Australian Craton

By

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Introduction

- It underlies all of the continent and adjoining shelf except for the Tasman Fold Belt in the east.
- The craton extends northward beneath the Arafura Sea to incorporate a south-central embayment in Papua-New Guinea.
- The craton is conveniently divided by the Central Australian Mobile Belt network into the North Australian, West Australian (Yilgarn and Pilbara blocks), Gawler (-Nullarbor) and Curnamona cratons and Northeast orogens, each with specific subdivisions.

Precambrian composite cratons, component cratons, shields, blocks, belts

(1)West Australian Shield including Pilbara and Yilgarn blocks, Capricorn Orogen and Bangemail Basin,

(2)North Australian Craton with adjoining Northeast Orogens and buried extensions,

(3)Central Australian mobile belts,

(4)Gawler-Nullarbor Block,

(5)Curnamona Craton with Tasrnanian inliers

Tectonic Framework

- The Australian Craton has been broadly divided on the basis of progressive cratonization of component blocks (Plumb 1979, Rutland 1981).
- However, no existing classification is fully satisfactory in a rapidly developing chronometric assessment that reveals significant intercratonic diachroneity.
- The interim classification illustrated here is, in fact, a blend of tectonic and chronostratigraphic divisions with substantial adherence to the classification of Plumb and James (1986).

