THE BIOSTRATIGRAPHY AND PALAEOECOLOGY OF SOUTH AUSTRALIAN PRECAMBRIAN STROMATOLITES

by

W. V. Preiss, B.Sc. (Hons.)

Department of Geology and Mineralogy
University of Adelaide

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APPENDIX I

GLOSSARY*

Apicular: A texture in which the mineral grains are strongly elongated and aligned parallel.

Axis: The centre-line of a column.

Banded microstructure: One in which the laminae are very continuous and have abrupt, distinct, more or less parallel boundaries.

Bioherm: A circumscribed organo-sedimentary structure whose minimum width is less than or equal to one hundred times its maximum thickness, embedded in rocks of different lithology.

Biostrome: A stratiform organo-sedimentary structure whose minimum width is more than one hundred times its maximum thickness. Note: when the dimensions are unknown, the term "stromatolitic bed" may be used.

Branching: The division of a column into new, discrete columns. The columns become discrete when they are first separated by an interspace.

Parallel branching: branching in which the axes of the new columns are parallel (most commonly they are also parallel to the axis of the original column).

Alpha-parallel branching: parallel branching in which the width of the individual remains constant.

Beta-parallel branching: parallel branching in which the original column widens gradually before branching.

Gamma-parallel branching: parallel branching in which the original column widens abruptly before branching.

Slightly divergent branching: branching in which the axes of the new columns diverge at less than 45°.

Markedly divergent branching: branching in which the axes of the new columns diverge at more than 45°.

* This glossary was compiled in cooperation with Dr M. R. Walter. Most of the terms are illustrated in Fig. 4.
Multiple branching: branching into more than two columns at approximately one level.

Bridge: A stromatolitic lamina or set of laminae linking adjacent columns.

Bump: A low, rounded protrusion on the side of a column.

Catagraphia: Unlaminated microscopic carbonate problematica (many may be of inorganic origin).

Coalescing columns: Adjacent columns which join and continue growth as one column.

Clot: A microscopic segregation of pigment.

Column: A discrete stromatolitic structure, with the dimension in the direction of growth greater than at least one of the transverse dimensions.

Columnar-layered stromatolite: A stromatolite in which short columnar and laterally linked (usually pseudocolumnar) portions alternate.

Cornice: Overhanging lamina or set of laminae, elongated transversely to the column axis.

Crest: The summit of an upward-convex lamina.

Crestal line: Line joining the crests of successive laminae.

Crestal zone: The environs of the crestal line. In Conophyton, the crestal zone is specifically the zone of thickening and contortion of laminae; the width of the crestal zone is the width of the thickened and/or contorted portions of laminae.

Cumulate stromatolite: A rounded, protruding, non-columnar stromatolite.

Dichotomous branching: Branching into two new columns.

Domed: With approximately constant radius of curvature.

Drusy: A texture in which mineral grains line a cavity.

Flat-laminated stromatolite: Non-columnar stromatolite with flat, continuous laminae (Cryptalgalaminate of Aitken, 1967).

Gently convex lamina: A lamina whose ratio of height to diameter is less than or equal to 0.5.
Gnarled column: A column with large bumps.

Grainstone: A mud-free, grain-supported carbonate rock.

Granulous: A mineral texture in which fine-grained patches are surrounded by coarser grains.

Hypidiotopic: A mineral texture intermediate between xenotopic and idiotopic.

Idiotopic texture: A texture in which the mineral grains are bounded by crystal faces.

Individual: A group of columns arising from a single basal column, or a discrete stromatolite in which the laminae are continuous.

Intercrystal texture: A texture in which the mineral grain boundaries are wrinkled.

Interspace: The space between columns, usually filled with sediment.

Intraclast: A reworked, partly lithified carbonate clast derived from within the basin of deposition.

Intramicrite: A carbonate rock consisting of intraclasts and a micrite matrix.

Intracre琶rite: A carbonate rock consisting of intraclasts and sparry cement.

Lamina: The smallest unit of layering in a stromatolite.

Lanceolate: An elongate transverse section of a column, tapering at both ends.

Laterally linked stromatolite: Stromatolite with wavy laminae which are continuous between crests.

Microlamina: A set of laminae.

Microphytolith: Oncolites and catagaphia (microscopic carbonate problematica).

Micro-unconformity: Surface of lamination discordance due to penecontemporaneous erosion, within a stromatolite.

Niche: A deep indentation in the side of a column.
Oncolites: Carbonate problematica with concentrically laminated microstructure, analogous to stromatolites, but unattached. (Many of the described Russian forms may in fact be of inorganic origin).

Ooid: Spherical or subspherical accretionary grain, usually of sand size, with concentric and sometimes radial microstructure. Superficial ooids are ooids in which the thickness of the accretionary coating is less than the radius of the ooid.

Oomicrite: A carbonate rock composed of ooids and a micrite matrix.

Ooesperite: A carbonate rock composed of ooids and a sparrit cement.

Packstone: A grain-supported carbonate rock in which some mud matrix is present.

Parabolic lamina: A lamina whose axial longitudinal section approximates a parabola.

Peak: Overhanging lamina or set of laminae with a small dimension transverse to the column.

Pellet: Ovoid to sub-ovoid grain of micritic carbonate of silt or sand size, lacking internal structure.

Pelmicrite: A carbonate rock composed of pellets and a micrite matrix.

Peleparite: A carbonate rock composed of pellets and a sparrit cement.

Pigment: Organic or inorganic colouring matter.

Platy column: A column in which one transverse dimension is much larger than the other.

Projection: A small columnar or conical outgrowth from the side of a column.

Pseudocolumnar stromatolite: Laterally linked stromatolite in which successive crests are superimposed forming column-like structures (pseudocolumns).

Rectangular lamina: Lamina which in a longitudinal section of a column is flat-topped with edges deflexed at about 90°.

Rhombic lamina: Lamina which in a longitudinal section of a column is flat-topped but has subparallel edges not perpendicular to the top.
Rib: A rounded protrusion which is elongated transversely to the column on which it occurs.

Selvage: An unlaminated coating on column margins.

Steeeply convex lamina: A lamina whose ratio of height to diameter is greater than 0.5.

Streaky microstructure: One in which the laminae vary in thickness and are moderately distinct and continuous, but frequently grade into one another. The darker laminae are usually the more distinct.

Striated microstructure: One in which the laminae originally formed as chains of lenses. (This excludes those cases where originally continuous laminae are disrupted by recrystallization).

Tabular bioherm: Bioherm with parallel upper and lower surfaces.

Tabular biostrrome: Biostrrome with parallel upper and lower surfaces.

Tonguing bioherm: A bioherm which intertongues at its margins with the surrounding sediment.

Trichotomous branching: Branching into three new columns.

Tubercous column: A column having prominent expansions and constrictions.

Vermiform microstructure: One in which narrow, sinuous, pale coloured areas (usually sparry carbonate) are surrounded by darker, usually finer grained areas.

Wackestone: A mud-supported carbonate rock with more than 10% grains.

Wall: Structure at the margin of a column formed by one or more laminae from within the column bending down and coating the margin for at least a short distance.

Wavy lamina: A lamina with flexures of wavelength greater than 2 mm.

Wrinkled lamina: A lamina with flexures of wavelength less than 2 mm.

Undulatory stromatolite: Laterally linked stromatolite in which successive crests are not superimposed.

Xenotopic texture: A texture in which the mineral grains are anhedral or irregularly shaped, i.e. not bounded by crystal faces.
The following sections were measured in the course of field work for the collection of stromatolites and environmental study.

1. Section of part of the Skilligalee Dolomite, Depot Creek

- Upper Member: Dark grey shaly and laminated dolomites, black cherts and magnesite conglomerates (not measured)
- Lower Member:
  5' Sandstone, coarse, pale grey, with dolomitic matrix. Interbeds of dolomite, dark grey, flaggy, with large dolomite clasts
  4' Dolomite, dark grey, shaly or laminated
  12' Dolomite, medium to dark grey, flaggy. Bands with dolomite clasts. Chert lenses and blebs
  4' Dolomite, stromatolitic, laterally linked to broad, expanding columns
  24' Sandstone, medium to coarse grained, pale grey, felspathic, thick bedded. In part quartzitic
  22' Interbedded shale, blue-grey, laminated and sandstone, coarse, grey, medium to flaggy bedded
  16' Shale and siltstone, blue-grey, laminated
  5' Shale, blue-grey, dolomitic
  10' Interbedded dolomite, pale to medium grey, flaggy to medium bedded and shale, blue-grey
  12' Shale, blue-grey
- (Apparent thickness here increased slightly by flexuring)
  8' Shale, blue-grey
  1' Dolomite, pink, medium bedded
  2' Shale, green-grey, laminated
  2' Dolomite, pink, medium bedded, with Tungussia wilkatanna
  3' Shale, green-grey, laminated
- (Erosional hiatus)
  17' Dolomite, pink, massive, fine grained, with Tungussia wilkatanna
  6' Shale, grey-green, laminated
  2' Dolomite, pink, with Tungussia wilkatanna
  7' Shale, grey-green, laminated
  4' Dolomite, pink, with Tungussia wilkatanna, overlying laminated dolomite
  14' Shale, green-grey, laminated
  6' Dolomite, pink, massive, with Tungussia wilkatanna
  9' Dolomite, pink, medium bedded, with LLH stromatolites
  14' Interbedded shale, grey-green, and dolomite, pink, flaggy
  10' Interbedded shale, grey-green, and dolomite, pink, with possible Tungussia wilkatanna
  4' Dolomite, pink, flaggy, wavy-laminated
Shale, purple and green laminated
Sandstone, medium-grained, arkosic, with coarse laminae
Shale, purple and green laminated
Dolomite, pink, with large Tungussia wilkašanana
Shale, purple and green laminated
Dolomite, pink, flaggy, with wavy, partly disrupted bedding
Shale, purple and green laminated
Interbedded shale, purple and green laminated, and dolomite, pink, laminated
Shale, purple and green laminated
Interbedded shale, purple and green laminated, and dolomite, pink to pale grey, flaggy to massive, laminated
Shale, green, laminated
Interbedded shale, green, laminated and dolomite, blue-grey, laminated. Some broad columns of Tungussia wilkašanana
As above, with thin sandy dolomite interbeds
Sandstone, arkosic, with heavy mineral lamination
Dolomite, medium grey, with Tungussia wilkašanana
Dolomite, blue-grey, flaggy, partly sandy
Dolomite, blue-grey, flaggy and shaly, with minor chert
Dolomite, flaggy, sandy, coarsely crystalline
Dolomite, blue-grey, flaggy, wavy-bedded, with chert lenses common at the top
No outcrop
Dolomite, medium-dark grey, flaggy, laminated. Partly cross-bedded, partly wavy-bedded
Dolomite, dark grey, with broad, cumulate stromatolites
Interbedded dolomite, blue-grey, flaggy, cross-laminated and dolomite, medium bedded to flaggy, sandy, with intraclasts
Dolomite, medium-grey, with Tungussia wilkašanana
Interbedded shale, grey, laminated, and dolomite, medium-grey, flaggy
Dolomite, sandy, fine intraformational conglomerate
Dolomite, buff, massive, brecciated
Shale, red and green laminated
Interbedded dolomite, pale grey, flaggy, and shale, red and green laminated
Dolomite, sandy, crystalline, with intraclasts
Shale, red and green laminated
Transition:
Sandstone, pink-grey, felspathic, poorly sorted
Dolomite, medium-grey, with disrupted laminae
Sandstone, flaggy, poorly sorted, with red shale partings
Sandstone, pink-grey, medium to coarse grained, medium bedded, well sorted
Sandstone, coarse grained, medium bedded, with red, mud-cracked shale partings with current ripples
Sandstone, pink, coarse, felspathic, medium bedded
Sandstone and quartzite, pink to grey, medium grained, medium bedded
Dolomite, pink to pale grey, flaggy, wavy-bedded, with possible solution vughs
Emeroo Quartzite: Sandstone, medium bedded, medium grained
(grading to coarse), partly foliated

