

CHAPTER 5 Curnamona Province

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CURNAMONA PROVINCE SUMMARY

Age

Sedimentation — late Palaeoproterozoic to early Mesoproterozoic.

Felsic and mafic volcanism — late Palaeoproterozoic to early Mesoproterozoic.

Granitic intrusion — late Palaeoproterozoic to early Mesoproterozoic, Cambro-Ordovician.

Olarian Orogeny — late Palaeoproterozoic(?) to early Mesoproterozoic.

Delamerian Orogeny — middle Cambrian to early Ordovician.

Prospective commodities

Cu, Au, Zn, Pb, Ag, U, REE, barite, wollastonite, feldspar, beryl, garnet and fluorite.

Major exploration models

- Iron oxide–Cu–Au deposits
- Broken Hill type Pb–Zn–Ag deposits
- Stratiform, shale-hosted Zn–Pb–Ag (Mount Isa – McArthur Basin style) deposits
- Vein gold
- Sedimentary uranium (in Cainozoic sedimentary cover).

Summary geology

The Curnamona Province comprises two major groups of rocks. Late Palaeoproterozoic metasedimentary and metavolcanic rocks (the Willyama Supergroup) and intrusives crop out in the Willyama Inliers, occur beneath younger cover in the southern Benagerie Ridge, and may be present in the Mount Painter Inliers. These rocks were intensely deformed, metamorphosed and hydrothermally altered in the ~?1640–1580 Ma Olarian Orogeny.

Mesoproterozoic (~1600–1580 Ma, equivalent to the Hiltaba Suite in the Gawler Craton) intrusives occur in the Willyama Inliers and southern Benagerie Ridge, and Mesoproterozoic sediments, volcanics and intrusives occur in the Mount Painter and Mount Babbage Inliers and northern Benagerie Ridge. These younger rocks were metamorphosed and deformed by the Delamerian Orogeny and, possibly, at least locally, by a Mesoproterozoic deformation in the Mount Painter Inliers but are undeformed in the centre of the province. The Willyama Supergroup and intrusives are extensively mineralised, and in New South Wales host the giant Broken Hill Pb–Zn–Ag orebody. Sedimentary and low-grade metasedimentary rocks of Neoproterozoic and Cambrian age, as well as Tertiary and Quaternary sediments, cover older basement across much of the province. Tertiary palaeochannel sediments host economic uranium deposits at Beverley and Honeymoon.



DESCRIPTION AND TECTONIC SETTING

The Curnamona Province is a large area of Palaeoproterozoic to Mesoproterozoic rocks in the northeast of South Australia and western New South Wales (Fig. 5.1). The province lies east of the Archaean to Mesoproterozoic Gawler Craton from which it is separated by the Neoproterozoic to Cambrian Adelaide Geosyncline basin complex (Preiss, 2000). Most of these rocks are obscured by younger sediments but they are exposed in the Willyama Inliers of the Olary – Broken Hill region, in the Mount Painter and Mount Babbage Inliers to the northwest, and are known from drillholes in the Benagerie Ridge. The centre of the province in the northern Benagerie Ridge, where rocks are undeformed by the Cambro-Ordovician Delamerian Orogeny, was named the Curnamona Cratonic Nucleus by Thomson (1970). The term Curnamona Craton has variously been used for both this area and the entire province. The geology and mineral potential of the South Australian portion of the province were reviewed by Robertson et al. (1998).

The Proterozoic basement of the Curnamona Province was overlapped by various Adelaidean (Neoproterozoic) and Cambrian sediments. The marginal zones of the province were affected by early and middle Neoproterozoic and Early Cambrian rifting events, and by deformation and low-grade metamorphism in the Cambro-Ordovician Delamerian Orogeny. The limits of the province, therefore, are not its original edges, but the limits of a crustal remnant encircled by Neoproterozoic and Palaeozoic mobile belts. The Precambrian continental basement in the mobile belts has been greatly attenuated and has subsided to deep levels beneath thick sedimentary accumulations and hence is not identifiable on aeromagnetic images.

The known rocks of the Curnamona Province fall into two main groupings (Table 5.1). The older comprises a late Palaeoproterozoic metasedimentary and partly metavolcanic succession (Willyama Supergroup) and intrusives that were both intensely tectonised and metamorphosed by the early Mesoproterozoic (and late Palaeoproterozoic?) Olarian Orogeny (?1640–1580 Ma). Neither the base of the Willyama Supergroup nor its basement have been identified. The younger grouping contains early Mesoproterozoic volcanics, sediments and granitoid intrusives that are either unmetamorphosed (as in the central, cratonic portion of the province) or metamorphosed at lower grade than the Willyama Supergroup (e.g. Mount Painter Inlier).

The late Palaeoproterozoic Willyama Supergroup is known with certainty only in the Willyama Inliers and the southern Benagerie Ridge subsurface. However, in the cratonic central region, the Willyama Supergroup may form the basement to the Mesoproterozoic supracrustals. A few drillholes intersect very low-grade metasediments which are nevertheless distinctly though weakly deformed, lying