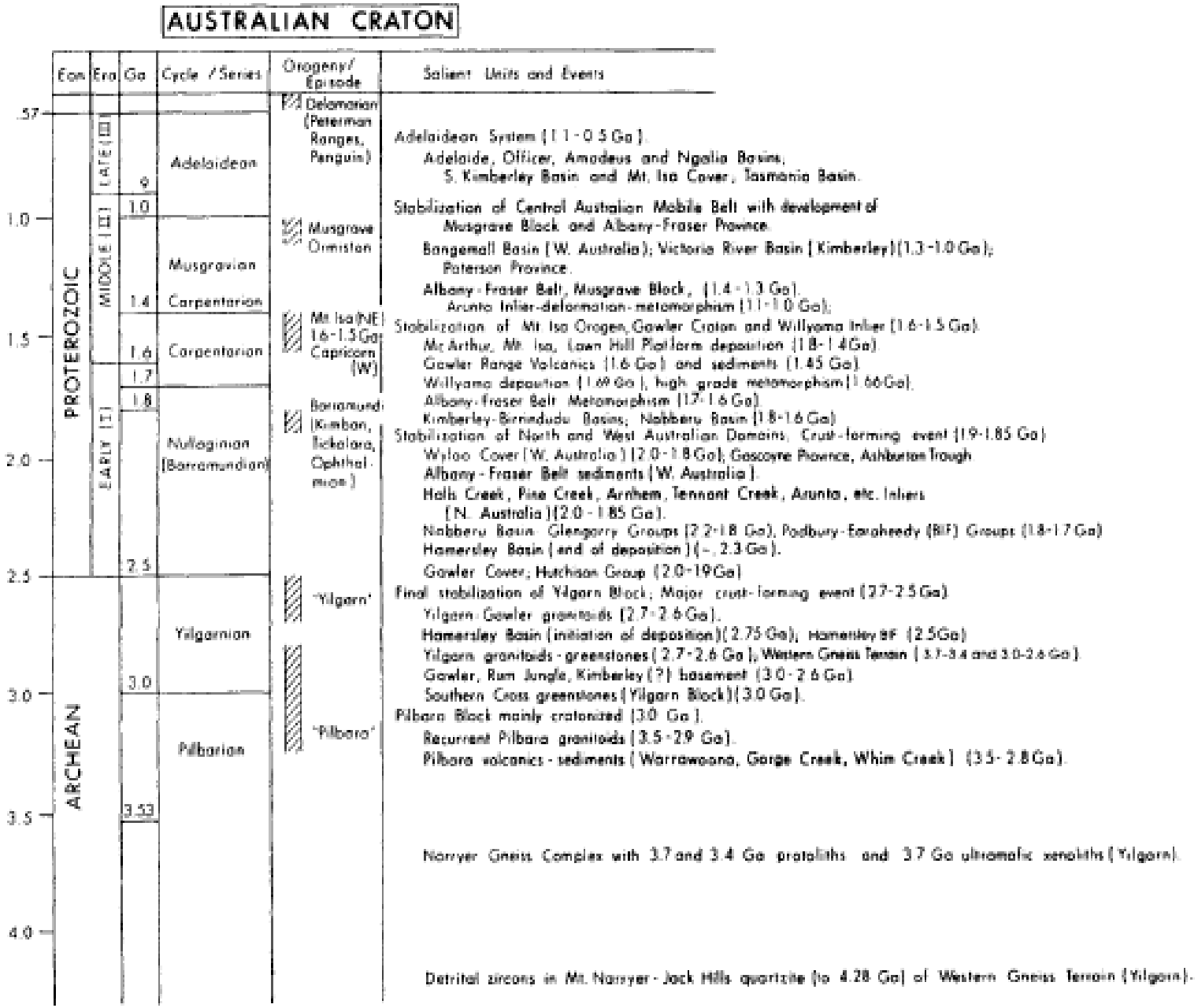

Fig. 1-3h. Summary chrono-stratigraphic development of Precambrian crust of the Australian Craton. Salient crustal units and events are arranged in relation to internal orogenies and resulting tectonic cycles.

Geologic Setting

- The Australian Craton, 7.6x106 km^2 in area, forms a varyingly indented rift-bound polygon with a northward horn crossing the Arafura Sea to include a south-central segment in New Guinea.
- Exposed Precambrian terrains, common in the western and coastal parts but scattered in the central desert region, amount to 2.3 x 106 km^2 or 30% of the total craton.
- The six main craton subdivisions are: West Australian Shield including Pilbara and Yilgarn blocks; North Australian Craton; Northeast Orogen; Central Australian Mobile Belt; Gawler- Nullarbar Craton; and Curnamona Craton.
- Precambrian rocks therein are divided into basement domains and platform cover.

Archaean Basement High Grade Provinces

- The Pilbara and Yilgarn blocks dominate the West Australia Shield.
- The smaller (60 000 km^2) *Pilbara Block* to the north is underlain by dominant (60%) domal granitic batholiths (3.5-2.85 Ga) up to 100 km across which are separated by coeval low-medium grade metasupracrustal rocks of the Pilbara Supergroup.
- The BIF-rich Hamersley cover (see below) upon the southern flank of the Pilbara Craton ranges in age from late Archean to earliest Proterozoic (2.8- ~2.3 Ga).
- The much larger (650 000 km 2) *Yilgarn Block* is divided into (1) the smaller, high grade, arcuate Western Gneiss Terrane in the west; and (2) the larger lower grade granitoid-greenstone provinces including the Eastern Goldfields province.
- The granulite facies gneisses contain numerous metasedimentary enclaves characteristic of shelf facies paleoenvironments, as well as local inclusions of--3.7Ga gabbro-anorthosite, the oldest such coherent lithology so far identified on Earth. Detailed ion-microprobe analyses of clastic zircons in nearby quartzites yield ages as old as 4276 Ma.

Archaean Basement Low Grade Provinces

- The lower grade provinces to the east are underlain by about 70% granitoid rocks (2.9- 2.6 Ga) and 30% metasupracrustal rocks, the latter distributed in numerous inter-domal greenstone belts (3.0-2.7Ga) containing thick unicyclic to multicyclic mafic-felsic volcaniclastic sequences.
- Eastern Goldfields greenstone belts are famous for widespread Au and Ni mineralization.
- Finally, the Gawler Craton in South Australia, an oval-shaped 800 km by 600 km domain centred upon the Gawler Ranges, contains scattered late Archean ages thereby pointing to original widespread Archean crust, now with pervasive Proterozoic tectono-magmatic overprint.
- A provisionally identified buried contiguous Archean block (Nullarbor) may extend -600 km to the west.