2. Section of the Brighton Limestone equivalent, Depot Creek
(generalized for the area shown in Fig. 24)

Umberatana Group:
Lower Willochra Formation: (not measured)
Siltstone, thinly bedded, grey, with very fine scale cross-bedding,
purple ripple-marked and frequently mud-cracked shale laminae
Brighton Limestone:
46' Purple shale, as above, with thin interbeds dolomite, pink, thinly
bedded, partly with upward concave structures. Dolomite pre-
dominates near base
9' Dolomite, pink, sandy, in part oolitic, massive. Crystalline
pink dolomite at base
10' Sandstone, dolomitic, purple-grey, cross-bedded, with quartz
grit and red granules. Lenticular beds, probably channel fills
12' Dolomite, stromatolitic, with bioherms of Katavia costata.
variable Limestone, pale grey, silty. Variable thickness. Lenses of
dolomitic sandstone
160' Limestone, grey, crystalline, oolitic, with large, randomly
approx. oriented oolitic intraclasts. Bioherms of Acaiiella augusta
and Inveria conjuncta, of variable thickness
Transition:
100' Interbedded siltstone, grey, calcareous, thinly laminated, and
limestone, pale grey, with stromatolitic (Omacheniüa utschurica)
bioherms and small channel fills of flat-pebble breccia
Tapley Hill Formation:
Siltstone, grey, very thinly laminated, calcareous

3. Section of the Brighton Limestone equivalent, Mundallio Creek

Umberatana Group:
Lower Willochra Formation: (not measured)
Shale, purple and grey, ripple-marked
Brighton Limestone:
3' Thinly interbedded dolomite and purple shale
18' Dolomite, pink, sandy, thick-bedded. Upper part with thin purple
shale interbeds, and concave-upward structures
46' Limestone, stromatolitic, with green and grey lamination.
Cleaved in part. Acaiiella augusta
43' Limestone, medium to thick bedded, with stylolites, mud-flake
breccia
40' Limestone, pale grey, stromatolitic, laterally linked and
pseudo-columunar; may include Omacheniüa utschurica.
Transition:
100' Siltstone, grey, thinly laminated, with 1' to 2' lenticular
stromatolitic limestone interbeds
Tapley Hill Formation:
Siltstone, thinly bedded, cleaved, slightly calcareous
4. Section of the Brighton Limestone equivalent, Buckaringa Hill

**Umberatana Group:**

**Lower Willochra Formation:** (not measured)

Shale, purple, with a few very thin dolomite interbeds

**Transition:**

38' Interbedded shale, purple, ripple-marked, 2" arkosic sandstone bands with red granules, and dolomite, pink-buff, very thinly bedded, partly with disrupted bedding and concave-upward structures

**Brighton Limestone:**

11' Dolomite, pink, oolitic
6' Dolomite, massive, sandy
13' Limestone, stromatolitic, highly cleaved
13' Limestone, oolitic, weathered
3' Dolomite, massive, possibly oolitic
21' Limestone, oolitic, weathered
6' Limestone, massive, grey, with partly dolomitized ooids and oolitic intraclasts
14' Limestone, stromatolitic, highly cleaved
46' Limestone, stromatolitic, deeply weathered
18' Limestone, including three 2' thick bioherms, possibly *Acaciella augusta*, but columns not entirely discrete

**Transition:**

22' Interbedded limestone, massive, pale grey, and green slate
34' Siltstone, flaggy, laminated, calcareous
29' Limestone, medium bedded, stromatolitic, pseudocolumnar
16' Siltstone
2' Limestone, flat-pebble breccia
33' Siltstone
2' Limestone, flat-pebble breccia

**Tapley Hill Formation:**

Siltstone, flaggy, calcareous, finely laminated

5. Section of the Brighton Limestone, Melrose Township

(Thicknesses uncertain due to poor outcrop and faulting)

**Umberatana Group:**

**Lower Willochra Formation:** (not measured)

Shale, purple, oscillation ripple-marked, with thin interbeds gritty sandstone. Current direction consistently E-W on 3 bedding planes

**Brighton Limestone:**

50' No outcrop
57' Patchy outcrops of dolomite, buff, brecciated
44' Poorly outcropping grey dolomite; bioherm of *Boxonia melrosa*
70' Dolomite, pale grey, pseudocolumnar stromatolitic
7' Dolomite, pale buff, with bioherm of *Boxonia melrosa*; columns are inclined at the bioherm margins
8' Limestone, medium bedded, structureless

**Tapley Hill Formation:**

Siltstone, very thinly laminated, grey
6. Section of the Brighton Limestone, Pichi Richi Pass

Umberatana Group:
Lower Willochra Formation: (not measured)
Shale, purple, highly cleaved

Brighton Limestone:
6' Dolomite, buff, massive, sandy, with intraclasts
20' Siltstone, calcareous, laminated
19' Dolomite, buff, massive, sandy, with intraclasts
25' Siltstone, calcareous, laminated
20' Dolomite, buff, massive, sandy, with intraclasts

Tapley Hill Formation:
Slate, calcareous, thinly laminated

7. Section of the Brighton Limestone, Horrocks Pass

Umberatana Group:
Lower Willochra Formation: (not measured)
Shale, purple, ripple-marked, with siltstone interbeds

Brighton Limestone:
9' Limestone, grey, massive, sandy
16' Limestone, grey, sandy, poorly outcropping
55' Limestone, grey, sandy and gritty, cross-bedded

Transition:
101' Limestone, medium grey, medium bedded, wrinkly-laminated, with very fine intraclasts, interbedded in calcareous siltstone
57' Siltstone, very calcareous, and silty limestone, flaggy
17' Limestone, sandy, and calcareous sandstone, filling a channel

Tapley Hill Formation:
Siltstone, calcareous, thinly laminated, flaggy

8. Section of part of the Umberatana Group, east of Yednalue (at 130° 46'E, 32°02'S)

Umberatana Group:
Tarcoola Siltstone:
Upper part of the formation not measured
22' Sandstone, grey, silty, very fine grained
54' Slate, grey
24' Sandstone, grey, calcareous, medium bedded
135' Slate, grey, calcareous

Etina Formation:
38' Limestone, stromatolitic, of wavy-laminated bioclimax, 20' long, separated by sandy limestone
431' Shale and slate, grey, laminated
136' No outcrop
71' Limestone, massive, sandy
68' Limestone, sandy, wrinkly-laminated, in part with deformed stromatolite columns
165' Limestone, thick-bedded, sandy and gritty
50' Limestone, sandy, poorly outcropping
314' Limestone, pale grey, sandy, flaggy to massive
9. Section of part of the Umberatana Group, 2 miles east of Warcowie

\[\text{Warcowie Siltstone:}\]

123°
Shale, thinly bedded, weathered

717°
Siltstone, pale green-grey, fine sandy

254°
Siltstone, green-grey, medium bedded

143°
Siltstone, green-grey, thinly bedded

\[\text{Brighton Limestone equivalent:}\]

144°
Limestone, grey, oolitic, with large oolitic intraclasts, slightly rounded. Possible stromatolite bed (*Inzeria multiplex*) not located in situ

125°
Poor outcrop

124°
Limestone, pale grey, sandy, with large intraclasts

296°
Limestone, pink, poorly outcropping, cleaved. May be in part approx. stromatolitic

204°
Limestone, pink, fractured

20°
Limestone, stromatolitic, with columns very closely spaced; *Inzeria multiplex*, with sandy interspaces

172°
Limestone, pale buff-grey, finely crystalline. Fractured

84°
Limestone, oolitic, pale grey, massive

32°
Limestone, oolitic, with fine mud-flake breccias

204°
Limestone, dark grey, oolitic, medium-bedded, irregularly laminated, sandy. Partly cross-bedded. Massive in upper part

\[\text{Tapley Hill Formation:}\]

Siltstone, calcareous, grey, laminated, flaggy

\[\text{Wilpene Group: (not measured)}\]

\[\text{Nypa's Gorge Formation:}\]

Dolomite, pink, flaggy

\[\text{Umberatana Group:}\]

\[\text{Etona Formation:}\]

63°
Sandstone, red, fine grained, cross-bedded, heavy mineral laminated

96°
Sandstone, brick-red, soft, silty, gritty

\[\text{Trezona Formation:}\]

173°
Shale, greenish- to purplish-grey

17°
Three thin lenticular beds limestone, pink, laminated

100°
Shale, greenish- to purplish-grey

28°
Shale, purple-grey

4°
Limestone, pink, mud-flake breccia

\[\text{Enorama Formation:}\]

645°
Shale, green and grey

100°
Shale, chocolate, very thinly bedded

99°
Shale, calcareous, very thinly bedded

98°
Shale, deeply weathered

198°
Shale, olive-green weathering

97°
No outcrop

\[\text{Etina Formation:}\]

99°
Shale, calcareous, grey, with thin 1" silty limestone interbeds

225°
No outcrop

300°
Limestone, medium bedded to massive, sandy, grey but pinkish at base
### Unnamed siltstones:

