NEW FAUNAL DISCOVERIES IN THE LATE NEOPROTEROZOIC OF SOUTH AUSTRALIA AND THEIR POTENTIAL SIGNIFICANCE IN THE EMERGING CHRONOMETRY OF THE EDIACARAN.

JENKINS*, Richard F.J. and NEDIN, Christopher, Dept. of Geology and Geophysics, The University of Adelaide, Adelaide, SA, 5005, AUSTRALIA.

Investigation of the late Neoproteozoic Rawnsley Quartzite in the western Flinders Ranges has disclosed four additional, hitherto unsuspected, erosive sequence tract boundaries. The base of the shoreface/intertidal 'member 1' of the Rawnsley Quartzite overlies the fluviatile and paralic Bonney Sandstone at an erosive surface which locally exhibits low angle (c. 2°) discordance. Further erosive surfaces separate member 1 from the transgressive-regressive cycles of members '2' and '3' as well as the well known Ediacara Member, which contains the type Ediacara assemblage of soft-bodied metazoan remains. Another downcutting surface occurs at the top of this member and a further one at the local base of the Cambrian. The sequence boundaries within the Rawnsley Quartzite locally erode down c. 10 - 30m through underlying strata, but the surface below 'member 3' forms deep channels with up to c. 175m of relief.

Small discoidal 'fossil' remains occur rarely in the Bonney Sandstone and earlier evidence of metazoans extends down to the upper Wonoka Formation. Careful search of 'member 1' of the Rawnsley Quartzite has so far revealed only net-like imprints assumed to be moulds of cyanobacterial mats. 'Member 2' includes a diverse fauna with *Rangea-* and *Ernietta*-like forms, a *Pteridinium* sp., *Kullingia, Hiemalora*, rare *Tribrachidium*, rare *Dickinsonia* (2 species), common simple trace fossils and *'Chondrites'*. *Pteridinium carolinaense*, of wide global significance, *Inkrylovia*, spectacular examples of other frondose forms preserved in a three dimensional manner, and a possible early chordate characterise 'member 3'. The type Ediacara assemblage is augmented by a giant *Dickinsonia* specimen 90cm long by 55cms wide (the ? largest known fossil worm in the world) and a 'family' of *Glaessnerina* fronds with the largest incomplete at over 75cm in length.

The new discoveries provide potential for correlation with Ediacaran faunas in the c. 1400m thick older Nama Group of southern Namibia and those of the Mackenzie Mountains northwestern Canada, where biotas are also reported through several thousand metres of strata. The three faunas of the Rawnsley Quartzite locally occupy a stratigraphic thickness of less than 100m indicating the possibility of considerable condensation. This raises the question as to how much older the immediately underlying parts of the succession in the Flinders Ranges might be.

Conventional U-Pb zircon geochronology and use of the sensitive high resolution ion microprobe, 'SHRIMP II', by W. Compston (Australian National University, Canberra) to date zircons from tuffs in fossiliferous late Neoproterozoic sections has provided a surprisingly wide spectrum of results. British workers lean towards the consideration that a substantial part of the Charnian is older than 600+Ma and this question is currently under investigation by SHRIMP. The discoidal *Ivesia lobata* is the oldest known of the Charnian fossil remains and a comparable taxon occurs in the Conception Group of Newfoundland. The Mistaken Point assemblage of Newfoundland is dated by SHRIMP at 571 ± 2.5 Ma, providing a reference for the appearance of *Charnia masoni* and *Charniodiscus concentricus* in this section at least. The conventional American zircon chronology for the richly fossiliferous Nama Group lies towards the younger end of the spectrum at 549 - 543 Ma; this sequence is significant for its overlap of Ediacaran soft-bodied faunas with carbonates containing varied 'skeletal' remains. SHRIMP gives an age of 531 ± 3.5 Ma for a tuff in poorly lithified Late Vendian sediments of the Podolian Ukraine, where c. 3 cm diameter *'Chuaria'* and a rich vendotaenid flora can sometimes be split from mudrocks with the fingers. This youthful result may be compared with SHRIMP ages of 530 ± 5 Ma from the older Cambrian of China and 526.6 ± 3.2 Ma for the ?early Botomian of South Australia, utilizing the same standard and newly revised statistical assessment.

The new chronometric results favour the hypothesis that selection pressure by the animals which began the process of acquiring mineralised skeletons led to a progressive replacement of the soft-bodied classical Ediacaran biotas.