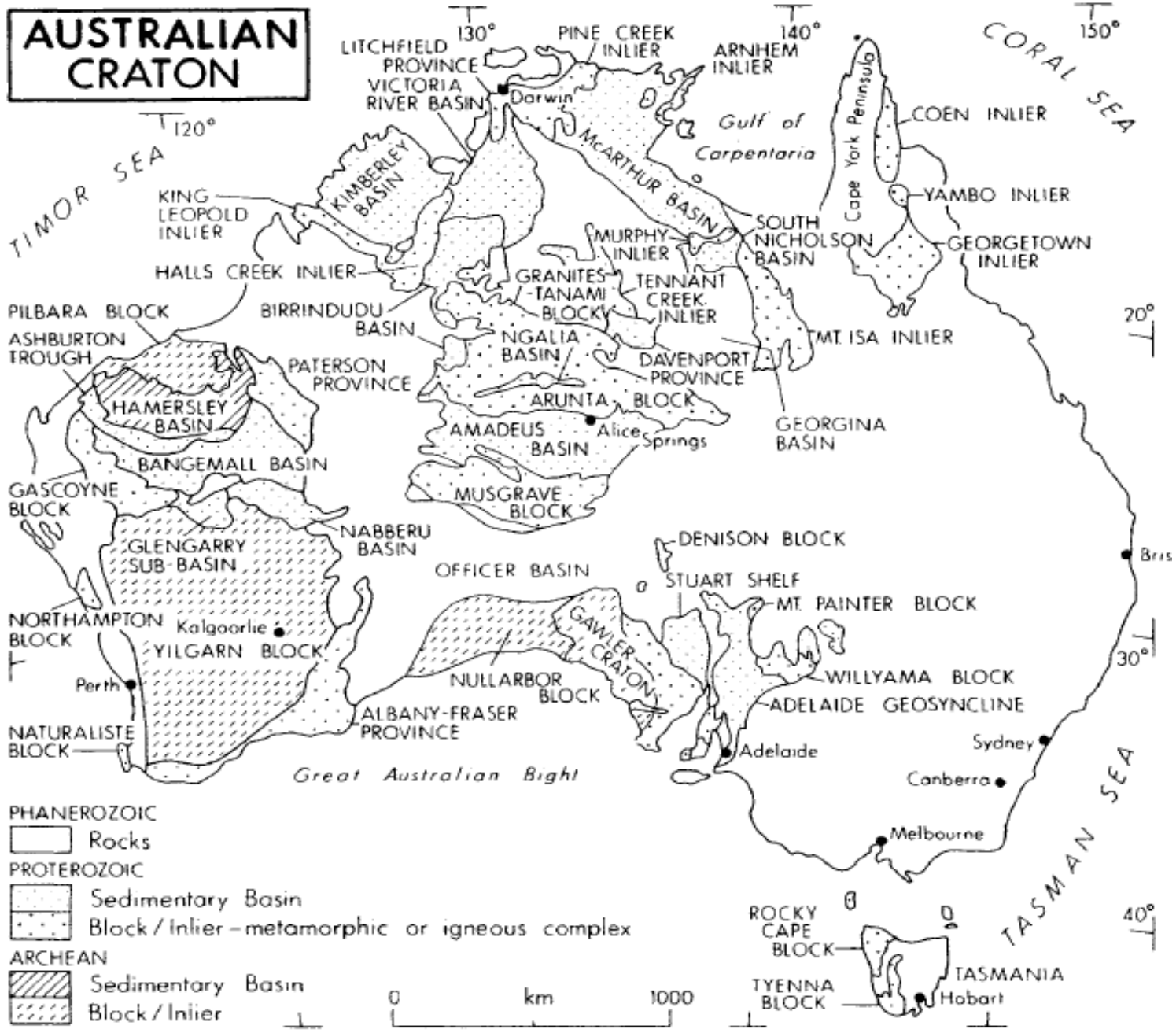

Fig. 1-5h. Main geologic outline and divisions of the Australian Craton (adapted from Wyborn 1988, Fig. 1).