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>131'</td>
<td>No outcrop</td>
</tr>
<tr>
<td>212'</td>
<td>Shale, brownish grey, thinly, evenly laminated</td>
</tr>
<tr>
<td>210'</td>
<td>No outcrop</td>
</tr>
<tr>
<td>196'</td>
<td>Shale, grey, laminated</td>
</tr>
<tr>
<td>98'</td>
<td>Sandstone, fine grained, calcareous, buff weathered</td>
</tr>
<tr>
<td>100'</td>
<td>No outcrop</td>
</tr>
<tr>
<td>99'</td>
<td>Siltstone, grey, calcareous, laminated, flaggy</td>
</tr>
<tr>
<td></td>
<td>Unmeasured: Siltstone, finely laminated, with a few massive siltstone interbeds</td>
</tr>
</tbody>
</table>

10. Section of part of the Etina Formation, east of Blinman

Uppermost approx. 400' of section were not measured

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>65'</td>
<td>Limestone, flaggy, irregularly wavy-laminated</td>
</tr>
<tr>
<td>28'</td>
<td>Limestone, sandy, with thin pebbly bands</td>
</tr>
<tr>
<td>123'</td>
<td>Limestone, sandy, banded</td>
</tr>
<tr>
<td>50'</td>
<td>Limestone, sandy, wavy-laminated</td>
</tr>
<tr>
<td>33'</td>
<td>Limestone, massive, gritty, cross-bedded</td>
</tr>
<tr>
<td>40'</td>
<td>Limestone, sandy, flaggy, with oscillation ripple marks (direction 130° - 310°)</td>
</tr>
<tr>
<td>57'</td>
<td>Limestone, massive, sandy and gritty, cross-bedded</td>
</tr>
<tr>
<td>51'</td>
<td>Limestone, silty, medium bedded, with gritty limestone interbeds</td>
</tr>
<tr>
<td>91'</td>
<td>Siltstone, calcareous, thinly bedded</td>
</tr>
<tr>
<td>154'</td>
<td>No outcrop</td>
</tr>
<tr>
<td>25'</td>
<td>Shale, chocolate, very thinly bedded</td>
</tr>
<tr>
<td>56'</td>
<td>No outcrop</td>
</tr>
<tr>
<td>29'</td>
<td>Limestone, sandy, with interbeds angular breccia</td>
</tr>
<tr>
<td>23'</td>
<td>Limestone, stromatolitic, irregularly pseudocolumnar, with interbeds sandy limestone</td>
</tr>
<tr>
<td>28'</td>
<td>Limestone, medium-bedded, sandy and pebbly</td>
</tr>
<tr>
<td>236'</td>
<td>Interbedded limestone, sandy, and siltstone, calcareous</td>
</tr>
<tr>
<td>72'</td>
<td>Limestone, with irregularly wavy-laminated stromatolites</td>
</tr>
<tr>
<td>77'</td>
<td>Limestone, pale grey, medium-bedded</td>
</tr>
<tr>
<td>66'</td>
<td>Limestone, with irregularly wavy-laminated stromatolites</td>
</tr>
<tr>
<td>110'</td>
<td>Limestone, pale grey, medium-bedded</td>
</tr>
<tr>
<td>42'</td>
<td>No outcrop</td>
</tr>
<tr>
<td>57'</td>
<td>Limestone, medium-bedded, silty</td>
</tr>
<tr>
<td>52'</td>
<td>Limestone, stromatolitic, with broad pseudocolumns, overlying massive flat-pebble breccia</td>
</tr>
<tr>
<td>28'</td>
<td>Interbedded limestone, silty, and irregularly wavy-laminated stromatolites. Sandy limestone at top</td>
</tr>
<tr>
<td>38'</td>
<td>Limestone, silty, thinly bedded</td>
</tr>
<tr>
<td>97'</td>
<td>Interbedded limestone, massive, gritty, cross-bedded, and irregularly wavy-laminated silty limestone</td>
</tr>
<tr>
<td>20'</td>
<td>Limestone, silty, pale grey, banded</td>
</tr>
<tr>
<td>5'</td>
<td>Limestone, massive, gritty</td>
</tr>
<tr>
<td>82'</td>
<td>Limestone, silty, poorly outcropping</td>
</tr>
<tr>
<td>114'</td>
<td>Shale, calcareous, with 6&quot; interbeds calcareous siltstone</td>
</tr>
<tr>
<td>101'</td>
<td>Shale, chocolate-grey, very thinly bedded, with a few 4&quot; interbeds limestone</td>
</tr>
<tr>
<td>Page</td>
<td>Description</td>
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<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>135'</td>
<td>Shale, grey, calcareous, thinly bedded</td>
</tr>
<tr>
<td>67'</td>
<td>Limestone, sandy, massive, with intraclasts</td>
</tr>
<tr>
<td>41'</td>
<td>Limestone,stromatolitic, irregularly wavy-laminated, with interbeds of gritty limestone</td>
</tr>
<tr>
<td>19'</td>
<td>Limestone, gritty, massive</td>
</tr>
<tr>
<td>10'</td>
<td>Siltstone, calcareous, banded</td>
</tr>
<tr>
<td>23'</td>
<td>Limestone, gritty and sandy, with stylolites. Large-scale cross-bedding (current direction 225°)</td>
</tr>
<tr>
<td>3'</td>
<td>Limestone, massive, sandy, irregularly wavy-laminated</td>
</tr>
<tr>
<td>70'</td>
<td>Shale, green-grey calcareous</td>
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<tr>
<td>5'</td>
<td>Limestone, dark grey, massive, oolitic, with intraclasts</td>
</tr>
<tr>
<td>28'</td>
<td>Shale, green-grey, calcareous</td>
</tr>
<tr>
<td>3'</td>
<td>Siltstone, pale grey, massive, calcareous</td>
</tr>
<tr>
<td>27'</td>
<td>Interbedded siltstone, flaggy, and sandy limestone</td>
</tr>
<tr>
<td>6'</td>
<td>Limestone, massive, dark grey, oolitic, with intraclasts</td>
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<tr>
<td>40'</td>
<td>Limestone, pale grey, sandy, flaggy, with interbedded calcareous sandstone and siltstone</td>
</tr>
<tr>
<td>23'</td>
<td>Limestone, thinly bedded, oolitic, with intraclasts. Thin flaggy dolomite interbeds</td>
</tr>
<tr>
<td>16'</td>
<td>Limestone, medium bedded, sandy, with intraclasts</td>
</tr>
<tr>
<td>9'</td>
<td>Limestone, pale grey, massive, sandy, with irregular stylolites, and interbeds fine calcareous sandstone</td>
</tr>
<tr>
<td>24'</td>
<td>Sandstone, calcareous, massive, buff, very fine grained</td>
</tr>
<tr>
<td>18'</td>
<td>Sandstone, calcareous, buff-weathered, flaggy. (Base of the lowest limestone)</td>
</tr>
<tr>
<td>1198'</td>
<td>Shale, pale green, with interbeds siltstone, medium bedded. Minor purplish-grey shales</td>
</tr>
<tr>
<td>Wundowie Limestone: Upper Member:</td>
<td>Dolomite, buff, crystalline</td>
</tr>
<tr>
<td>12'</td>
<td>Dolomite, buff, crystalline</td>
</tr>
<tr>
<td>76'</td>
<td>Shale, reddish, poorly outcropping</td>
</tr>
</tbody>
</table>
Wundowie Limestone: Middle Member:
61' Dolomite, buff, medium-bedded
236' Shale, reddish-brown at top, grading to greenish-grey at base
Wundowie Limestone: Lower Member:
61' Dolomite, pink, irregularly wavy bedded, grading down into
stratatoletic bed of sloping pseudocolumns
28' Dolomite, buff, sandy, medium-beded. In part pebbly
Amberoona Formation:
418' Siltstone and shale, greenish-grey, poorly outcropping at base
Balcanoona Formation: (thickness not measured accurately)
1500' Dolomite, pure, pink to buff at top
approx. Interbeds dolomite, buff, irregularly wavy-laminated, rarely with
preserved pseudocolumns
Dolomite, buff to brown, sandy, with a few interbeds calcareous
shale

12. Section of part of the Umberatana Group, Roebuck Bore

Wilpena Group:
Ulupa Siltstone equivalent: (not measured)
Shale, greenish weathering
Nuccaleena Formation:
23' Dolomite, buff, flaggy, with limonite pseudomorphs after pyrite
Umberatana Group:
Elatina Formation:
75' Sandstone, pale brown, massive, in part gritty, felspathic, in
part quartzitic
Enorama Formation:
450' Shale, green-grey, poorly outcropping at top; grading to
purplish-grey at the base
Wundowie Limestone: Upper Member:
6' Limestone, pale grey, irregularly wavy-laminated
3' Limestone, flat-pebble breccia
10' Shale, greenish-grey, very fissile
16' Shale, reddish-brown, very fissile
Wundowie Limestone: Middle Member:
10' Limestone, pink-grey, irregularly wavy-laminated
4' Limestone, pale grey, sandy
2' Limestone, contiguous low-domed bioherms, Linella mungallina
143' Shale, greenish-grey, silty, with calcareous siltstone interbeds
Wundowie Limestone: Lower Member:
11' Limestone, pale grey, massive, with irregularly wavy stroma-
tolites
20' As above, but with distinct pseudocolumns
11' Limestone, gritty, cross-bedded, with intraclasts. Channel
cross-beds
48' Limestone, thinly bedded, with disrupted laminae
Amberoona Formation:
411' Shale, olive-green
Balcanoona Formation:
9' Limestone, pale grey, with intraclasts
9' Limestone or dolomite, red, crystalline
Limestone, pale grey, with intraclasts

Shale, green

Limestone, grey-buff, irregularly, finely laminated

Limestone, grey-buff, with laterally linked and small bulbous stromatolites

Limestone, sandy, massive and thinly bedded

Dolomite, buff, crystalline, fine sandy

Limestone, blue-grey, thinly, in part wavy-laminated, with micro-unconformities. Top 6' dolomitized

Limestone, blue-grey, with irregularly wavy-laminated stromatolites

Limestone, brown, silty, flaggy, with interbedded shale

Yankandina Formation:

Siltstone, brown weathering, calcareous, thinly laminated

Dolomite, poorly laminated, yellow weathering

Siltstone, brown weathering, calcareous, thinly laminated

Interbedded limestone, sandy, massive, and limestone, wavy-bedded

Shale and siltstone, calcareous, with laterally linked stromatolitic limestone interbeds

(Section discontinued)

13. Section of part of the Umberatana Group, near Teetree O.S.

Umberatana Group:
Angepena Formation: (not measured)

Shale, dark purplish-brown, with thin interbeds siltstone

Wundowie Limestone: Upper Member:

Dolomite, buff, finely crystalline, sandy, with relict ooids, intraclasts

Angepena Formation:

Shale, chocolate to purple (Section may be disturbed by faulting)

Wundowie Limestone: Middle Member:

