig. 3) as a major event apparently occupying a period of some 25 m.y. and having a wide extent. It followed deposition of most of the Owen Conglomerate and preceded that of the Pioneer Beds (the upper part of the Owen Conglomerate).

The Haulage unconformity was first mentioned in print by Bradley (1954), but it had previously been mapped by S. B. Dickinson (Mount Lyell Mining and Railway Co. records, 1945). It was re-mapped in more detail by M. L. Wade and myself in 1954, and found to extend north-south through the Mount Lyell orefield for about 1.5 km, and east-west for about 400 m. Solomon (1969) interpreted the unconformity as a period of local uplift on the western margin of the Owen basin (along the Great Lyell Fault), causing slumping and soft-sediment folding of the uppermost Owen sediments and underlying volcanic rocks. The succeeding Pioneer Beds (sandstones and conglomerates) were deposited on Owen Conglomerate and Mount Read Volcanics, but probably did not cover the entire area because at North Lyell the lowermost beds of the succeeding Gordon Limestone rest directly on volcanic rocks (Fig. 1).

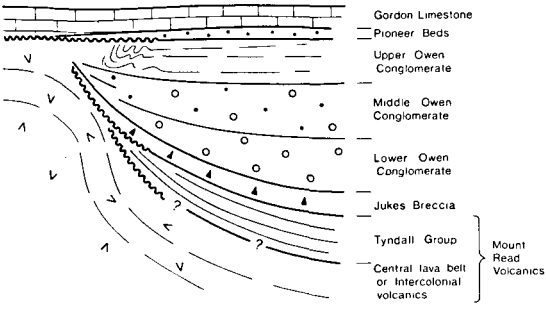

Fig. 1. Schematic diagram to illustrate the simplest interpretation of the relationship between the three unconformities referred to in the text. The Pioneer Beds are part of the Owen Conglomerate formation.

Detailed mapping north and south along the West Coast Range has failed to find more Haulage-type unconformities, emphasising the local nature of the disturbance. The elevation of the Haulage movement to an event capable of producing schistosity in the Mount Read Volcanics (Williams, 1978, p. 191) reflects, I suspect, a misreading of a confusing statement by Reid (1975, p. 611).

In summary so far, I find it difficult to extrapolate from the localised, superficial nature of the Haulage movements suggested by the field evidence to the significant and protracted period of deformation and non-deposition implied by Webby (1978), and to a lesser extent by Williams (1978).

The significance of the Jukesian unconformity also needs clarification. The relationships on Mount Jukes are fairly clear, viz. Jukes Breccia or Conglomerate unconformably overlies Mount Read Volcanics (Carey & Banks, 1954). Drilling and subsequent mapping at Mount Lyell (Jago *et al.*, 1972; Corbett *et al.*, 1974) suggested an unconformity in the Comstock area between the Tyndall Group, then a newly recognised upper unit of the Mount Read Volcanics, and the mineralized Mount Read Volcanics. This boundary was correlated with the Jukesian unconformity despite certain structural difficulties. This conclusion might be the simplest solution (Corbett *et al.*, 1974, p. 184), but there is good reason for believing that there may be two unconformities in certain areas, as noted by Williams *et al.* (1975). At South Darwin, White (1975) identified two unconformities, one involving a sequence of > 300 m of volcanic and volcaniclastic rocks overlying mineralized volcanics (Intercolonial volcanics of White, 1975, or the Central lava belt of Corbett *et al.*, 1974), and one between Jukes Breccia and the same mineralized volcanics (the Jukesian unconformity). The mineralized volcanics enclose the Darwin Granite and fragments of this granite occur in both sets of younger rocks. The second unconformity almost overlaps the first, making it impossible to draw one surface beneath the Jukes Breccia and

the volcanic/volcaniclastic sequence. The geology is not so clear at Comstock, but a similar situation seems to exist there, though the older unconformity is not necessarily the same as the older one at Darwin.

I suggest that the simplest interpretation on present evidence is that at Darwin and Comstock the Jukesian unconformity is later than an earlier unconformity, in the manner shown in Figure 1. This repetition of unconformities appears to be very localised and probably results from north-south faulting and associated folding, as suggested by Banks (1956).

It is possible to expand on the nature of late Cambrian (Delamerian) deformation from the evidence of the massive-sulphide deposits in the volcanics. Most of those north of Mount Lyell are Zn-Pb-Cu-rich and stratiform while at, and south of, Mount Lyell they are mainly Cu-rich and of vein or replacement type. The upper part of the Mount Lyell sequence has been eroded and it is suggested that in the southern deposits the Zn and Pb sections, which in such deposits tend to form mainly at or near the rock-water interface, were mostly eroded, while in the north they were not. The relatively deep erosion in the south, also indicated by the exposure of the Darwin Granite at the earlier unconformity, may reflect a regional northerly plunge in the earliest Delamerian structures. This suggestion, of course, substantially reduces the exploration potential of the Mount Lyell-Darwin area.

The massive-sulphide deposits probably formed by convective fluid circulation driven by heat from such magmatic bodies as the Darwin Granite. This implies coeval mineralization and shallow plutonism prior to deformation and erosion of the earliest stage of the Delamerian Orogeny. Mineralization may well have been followed, and erosion preceded, by further volcanism.

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Reply: Delamerian unconformities in Tasmania

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Dr Solomon's comments pertain to one aspect of my general review of the Ordovician history of the Australian continental platform and shelf margin, namely, the nature and significance of certain tectonic events in the Early Palaeozoic succession of western Tasmania (Webby, 1978, pp. 45-46 and fig. 3). In reviewing this aspect I relied entirely on previously published data, especially that contained in the excellent account of Cambrian-Ordovician relationships in the Queenstown area of western Tasmania by Corbett *et al.* (1974). I attached wider (regional) significance to the angular (Haulage and Lynchford) unconformities within the Owen Conglomerate, but did not, in spite of Solomon's assertions to the contrary, regard them as manifestations of an event with a 25 m.y.-long history of deformation. Given present estimates of about 60 m.y. for the entire Ordovician Period it is difficult to understand how Solomon de-