The Ediacaran: a New System and Period

The Global Stratotype Section and Point for the newly defined Ediacaran System has been ratified at the base of the cap carbonate in Enorama Creek. A near-continuous section from the Marinoan glaciation to the base of the Cambrian is exposed in the Flinders Ranges, with type sections of included stratigraphic units exposed in the area around Brachina and Bunyeroo gorges. The stratigraphy and local and regional correlations are well established in the literature and were summarized by Preiss (1987, 2000). Lithostratigraphic correlations have been established between the type sections, other measured sections throughout the Adelaide Rift Complex, and continuously cored drill hole sections on the Stuart Shelf, 80-100 km to the northeast (Fig. 1). Continuously cored drill holes in the Officer Basin can be tied to the Adelaide Rift Complex and Stuart Shelf sections (Figure 2) using a variety of methods, including lithostratigraphy; the use of key stratigraphic markers, such as glacial episodes, the widespread and time-synchronous Acraman impact ejecta layer, a widespread canyon cutting episode, the appearance of the stromatolite *Tungussia julia* and the appearance of the bilaterian Ediacaran fauna and associated trace fossils. Correlations can also be extended to the Amadeus and, to a limited extent, the Georgina basins. The proposed lithostratigraphic correlations have been confirmed by carbon isotope chemostratigraphy, sequence stratigraphy, and seismic interpretation (see Preiss, 2000; Walter, *et al*., 2000; Morton and Drexel, 1997 and references therein).

A rigorous sampling program was started in 1991 to establish an acritarch biostratigraphy throughout Australian Neoproterozoic basins based on palynological studies of continuously cored drill holes (Fig. 2). In general, samples were taken at 10–20 m intervals and more than 1000 samples have now been examined (Fig. 3-10). Unfortunately, despite extensive sampling of field sections in the Flinders Ranges, no acritarchs (acid-insoluble fossils of single-celled, phytoplanktonic, green algae) were recovered, in part because the rift sequence is too thermally mature for palynomorphs to be preserved, and in part because organic material has been leached from a deeply weathered profile. However, palynomorphs are preserved in the Stuart Shelf drill holes, and despite patchy preservation in parts of the succession, the species identified allow correlation with excellently preserved assemblages throughout much of the Officer Basin (Fig. 11). Similar species distribution patterns have been documented in the Amadeus Basin. Preservation in the Georgina Basin succession is too poor for useful analysis at present.

Sufficient data has now been gathered from the Officer and Amadeus Basins to demonstrate the potential for a biostratigraphic zonation of the lower and middle part of the Ediacaran (Figure 12) (Grey, in prep.). Further studies are currently underway on the more poorly documented parts of the succession.

**Palynology of Ediacaran successions in Australia**

Acritarch assemblages in the middle Ediacaran are extraordinarily diverse taxonomically, are morphologically complex, and show unmistakable patterns of secular variation (Fig. 12). These characteristics permit the erection of a zonal scheme at levels of precision equivalent to the Phanerozoic record. The zones are independent of taphonomic and palaeoenvironmental
influences, and they are demonstrably independent of lithology, lithostratigraphy, and sequence stratigraphy. Using composite sections, a scheme comprising two palynofloras, the Ediacaran Leiosphere Palynoflora (ELP), and the Ediacaran Complex Acanthomorph Palynoflora (ECAP), which is subdivided into four zones, has been proposed (Grey, in prep.). Although the scheme must be considered a preliminary one, it represents a significant advance in Neoproterozoic biostratigraphic studies, and should provide an important tool for future stratigraphic correlation.

The presence of certain acritarch species in probably coeval successions in Australia, Siberia, China, and northern Europe, suggests that the proposed zonation has good potential for global application, and that biostratigraphic principles and methodology can be applied to the Neoproterozoic.

References