Limestone, pale brownish-grey, with irregular, wavy stromatolites

Angepena Formation:

Shale, greenish-grey, poorly laminated, grading to reddish at base. 2" interbeds of calcareous siltstone

Wundowie Limestone: Lower Member:

Limestone, pale grey, with Tungusia etina, including parallel-branching columns. Bioherms overlies and interfinger with sandy and oolitic limestone

Limestone, oolitic, with intraclasts

Amberona Formation: (not measured)

Shale, greenish-grey

14. Section of part of the Umberatana Group, 4\frac{1}{2} miles west of Angepena

Wilpeena Group:

Purple micaceous shale

Umberatana Group:

Flatina Formation:

Sandstone, flaggy, soft, gritty

Quartzite, medium-bedded, medium-grained, arkosic
Greywacke, purplish-grey, gritty, with angular rock fragments up to 2 cm

Sandstone, purplish-grey, silty, with rounded red granules

(Possible erosional contact)

Enorema Formation:

Siltstone, calcareous, purplish grey

Slate, greenish-grey, laminated

Shale, greenish-grey, laminated

Poor outcrop; some purple shale exposed

Shale, purple-grey

Wundowie Limestone: Upper Member:

Limestone, grey-brown, cleaved

(Quartz-calcite vein)

Shale, purplish-grey

Wundowie Limestone: Middle Member:

Limestone, pale grey, irregularly laminated

Limestone, sandy, gritty, flaggy

Limestone, pale brown-grey, with chloritic partings

Shale, pale blue-grey

Wundowie Limestone: Lower Member:

Limestone, pink-grey, finely crystalline, cleaved

Limestone, sandy

Angepena Formation:

Shale, greenish-grey, with minor calcareous interbeds

Shale, purplish-grey, laminated

Shale, brown, dolomite

Poor outcrop: dolomite, brecciated, gossanous

Shale, buff weathered

Balcanoona Formation:

Dolomite, ferruginous

No outcrop

Dolomite, buff, silicified and ferruginous

Dolomite, pale buff, laminated, finely crystalline. Small-scale slump structures in lower part

Dolomite, buff, massive, crystalline

Dolomite, buff, massive. Stromatolite bioclast of indeterminate boundaries, poorly preserved

Dolomite, buff, massive

Yankalinni Formation: (not measured)

Siltstone, grey, calcareous, deeply weathered

Dolomite Group:

Nucreena Formation: (not measured)

Dolomite, pink, flaggy

Umberatana Group:

Flatina Formation:

Sandstone, coarse, partly gritty, arkosic, medium-bedded

Siltstone, grey-green, massive, partly gritty

Trezona Formation:

Shale, grey-green

15. Section of part of the Umberatana Group, Maynards Well
Shale and siltstone, grey-green, with three 1' bands of limestone mud-flake breccia, pink-grey
26' Siltstone, green, with limonite pseudomorphs after pyrite
2' Limestone mud-flake breccia

Enorema Formation:
34' Siltstone, calcareous, grey, flaggy to massive
1788' Siltstone, greenish-grey, flaggy, with occasional interference ripples near top

Wundowie Limestone: Upper Member:
3' Limestone, pale grey, massive, crystalline, irregularly wavy bedded
4' Dolomite, buff, irregularly wavy bedded; contiguous bioherms
35' Poor outcrop
Wundowie Limestone: (Middle and Lower Members not differentiated)
153' Limestone, pale grey, wavy bedded, with shale interbeds poorly exposed

Ambereena Formation:
85' Siltstone and shale, green-grey
Balcanoona Formation:
24' Limestone, pale grey, irregularly wavy bedded
25' Limestone, grey, flaggy, flat-laminated
37' Limestone, massive, irregularly wavy-laminated
45' Limestone, massive, dark grey, oolitic, with fine intraclasts
44' Limestone, dark grey, irregularly wavy-laminated, with inter-bedded small cumulate and laterally linked stromatolites

Yankaninna Formation: (not measured)
Limestone, pale grey, silty, and calcareous siltstone. Current ripples of 5" wavelength

16. Section of part of the Umberatana Group, near Wundowie Bore

Wilpena Group:

Nuccaleana Formation:
42' Dolomite, pink, flaggy, with purple shale interbeds at the top

Umberatana Group:

Flatina Formation:
17' Grit, pink, calcareous, and fine muddy conglomerate
13' Sandstone, purple-grey, gritty, with trough cross-bedding
4' Sandstone, purple, massive, fine grained, passing laterally into calcareous grits

39' Siltstone, purple-grey, flaggy
2' Sandstone, calcareous, gritty, lensing out to the west (may be filling an erosional channel)

Trezona Formation:
3' Limestone, pink, mud-flake breccia
2' Siltstone, green, calcareous, with mud-flake breccia limestone at base
61' Shale, silty, green-grey, laminated
21' Limestone, pink, mud-flake breccia limestone interbeds in green shale
85' Shale, grey-green, silty, with several 1' interbeds of stromatolitic or mud-flake breccia limestone
1000' Enorama Formation:
Shales, greenish-grey, with minor siltstone interbeds, grading to purplish-grey at the base.
Wundowie Limestone: Upper Member:
21' Limestone, pale grey, stromatolitic, irregularly wavy-laminated, with numerous concordant stylolites. Domed biostrome
39' Shale, purplish-grey
Wundowie Limestone: Middle Member:
13' Limestone, stromatolitic, irregularly wavy-laminated. Domed biostrome. In part sandy
110' Shale, greenish-grey, partly calcareous
Wundowie Limestone: Lower Member:
14' Limestone, irregularly wavy-laminated
8' Limestone, stromatolitic, with long straight columns (possibly altered Linella munyallina). Domed biostrome
Amberguna Formation:
538' Siltstone, blue-grey, poorly outcropping
Balcanoona Formation:
47' Limestone, dark grey, with wavy stylolites
32' Limestone, dark grey, massive, in part stromatolitic
Dolomite, buff, massive
(section continued 2 miles to the west on Patsy Springs-Wundowie Bore Road)
66' Shale, purple-grey
77' Limestone, dark grey, oolitic, with intraclasts, with large-scale cross-cutting dolomitization
67' Limestone, massive, oolitic, with wavy-laminated stromatolite interbeds
82' Limestone, oolitic, massive
191' Dolomite, buff to pale grey, massive. No internal structures preserved. Locally brecciated and veined
194' Dolomite marble, coarsely crystalline
134' Dolomite, pale grey, massive
Dolomite, pale grey, massive, in part with broad wavy lamination
(section not measured below this point, but massive dolomites extend down for at least 800')

17. Section of part of the Umberatana Group, Burr Well

Enorama Formation: (not measured)
Siltstone, flaggy, laminated, partly oscillation ripple-marked, greenish to purplish-grey, grading down into shale
Wundowie Limestone: Upper Member:
9' Limestone, consisting of 6' spherical bioherms, contiguous, of Jurusania burraneig, capped by domed biostrome, same stromatolite
326' Shale, silty, grey-green
Wundowie Limestone: Middle Member:
5' Limestone, stromatolitic, flat-laminated to cumulate at base, and Inzeria cf. tjomus above a stylolitic zone. Capped by sandy limestone
Siltstone and shale, flaggy, calcareous, minor interbeds limestone, flaggy. Sandy limestones in channel fills at base.

**Windowie Limestone: Lower Member:**

Limestone, gritty, massive

Shale, silty and calcareous, containing both contiguous and isolated bioclasts of *Linella mnnysalina*

Shale, calcareous, with interbeds flaggy limestone

Limestone, sandy, with thin interbeds of calcareous siltstone

**Amberconwa Formation:**

Shale, greenish-grey, laminated

*Balcanacona Formation:*

Limestone, silty, banded

Limestone, dark grey, thinly laminated

Limestone, medium-bedded, oolitic, with fine intraclasts

Limestone,stromatolitic, laterally linked

Limestone, dark grey, oolitic

Limestone, dark grey, stromatolitic, probably *Linella ukka*

Limestone, massive, oolitic, patchily dolomitised

Limestone, dark grey, with *Linella ukka*

Limestone, dark grey, oolitic, with rounded intraclasts

Limestone, silty, banded

Shale, green-grey, silty

Limestone, silty, banded

Limestone,stromatolitic, with *Linella ukka*

Shale, green-grey

Limestone, with *Linella ukka*

Limestone, massive, dark grey, with rounded intraclasts

Shale, green-grey, calcareous

Limestone, with *Linella ukka*, bridged at the top

Shale, green-grey, calcareous, with thin interbeds silty limestone. Limestone, dark grey, thick-bedded, banded, silty. Extensively dolomitised along strike.

Section of the Balcanacona Formation, approximately 100 yds to the east

**Amberconwa Formation:**

**Balcanacona Formation:**

Limestone, blue-grey, oolitic

Siltstone, blue-grey, oolitic and with rounded intraclasts

Limestone, buff-grey, massive. Largely replaced by dolomite

Limestone, buff-grey, massive, coarsely oolitic, sandy

Dolomite, buff, massive, finely crystalline

Limestone, blue-grey, oolitic

Limestone, dark grey, oolitic, with silty, cross-bedded interbeds. Numerous beds with dolomitic intraclasts

Dolomite, pink, medium to thick-bedded, with interbeds silty or gritty, cross-bedded

Dolomite, pink, thinly laminated, cross-bedded

Dolomite, pink, massive, with sandy and silty bands

Dolomite, pink, massive to medium-bedded

Dolomite, buff, massive
Limestone, with irregularly columnar stromatolites, interspaces dolomitized

Limestone, dark grey, partly dolomitized, with irregular stromatolites, and well-beded fine, flat-pebble breccia beds

Yankanka Formation: (not measured)
Limestone, flaggy, silty, grading down into calcareous siltstone

150'. Limestone, with irregularly columnar stromatolites, interspaces dolomitized

97'. Limestone, dark grey, partly dolomitized, with irregular stromatolites, and well-beded fine, flat-pebble breccia beds

Yankanka Formation: (not measured)
Limestone, flaggy, silty, grading down into calcareous siltstone

18. Section of the Wundowie Limestone, 1 mile south of the Arkaroola Airstrip

Angapene Formation:
Shale, reddish-brown

Wundowie Limestone: Upper Member:
6'. Limestone, with irregularly wavy laterally linked stromatolites
8'. Limestone, with bioherms of variable size, Linella munyailla, overlying flat-pebble breccia

Wundowie Limestone: Lower Member:
4'. Limestone, sandy, irregularly laminated
56'. Shale, chocolate, with 2' interbeds limestone, flaggy, silty, grey

Wundowie Limestone: Middle Member:
19'. Limestone, pale grey, stromatolitic, mainly laterally linked, but with minor columnar intercalations
110'. Shale, purplish-grey, calcareous, with interbeds siltstone, grey, flaggy

19. Section of part of the Umberatana Group, near Myrtle Springs

Umberatana Group:

Trezona Formation:
Shale, purple
17'. Limestone, pink, stromatolitic, highly cleaved, recrystallized
305'. Slate, purple, weathered
29'. Limestone, pink, partly stromatolitic and partly mud-flake breccia, cleaved

Enorama Formation:
764'. Slate, grey, calcareous, laminated

Wundowie Limestone: Upper Member:
20'. Limestone, pale grey, sandy
32'. No outcrop

Wundowie Limestone: Middle Member:
28'. Limestone, dark grey, stromatolitic
12'. Limestone, gritty, felspathic, containing 5 m bioherms of Linella munyailla
7'. Limestone, gritty
7'. Smaller bioherms Linella munyailla
11'. Limestone, pale pink-grey, with wavy-laminated stromatolites
29'. Limestone, pale grey, sandy, with intraclasts
41'. Shale, poorly outcropping
Wundowie Limestone: Lower Member:
25' Shale, poorly outcropping, with thin limestone interbeds
10' Limestone, pale grey, mottled, possibly with small recrystallized
columnar stromatolites and larger, cumulate stromatolites

Amberconna Formation:
215' Shale, deeply weathered

Balcanonna Formation:
4' Limestone, irregularly wavy-laminated
12' No outcrop
34' Limestone, medium-grey, irregularly laminated, with numerous
    stylolites. Interbeds of contiguous stromatolitic bioherms,
    oolitic limestone and intraclast limestone
4' Limestone, pale grey, sandy, massive
23' Limestone, medium grey, irregularly mottled, with some irregular
    stromatolites
43' Limestone, silty, massive, thinly banded, in part slightly cross-
    bedded

Yankanginna Formation:
97' Siltstone, calcareous, thinly laminated, with interbeds silty
    limestone
33' Siltstone, thinly laminated, calcareous, with thin interbeds
    limestone, dark grey, stromatolitic and partly with curled
    intraclasts
53' No outcrop
7' Limestone, dark grey, with small cumulate stromatolites
23' Limestone, medium grey, laminated, with flaggy, silty interbeds
24' Limestone, dark grey, intraformational breccia

Tapley Hill Formation:
Siltstone, dark grey, very thinly laminated
| TABLE VI |

### PRECAMBRIAN STRATIGRAPHY — ADELAIDE GEOSYNCLINE |

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<th>ADELAIDE REGION</th>
<th>NORTH YORK PEN</th>
<th>MID — NORTH</th>
<th>SOUTH FLINDERS</th>
<th>CENTRAL FLINDERS</th>
<th>NORTHERN FLINDERS</th>
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</thead>
<tbody>
<tr>
<td>WHITE QUARTZITE</td>
<td></td>
<td></td>
<td>POUND QUARTZITE</td>
<td>POUND QUARTZITE</td>
<td>POUND QUARTZITE</td>
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<tr>
<td></td>
<td>BARUNGA SS</td>
<td></td>
<td>WONOKA FM</td>
<td>WONOKA FM</td>
<td>WONOKA FM</td>
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<tr>
<td>RED SILTSTONE 2.</td>
<td>RED SILTSTONE</td>
<td>&quot;SEACLIFF SS&quot;</td>
<td>A.B.C. RANGE QTE</td>
<td>A.B.C. RANGE QTE</td>
<td>A.B.C. RANGE QTE</td>
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<td>SEALIFE SS 3.</td>
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<td>ULUPA SILTSTONE</td>
<td>NUCCALEEINA FM</td>
<td>NUCCALEENA FM</td>
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<td>TAPLEY HILL FM</td>
<td>TAPLEY HILL FM</td>
<td>TAPLEY HILL FM</td>
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<tr>
<td>REYNELLA SILTSTONE 4.</td>
<td>&quot;REYNELLA SILTSTONE&quot;</td>
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<td>GRAMUSQTE</td>
<td>ENORAMA FM</td>
<td>BALPARANA SS</td>
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<td>GREEN SILTSTONE 5.</td>
<td>GREEN SILTSTONE</td>
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<td>GUMBOWE ARKOS</td>
<td>TAPLEY HILL FM</td>
<td>MT CURTIS TILTIE</td>
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<tr>
<td>PURPLE SHALE AND SS 8, 9, 10.</td>
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<td>TARCOWIE SILTSTONE</td>
<td>ENORAMA FM</td>
<td>FORTRESS HILL FM</td>
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<tr>
<td>BRIGHTON LS 11.</td>
<td></td>
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<td>PEKINA FM</td>
<td>WOOLSEY DELOMITE</td>
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<td>TAPLEY HILL FM 12.</td>
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<td>BRIGTON LS&quot;</td>
<td>RYELINA FM</td>
<td>MOUNTS FARM DOL</td>
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<td>STURT TILLITE 13.</td>
<td>? TILLITE ?</td>
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<td>APPILA TILLITE</td>
<td>WOOLSEY DELOMITE</td>
<td>BALLAINOO DOL</td>
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<td>BELAIR SUBGROUP 14.</td>
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<td>YUDNAMUTANASUBGROUP</td>
<td>WOOLSEY DELOMITE</td>
<td>YANKANINNA DOL</td>
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<td>YUDNAMUTANASUBGROUP</td>
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<td>BEAUMONT DOL 16.</td>
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<td>RHYNIE SS</td>
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<td>MONTACUT DOL 20.</td>
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<td>ARLDA SS 24.</td>
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Table IX: Slightly modified from Walter (1970, Table 6)

The time ranges of stromatolites in the USSR. The non-branching columnar groups Colonnella and Conophyton are placed first, then the branching conophyton-like group Jacutophyton, followed by columnar branching and then non-columnar stromatolites. The widths of the columns in the table representing the Early, Middle and Late Riphean, Vendian and Cambrian are proportional to the time spans of these units; this is not so for the smaller subdivisions of the Middle and Late Riphean and Vendian, which are not yet widely accepted. A time range is represented by a dotted line (......) if it is not known precisely relative to these subdivisions. Doubts expressed in the Russian literature about the time ranges are marked with queries (?). Taxa of doubtful validity are indicated by quotation marks ("), while a query (?) indicates doubt about the classification of a taxon. The limits of the time ranges are not precise.

+ Komar & Semikhatov (1969) do not show B. lacera extending into the Late Riphean

* Komar & Semikhatov (1969) do not show B. prima in the early Middle Riphean

** Raaben (1969a) places K. karatavica in the younger subdivision of the Late Riphean, although Krylov (1963) had placed it in the older Late Riphean
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<th>Cambrian</th>
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<td>Irregularia ff.</td>
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TABLE X

Correlation of South Australian stromatolite-bearing sequences with those established in the USSR. Note that the vertical dimension is not drawn to scale (neither with respect to time nor thickness of sediments).

\( \bigtriangleup \bigtriangleup \bigtriangleup \) are the symbols for tillites

\( \cdots \cdots \cdots \) indicates correlations based on stromatolite assemblages

\( \ldots \ldots \ldots \ldots \) indicates an unconformity
<table>
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<tr>
<th>Rock Unit</th>
<th>Stromatolites</th>
<th>Correlation with USSR</th>
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<td><strong>EARLY ADELAIDEAN</strong></td>
<td></td>
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</tr>
<tr>
<td>Skillogalee Dolomite</td>
<td><em>Baicalia burra</em></td>
<td><strong>LATE RIPHEAN</strong></td>
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<tr>
<td></td>
<td><em>Tungussia wilkatanna</em></td>
<td><strong>Minyar Complex</strong></td>
</tr>
<tr>
<td><strong>UPPER CALLANNA BEDS</strong></td>
<td></td>
<td><strong>760 to 680 m.y.</strong></td>
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<tr>
<td><strong>LOWER CALLANNA BEDS</strong></td>
<td><em>Conophyton garganicum</em></td>
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<tr>
<td><strong>LATE ADELAIDEAN</strong></td>
<td></td>
<td><strong>950 ± 50 m.y.</strong></td>
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<td><strong>BURRA GROUP</strong></td>
<td><em>Acaciella f. indet.</em></td>
<td><strong>LATE RIPHEAN</strong></td>
</tr>
<tr>
<td></td>
<td><em>Gymnosolan ramsayi</em></td>
<td><strong>Minyar Complex</strong></td>
</tr>
<tr>
<td><strong>UMBERATANA GROUP</strong></td>
<td><em>Kulparia kulparensis</em></td>
<td><strong>LATE RIPHEAN</strong></td>
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<tr>
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<td><em>Jurusanian burresssis</em></td>
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<td><em>Inzoria cf. tjomusi</em></td>
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<td><em>Linella mungallina</em></td>
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<td><em>Omechtenia utscherica</em></td>
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<td><em>Ediacara fauna</em></td>
<td><strong>CAMORIAN</strong></td>
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<td>(Stromatolites not yet identified)</td>
<td><strong>570 ± 10 m.y.</strong></td>
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<td><strong>HAWKER GROUP</strong></td>
<td><em>Acaciella angapeona</em></td>
<td><strong>VENDIAN</strong></td>
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<td></td>
<td><strong>680 ± 20 m.y.</strong></td>
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Table XI

The environments of growth of the better known South Australian stromatolites. The first five columns are based on direct observations in the field and in the laboratory; the other six are interpretative.
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<tr>
<th>STROMATOLITE FORM</th>
<th>WAVE OF OCCURRENCE</th>
<th>RELIEF OF CLIFFS</th>
<th>RELIEF OF BEDROCK</th>
<th>DIATOMS AND EROSION</th>
<th>TERRAIN</th>
<th>CURRENT OR WATER ENERGY</th>
<th>DEPTH ZONE</th>
<th>SALINITY</th>
<th>CONDITIONS OF OXIDATION</th>
<th>PALAEOGRAPHIC SETTING</th>
<th>TRANSgressive OR REGRESSIVE</th>
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<td>Agglutinated</td>
<td>Extensive</td>
<td>0.5 to no more than 5 cm</td>
<td>0 to 2 m</td>
<td>Very rare</td>
<td>A little silty sand in the interspaces</td>
<td>Very high, but reduced within biostromes</td>
<td>Inter tidal to shallow subtidal</td>
<td>Probably normal oxidizing</td>
<td>Littoral, exposed to the open sea</td>
<td>Slowly regressive</td>
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<tr>
<td>Agglutinated</td>
<td>Domed and tabular biostromes</td>
<td>0.5 to no more than 5 cm</td>
<td>0 to 1 m</td>
<td>Very rare</td>
<td>Very variable, low to high</td>
<td>Variable, low to moderate</td>
<td>Not known</td>
<td>Probably normal</td>
<td>Probably slightly reducing</td>
<td>Not known</td>
<td>Possibly transgressive</td>
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<tr>
<td>Biostromes,</td>
<td>Small domed biostromes</td>
<td>Up to 20 cm</td>
<td>At least 10 cm</td>
<td>A little silty sand in the interspaces</td>
<td>Very little</td>
<td>Low, to very high, even within biostromes</td>
<td>May be less than 1 m</td>
<td>May reach hyper-salinity</td>
<td>Variables: oxidizing to reducing</td>
<td>Sheltered lagoons or headlands exposed to wave action</td>
<td>Not known</td>
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<td>Domed biostromes</td>
<td>More than 2 to 3 cm</td>
<td>Possibly more than 2 m</td>
<td>Very rare</td>
<td>Negligible</td>
<td>Low, at least within biostromes</td>
<td>Not known</td>
<td>Possibly elevated</td>
<td>Probably strongly oxidizing</td>
<td>Possibly a sheltered littoral position</td>
<td>Possibly regressive</td>
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<td>Very thick biostromes</td>
<td>More than 10 cm in the conical portion</td>
<td>Not known</td>
<td>Race</td>
<td>Negligible</td>
<td>Possibly low</td>
<td>Not known</td>
<td>Possibly elevated</td>
<td>Uncertain: may be slightly reducing</td>
<td>Not known</td>
<td>Not known</td>
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<tr>
<td>Composita</td>
<td>Not known, possibly biostromes</td>
<td>More than 2 to 3 cm</td>
<td>Not known</td>
<td>Slight contemporaneous erosion</td>
<td>Considerable</td>
<td>Low to moderate</td>
<td>Not known</td>
<td>Probably normal</td>
<td>Strongly reducing</td>
<td>Possibly on shalws above a rising diapir</td>
<td>Not known</td>
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<td>Composita</td>
<td>Low domed biostromes</td>
<td>Less than 50 cm</td>
<td>Very rare</td>
<td>Considerable silts in the interspaces only</td>
<td>Very low within biostromes</td>
<td>Not known</td>
<td>Probably normal</td>
<td>Uncertain:</td>
<td>Carbonates banks in the open sea</td>
<td>Sea level fluctuating with diapirism</td>
<td></td>
</tr>
<tr>
<td>Concretion</td>
<td>Domed biostromes</td>
<td>0.5 to no more than 5 cm</td>
<td>Possibly up to 2 m</td>
<td>Rare</td>
<td>Considerable in the interspaces</td>
<td>Very high, but reduced within biostromes</td>
<td>Inter tidal to shallow subtidal</td>
<td>Probably normal oxidizing</td>
<td>Littoral, exposed to the open sea</td>
<td>Slowly regressive</td>
<td></td>
</tr>
<tr>
<td>Concretion</td>
<td>Extensive biostromes</td>
<td>0.5 to no more than 5 cm</td>
<td>Not known</td>
<td>Rare</td>
<td>Extremely variable</td>
<td>Low to moderate within biostromes</td>
<td>Possibly upper intertidal</td>
<td>Either elevated or normal</td>
<td>Strongly oxidizing</td>
<td>Littoral, in a carbonate bank in the open sea</td>
<td>Probably regressive</td>
</tr>
<tr>
<td>Concretion</td>
<td>Juxtaposed spherical biostromes</td>
<td>More than 2 to 3 cm</td>
<td>Very rare</td>
<td>Water sand in interspaces</td>
<td>Low within biostromes</td>
<td>Not known, possibly more than 2 m</td>
<td>Probably normal</td>
<td>Probably oxidizing</td>
<td>Strong oxidizing</td>
<td>Sea level fluctuating with diapirism</td>
<td></td>
</tr>
<tr>
<td>Concretion</td>
<td>Biostromes</td>
<td>More than 2 to 3 cm</td>
<td>Up to 1 m</td>
<td>Very rare</td>
<td>Sand present in columns, abundant in interspaces</td>
<td>High even within biostromes</td>
<td>Upper intertidal</td>
<td>Probably elevated</td>
<td>Strongly oxidizing</td>
<td>Littoral, exposed to the open sea</td>
<td>Regressive</td>
</tr>
<tr>
<td>Solaria</td>
<td>Domed bed, possibly biostromes</td>
<td>Commonly 1 to 2 cm</td>
<td>Not known</td>
<td>Penetcontemporaneous sand dykes</td>
<td>Coarse sand very abundant</td>
<td>Very high, even within the strata nomic bed</td>
<td>Intertidal to subtidal</td>
<td>Probably normal</td>
<td>Possibly slightly reducing</td>
<td>Possibly life - scrambling to the open sea</td>
<td>Not known</td>
</tr>
<tr>
<td>Linella spp.</td>
<td>Gently domed biostromes</td>
<td>More than 2 to 3 cm</td>
<td>0 to 50 cm</td>
<td>Very rare</td>
<td>Negligible</td>
<td>High even within biostromes</td>
<td>Intertidal to subtidal</td>
<td>Probably normal</td>
<td>Probably slightly reducing</td>
<td>Possibly life - scrambling to the open sea</td>
<td>Not known</td>
</tr>
<tr>
<td>Linella spp.</td>
<td>Juxtaposed domed biostromes</td>
<td>More than 2 to 3 cm</td>
<td>0 to 2 cm</td>
<td>Rare</td>
<td>Sand content extremely variable</td>
<td>Variable, from low to moderate</td>
<td>Intertidal to subtidal</td>
<td>Probably normal</td>
<td>Variables: oxidizing to reducing</td>
<td>Carbonate banks in the open sea</td>
<td>Sea level fluctuating with diapirism</td>
</tr>
<tr>
<td>Murchisonia</td>
<td>Small domed biostromes</td>
<td>Commonly 1 to 2 cm</td>
<td>10 to 20 cm</td>
<td>Envelope of slits prior to stromatolite growth</td>
<td>Very little</td>
<td>Low to moderate</td>
<td>Low intertidal to shallow subtidal</td>
<td>Probably normal</td>
<td>Probably slightly reducing</td>
<td>Littoral, exposed to the open sea</td>
<td>Regressive</td>
</tr>
<tr>
<td>Tunicaria</td>
<td>tongues biostromes</td>
<td>More than 2 to 3 cm</td>
<td>0 to 50 cm</td>
<td>Slight contemporaneous erosion of laminae</td>
<td>Very variable, low to very high</td>
<td>Intertidal to shallow subtidal</td>
<td>Probably normal</td>
<td>Variables: oxidizing to slightly reducing</td>
<td>Carbonates banks in the open sea</td>
<td>Sea level fluctuating with diapirism</td>
<td></td>
</tr>
<tr>
<td>Tunicaria</td>
<td>biostromes</td>
<td>More than 2 to 3 cm</td>
<td>Low or moderate</td>
<td>Very little</td>
<td>Terrigenous elastics</td>
<td>Low energy</td>
<td>Possibly less than 1 m</td>
<td>Possibly elevated</td>
<td>Onset of erosion, possibly also reducing</td>
<td>Possibly in sheltered lagoons</td>
<td>Not known</td>
</tr>
</tbody>
</table>
Plate 1

Apachiella augusta: Brighton Limestone, Depot Creek. Vertical sections showing mode of occurrence.

(a) Margin of a bioherm (pale coloured at right of photograph) intertonguing laterally with massive-bedded cosparite (at left).

(b) Longitudinal section of a bioherm, showing the passage from basal flat-laminated stromatolite through broad columns into narrow upper columns.

(c) Frequently bridged narrow columns arising directly from undulatory stromatolite.

(d) Portion of a bioherm showing the intercalation of columnar and laterally linked stromatolites.

(e) Details of transition from broad, frequently bridged basal columns to upper, narrow, discrete columns. Broad columns in lower right-hand corner have inclined margins and sub-horizontal laminae.

Note: hammer is 30 cm long; marking pen is 10 cm.
Plate 2

*Acaciella augusta*: Brighton Limestone, Depot Creek. Microstructure (thin sections).

(a) Two narrow columns, linked by a bridge; illustrates the slightly wavy, discontinuous, streaky lamination. The darker laminae are green, dolomitic (S401).

(b) & (c) (S404 and S401 respectively). The gross shape and branching of columns. The interspaces are filled with interlayered micrite and intramicrite, in 0.5 to 1.0 cm bands. (c) is natural size. In (b), laminae become doubly-crested before branching, but in the centre of the photograph (c) is an example of a short interspace between crests bridged by the overlying lamina; the column resumes its former growth pattern.

(d) Recrystallized specimen from Mundallio Creek (S538), illustrating radiating recrystallized acicular textures in the lower part of the photograph.

(e) Lenticular open spaces between laminae, possibly representing original gas vesicles (S163).
Plate 3

(a) Irregular, frequently bridged columns; part of an *Acaciella augusta* bioherm. Thin section. Brighton Limestone, Depot Creek (S162).

(b) Evenly laminated ferruginous stromatolite, possibly *Acaciella angepenna*. Thin section. Lower Cambrian, near Wirrealpa. The dark laminae are outlined by finely disseminated haematite. (S564; specimen collected by Mr. P. Haslett).

(c) & (d) *Acaciella f.* indet. Both specimens are erratics from the lower tillite, north of the Enorana Diapir. Thin sections. Note the very numerous concordant stylolites in (d). (S509 and S539 respectively. S539 was collected by Dr. B. Daily).

(e) to (g) *Acaciella angepenna*: Lower Cambrian. Thin sections.

(e) Irregular columns from the margin of a small bioherm; Angepenna (S458).

(f) Pseudocolumns with rare interspaces. Note the domed laminae grown upon partly buried intraclasts, and the extremely continuous lamination; Angepenna (S462).

(g) Regular, alpha-parallel branching columns, Italouie Gorge. Lamination is very continuous but indistinct (S2, Mawson's specimen).
Plate 4

Acaciella anepena: Lower Cambrian. Sections perpendicular to bedding, showing mode of occurrence at Angepena.

(a) A bioherm of cumulate and pseudocolumnar stromatolites. Small cumuli are seen immediately to the right of and above the pen.

(b) Lateral termination of a thin bioherm; at the margin, columns remain subvertical and pass laterally into flat-laminated, mechanically deposited lime mudstone.

(c) Upper portion of an elliptical bioherm, showing irregular, frequently coalescing columns.

(d) Marginal section of a bioherm. Note that laminae are completely recurved under the bioherm edge. Specimen is in situ. In (a) to (d), the ball point pen is 16 cm long.

(e) Lateral termination of a bioherm, which sank into the soft substrate during growth. White areas are dolomitized. Width of specimen is 21 cm (S460).

(f) & (g) Etched sections of recurved margins of the bioherm in (d) (S300). Note that here growth partly proceeded downwards. Specimens collected from the outcrop shown in (d). (f) is 17 cm wide, (g) is 15 cm wide.

Specimens (e), (f) & (g) are sections cut perpendicular to bedding, and placed in their natural orientation.
Plate 5

(a) to (c) *Acaciella angelpa*; Microstructure. Thin sections.

(a) & (c) Evenly laminated, discrete columnar forms from Italowie Gorge (S44 and S4 respectively, Mawson's specimens).

(b) Vermiform microstructure, interpreted as due to algal boring, disrupting the normally very even, continuous lamination; *Angepa* (S458).

(d) to (f) *Baicalia burra*; Skillogalae Dolomite. Sections perpendicular to bedding, showing the mode of occurrence.

(d) Small lenticular bioherms interbedded in thinly bedded dolomites; Yatina.

(e) Broad pseudocolumns; West Mount Hut.

(f) Broad cumuli at base of a biostrime; West Mount Hut.

*Note*: the ball-point pen is 15 cm long; the hammer is 30 cm.
Baicalia burra: Skillogalee Dolomite. Mode of occurrence.

(a) Nearly circular transverse sections of silicified subcylindrical columns (section parallel to bedding, in situ); Dutton's Trough H.S.

(b) Portion of a biostrome interbedded in massive, fine grained dolomites; Dutton's Trough H.S.

(c) Possible Baicalia burra; Depot Creek (examined in the field only)

(d) Columns arising from flat-laminated stromatolites; West Mount Hut

(e) Columns arising from flat-laminated stromatolites; Dutton's Trough H.S.

(f) Details of the biostrome shown in (b). Longitudinal section of partially silicified columns; the section is parallel to the tectonic cleavage, in the plane of flattening of the columns

(g) Irregular columns with numerous micro-unconformities and highly variable lamina shape; West Mount Hut

Note: The hammer is 30 cm long and the marking pen in (e) is 10 cm long. In (d), the length of the pen shown in the photograph is 11 cm long.
Plate 7

Baicalia burra: Skillogalee Dolomite

(a) Longitudinal section of upward-expanding tuberous columns near the base of a biostrome; Dutton's Trough H.S.

(b) Partially silicified vertical, subcylindrical columns; Dutton's Trough H.S.

(c) Markedly tuberous columns with high-angle micro-unconformities. The laminae are distinctly, evenly banded, except where eroded. Interspaces are filled with coarse intrasparite comprising both flat dolomite pebbles and small, rounded grains. Thin section; Myrtle Springs (S489)

(d) Slightly divergent branching in regular, subcylindrical columns. Thin section; Dutton's Trough H.S. (S533). The specimen is taken from the biostrome shown in Pl.6b

(e) Branching of narrow columns from the sides of a main, wide column; Dutton's Trough H.S. (S534). The specimen is taken from the biostrome shown in Pl.6b

(f) Tuberous and inclined columns with evenly banded microstructure and high-angle micro-unconformities. Thin section; Myrtle Springs (S487)

Note: The hammer in (a) is 30 cm long, and the marking pen in (b) is 10 cm.
Plate 8

**Baicalia burra**: Skillogalee Dolomite. Thin sections.

(a) Irregular, tuberous columns with evenly banded but secondarily fractured laminae and frequent micro-unconformities. Thin section; West Mount Hut (S303)

(b) Subcylindrical columns with steeply domed, evenly banded laminae. Thin section; West Mount Hut (S302). The specimen is taken from the outcrop shown in Pl.6d

(c) *Baicalia burra* with minor pelletal laminae. Thin section; Wirrumba (S150)

(d) *Baicalia burra* with predominantly pelletal laminae. Thin section; Copley (S496)

(e)(f) Moderately divergent branching columns, with some pelletal laminae. Thin sections; Yatina (S222, holotype, and S218 respectively)

(g) Complex branching of columns from Arkaroola. Thin section (S457)

(h) Details of lamination of the specimen in (b); West Mount Hut (S302). Thin section illustrating the nature and continuity of laminae, the lenticular, spar-filled voids and the presence of detrital grains in some laminae
Plate 9

(a) Indeterminate stromatolite, possibly Baicalia burra. Thin section; River Wakefield Group, Carriston (S322)

(b) Baicalia burra. Cut slab illustrating parallel branching columns with high-angle micro-unconformities and banded lamination; Chintapanna Well (S96, specimen collected by Mr. C. R. Dalgarno). Note the overgrown stromatolite fragment in the lower left quadrant, and the branch arising from an eroded column in the upper right.

(c) Baicalia burra with finely silicified laminae. Thin section; Worumba. Natural size (S151). Note the vertical tectonic veins.

(d) to (f) Boxonia melrose: Brighton Limestone, Melrose

(d) Transverse sections of columns, as exposed on a bedding plane.

(e) Hand specimen illustrating longitudinal sections of columns.

(f) Thin section illustrating lamination and wall structure. Natural size (S177). Note: the upper left and lower left corners of the thin section are composed of highly weathered rock.
Plate 10

(a) to (c) Thin sections of *Boxonia melrose*: Brighton Limestone, Melrose (S504, S502 and the holotype, S503 respectively). The lamination is indistinctly banded, and becomes diffuse in the wall zone.

(d) to (f) *Conophyton garganicum garganicum*: Paratoo Diapir

(d) Part of a broad mound at the base of the stromatolitic bed.

(e)(f) Circular, elliptical and lanceolate transverse sections of columns, in a section apparently parallel to original bedding.
Plate 11

Conophyton garganicum garganicum: Paratoo Diapir

(a) (b) Longitudinal, axial thin sections, showing type of lamination and the crestal zone. Natural size (S214 and S532 respectively). Note that the extremely continuous bands visible in (a) & (b) are macrolaminae.

(c) Slightly oblique section of a column, with a pronounced protrusion on its side (upper right corner).

(d) Basal part of columns (without conical laminae) arising from the flat-laminated stromatolites of the underlying broad mounds.

(e) The partially silicified margins of two adjacent columns, illustrating their ragged nature.
Plate 12


(a) Details of the crestal zone, illustrating sharp lateral displacements of successive crests (S532)

(b) Details of the lamination, showing the extremely thin, continuous laminae, macrolaminae and possible detrital grains incorporated in them (S214)

(c)(d) Details of the textures of dark and light laminae (S278) & (e)

(f) Small, lenticular, spar-filled void between laminae (S277)

(g) Brecciation of the crestal zone, perhaps by compaction of lithified laminae (S277)
Plate 13

*Gymnosolen ramsayi* occurs as boulders in a conglomerate in the Tapley Hill Formation, near Wilson.

(a) Longitudinal section of regular, walled columns interpreted to be derived from a bioherm centre (S388)

(b) Part of a stromatolitic boulder. The stromatolitic columns are dark grey; the pale grey areas are inter-space sediment

(c) Longitudinal thin section of a column showing the recrystallization of the wall zone, where lamination is obliterated. Natural size (S344, specimen collected by Prof. E. L. Winterer)

(d) Inclined columns, interpreted as marginal in the bioherm from which they were derived (S387)

(e) Longitudinal thin section of vertical columns, illustrating the streaky microstructure. Natural size (S388)
Plate 14

(a) *Gymnosolen ramsayi*: broad, possibly basal columns. Thin section; boulder in conglomerate, Tapley Hill Formation, near Wilson (5387). Large patches within columns are recrystallized

(b) *Inzeria cf. tjomusi*: portion of a thin bioherm, showing the lower, wavy-laminated stromatolites separated from the upper columnar stromatolites by a stylolite (at the pencil point); Middle member of the Wundowie Limestone, Burr Well. Columns are dark grey; pale grey areas are interspace sediment

(c) *Gymnosolen ramsayi*: thin section of strongly recrystallized columns; boulder in conglomerate, near Wilson (5390). The white patches consist of sparry calcite resulting from the recrystallization of the fine, dark grey stromatolitic calcite

(d),(e) *Inzeria cf. tjomusi*: portions of bioherms; middle member of the Wundowie Limestone, Burr Well. In each case, the upper columnar zone (poorly visible in the photographs) is separated from the lower continuously laminated stromatolite by an intensely lobate stylolitic zone
Plate 15

(a), (c) *Inzeria cf. tjomusi*: middle member of the Wundowie Limestone, Burr Well.

(a) Thin section, illustrating subcylindrical columns with altered margins and interspaces, the gently convex to low-conical lamina shape, a niche-projection (column on the left) and the intensely stylolitic zone at the base of the columns (S542)

(c) Outcrop of columnar zone from which S542 was taken. Note the small niche in the column at the right

(e) Details of the niche-projection and diffusely banded lamination, thin section (S542)

(b), (d) *Inzeria conjuncta*: Brighton Limestone equivalent, Depot Creek

(b) Outcrop of part of bioherm. Owing to thick lichen cover, columns are not visible on the weathered surface, but the overall trend of the lamination is discernible

(d) Thin section illustrating narrow, upper columns with frequent bridges. Column margins are frequently stylolitic. Dark laminae are green, dolomitic (holotype, S402)

(f) Thin section, specimen collected from the eastern margin of the bioherm shown in 15(b). Columns are inclined, elongated, tuberous, and usually in contact. The dark laminae are green, dolomitic (S403)
Plate 16

(a) **Inzeria conjuncta**: lower, broad columns, thin section; Brighton Limestone, Depot Creek; (holotype, S402). Note the niche in the column margin (centre of photograph). The dark laminae are green, dolomitic.

(b) Indeterminate stromatolite: broad, frequently bridged columns; base of the Brighton Limestone, west of Mt Remarkable. Note: the marking pen is 10 cm long.

(c) **Inzeria conjuncta**: details of distinct, streaky, wavy lamination and margin structure; Brighton Limestone, Depot Creek. Thin section (holotype, S402).

(d) **Inzeria multiplex**: thin section illustrating vertical columns; Brighton Limestone, NW of Mt Remarkable. Natural size (holotype, S385). The interspaces consist of banded, fine grained dolomite with a few flat intra-clasts. The niche-projection in the lower right corner passes into a short column (see Fig.13i).
Plate 17

(a) to (d) *Inzeria multiplex*: Brighton Limestone

(a) Thin section of columns and sandy interspaces; Yednalue (5499). The column margins are frequently altered by stylolites. Note the niche-projections in the sides of columns.

(b) Longitudinal section of inclined columns in situ; NW of Mt Remarkable.

(c) Longitudinal section, cut slab (holotype S365). Note the banded interspace sediment.

(d) Details of streaky lamination and margin structure, partly obliterated by stylolites. Thin section (holotype S365); NW of Mt Remarkable.

(e) *Jurupania burrenensis*: contiguous spherical bioherms; upper member of the Wundowie Limestone, Burr Well. Note: the hammer is 30 cm long.
Plate 18

**Jurusania burrakensis**: upper member of the Wundowie Limestone, Burr Well

(a), (d) Vertical straight columns in the centre of a bioherm. In (a), note part of the bioherm core below the hammer handle.

(b) Vertical straight columns near a bioherm margin

(c) Thin section of cylindrical columns with interspaces filled with flat-pebble intramicrite; (holotype 5543)

(e) Details of the lenticular, streaky lamination and walled margin structure (5543)

(f) Base of columnar portion, arising from undulatory stromatolites; thin section (5481)

(g) Dichotomous, branching in alpha-parallel cylindrical columns; thin section (5482)

Note: in (a), (b) & (d), the hammer is 30 cm long.
Plate 19

*Katavia oostata*: upper, dolomitc member of the Brighton Limestone equivalent, Depot Creek

(a) Portion of a bioherm with downturned margins. Note that the major layering is brought out by stylolites

(b) Longitudinal section of subcylindrical, straight columns, in situ. The hammer is 30 cm long

(c) Thin section, illustrating indistinct, wavy and wrinkled lamination and the wall (S175)

(d) Transverse sections of columns resemble mud-cracked polygons. Exposure parallel to bedding, in the same outcrop as 19(b). The pen is 15 cm long
Plate 20

(a), (b) *Katavia costata*: Brighton Limestone equivalent, Depot Creek

(a) Vertical columns in the centre of a bioherm

(b) Cylindrical, narrow columns arising directly from flat-laminated stromatolites. Note: the hammer is 30 cm long

(c) to (f) *Kulpara kulparensis*: Etina Formation equivalent, near Kulpara

(c) Longitudinal section of cylindrical columns (float specimen)

(d) Complexly lobate transverse sections of columns (section in situ, parallel to bedding). Note: the pen is 15 cm long

(e) Small, irregular columns from unit A at the base of the bed; thin section (S270)

(f) A sand-dyke, post-dating the lithification of the stromatolites, cuts stromatolite columns and incorporates fragments of the wall rock; thin section (S420)
Plate 21

(a) to (d) **Kulparia kulperensis**: Etina Formation equivalent, near Kulpara

(f) Longitudinal thin sections of columns (S271, holotype S380, S380 and S419 respectively). In (d) note the late stage vein filling a fracture within the sand-dyke

(f) Details of walled margin structure and the coarse interspace sediment. Thin section

(e) & (g) **Linella ukka**: Balcanoona Formation; Burr Well

(e) Longitudinal sections of tuberous, divergent branching columns; cut slab (5477)

(g) Subhorizontal columns at a bioherm margin
Plate 22

(a) to (c) **Linella ukka**: top of the Balcanoona Formation, Burr Well

(a) Longitudinal sections of tuberous columns with pointed projections. The marking pen is 10 cm long

(b) Cut slab, illustrating longitudinal section of columns and divergent branching (S478). The large white areas patches of coarsely recrystallized calcite

(c) Longitudinal thin section (S477). Note that the laminae are largely obliterated by recrystallization

(e) Details of microstructure and the wall zone. Note the patchy recrystallization and calcite veins; thin section (S477)

(d) **Linella marnellina**: Wundowie Limestone, Roebuck Bore. Inclined columns, at margin of a small bioherm

(f) Nearly vertical section of columns, probably **Linella marnellina**, Wundowie Limestone, 2 miles east of Copley
Plate 23

(a) to (d) Linella munyallina; Wundowie Limestone

(a) Outcrop showing longitudinal sections of stylolite-bounded columns at Wundowie Bore

(b) Outcrop showing circular and lobate transverse sections of both broad and narrow columns, near Myrtle Springs

(c) Longitudinal sections of complexly branching columns; Roebuck Bore

(d) Part of a bioherm in the same bed as 23(b), near Myrtle Springs. Note the strong cleavage in the limestone bed; the curvature of the bioherm is, however, primary, not of tectonic origin

(e) Section perpendicular to bedding of interbedded wavy-laminated and columnar stromatolites, possibly Linella munyallina; Wundowie Bore

(f) Undulatory stromatolites (laminae are accentuated by concordant stylolites); north of Patsy Springs H.S., east of Copley
Plate 24

**Linella munyaallina**: Wundowie Limestone

(a) Thin section, showing stylolite-bounded columns; Wundowie Bore (S471)

(b) Thin section showing walled, parallel columns; near Myrtle Springs (S494)

(c) Recurved margin of a bioherm; lower member of the Wundowie Limestone, Burr Well. The surrounding sediment at right is laminated shale

(d) Thin section showing steeply domed laminae in parallel columns, near Myrtle Springs. Note the lenticular sandy layers in the interspaces. Thin section (S495)

(e) Inclined columns at a bioherm margin; lower member of the Wundowie Limestone, Burr Well

(f) Short columns in a thin bed; near the Arkaoola Airstrip, Munyallina Valley

(g) Inclined columns from a bioherm margin; here the wall is poorly developed; lower member of the Wundowie Limestone, Burr Well. Thin section (S486)
Plate 25

Linella munyaallina: Wundowie Limestone

(a) Thin section of stylolite-bounded columns; two miles east of Copley

(b) Thin section showing basal columns arising from flat-laminated stromatolite; NE corner of Lake Arthur; (Specimen collected by Mr. B. Murrell, S552)

(c) Thin section showing columns with numerous bridges; near the Arkaroola Airstrip, Munyallina Valley (5294). Here the wall is well developed, but largely recrystallized

(d) Thin section showing irregular, bridged columns with poorly developed wall; lower member of the Wundowie Limestone, Burr Well (5485)

(e) Thin section of irregular, coalescing columns, part of a small isolated bioherm; near the Arkaroola Airstrip, Munyallina Valley (5451). Columns are extensively altered by fracturing, stylolites and recrystallization
Plate 26

(a) *Linella mnyallina*: thin section of slightly divergent branching columns, Wundowie Limestone, Roebuck Bore (S431)

(b) *Linella mnyallina*: details of the lamination and wall structure; Wundowie Limestone, near Myrtle Springs; thin section (holotype S495)

(c) to (f) *Omatohenia utachuriga*: lower (transitional) member of the Brighton Limestone, Depot Creek

(c) A large stromatolite cumulus grown over the eroded surface of the underlying laminated silts. At the right is a small erosional channel filled with flat-pebble breccia

(d) Thin section showing columns with numerous bridges and pelletal laminae (S399). The dark laminae are dolomitic

(e) Large cumulus containing pseudocolumns. At left is a channel filled with flat-pebble breccia

(f) Thin section showing small column with pelletal laminae commencing growth over an erosional high in the underlying silts (S165). Note the truncation of the lamination in the siltstone
Plate 27

(a), (b) *Omaechtania utophurica*: Brighton Limestone, Depot Creek. Longitudinal sections of columns with numerous bridges.

(c), (e) Columnar-layered stromatolites resembling *Omaechtania*, Balcanoona Formation, Nepouie Creek, 5 miles north of Balcanoona. Unlike the Depot Creek occurrence, here laminae grade to low-conical shape.

(d), (f) Longitudinal thin sections, Depot Creek (SL66 and SL20 respectively). Pellaral laminae, present in (d), are poorly developed in (f). Note the inclined column margins and numerous bridges in (d).
Plate 28

(a) to (c) *Omacltania utschurica*: Brighton Limestone, Depot Creek

(a) Longitudinal thin section of short, frequently bridged columns (S164)

(b) Large stromatolite dome grown over siltstone. The bedding of the silts is also domed, probably by later compaction

(c) Thin section illustrating details of pelletal microstructure (S399)

(d) to (f) *Tungussia etina*: Flinders Ranges

(d) Tuberous, markedly divergent branching columns; Balcanoona Formation, east of Mt Chambers. Note the frequent tectonic veins

(e) Subparallel columns in the central part of a bioherm; Wundowie Limestone, near Teetree O.S.

(f) Poorly defined columns and undulatory stromatolites; Etina Formation, Enorama Creek
Plate 29

*Tunugusia etina*: Flinders Ranges

(a) Longitudinal outcrop section of markedly divergent, multiple branching and tuberous columns; Balcanoona Formation, east of Mt Chambers

(b) Thin section of walled columns; Wundowie Limestone, near Teetree O.S. (S446). Laminae are largely altered, but the wall is generally preserved

(c) Thin section showing details of lamination and margin structure; Balcanoona Formation, east of Mt Chambers. Thin section (SS25)

(d) Irregular, coalescing columns; Etina Formation, near Arkaba H.S. Thin section (S522). Note the numerous stylolites concordant with the stromatolitic lamination

(e) Vertical thin section showing both longitudinal and transverse sections of variously oriented columns; Balcanoona Formation, east of Mt Chambers (holotype, S435)

(f) Wavy, banded, partly inverse-graded lamination; Etina Formation, east of Blinman; thin section (S158)
Plate 30

(a) *Tuncussia etina*: cut slab showing markedly divergent, multiple branching of columns; Wundowie Limestone, near Teatree 0.5. (S441)

(b) Longitudinal thin section of tuberous, patchily walled columns; Balcanoona Formation, east of Mt Chambers (S525)

(c) to (f) *Tuncussia wiltianna*: Skillogalee Dolomite, Depot Creek

(c),(d) Markedly divergent branching tuberous columns, with frequent bridges in the upper part

(e),(f) Thin sections of gently inclined columns (S170 and S167 respectively). Note the uniformly banded microstructure, with macrolaminae. Interspaces in (f) contain stromatolitic fragments
Plate 31

(a) to (e) *Tungussia wilkattenia*: Skillogalee Dolomite, Depot Creek

(a) Right-angle bend in subhorizontal column. Thin section (S169)

(b) Thin section showing details of microstructure and wall. The darker areas are dolomitic remnants after patchy silification. Laminae are best preserved in silicified portions (holotype S412)

(c) Cut slab showing markedly divergent branching columns (S169)

(d) Multiple, markedly divergent branching columns. Thin section (holotype S412)

(e) Details of wall in silicified columns. Thin section (S176)

(f) Indeterminate stromatolite resembling *Parmites con- crescens*, Etina Formation, south of the Enorama Diapir. All the fine laminae are stylolitic. Thin section (S523)
Plate 32

Miscellaneous stromatolites

(a) Large elongate cumulate stromatolites; Trezona Formation, near Mt Chambers. The elongation trends approximately NS

(b) View of a bedding plane containing large, elongate cumulate stromatolites; Trezona Formation, Enorama Creek

(c) Thin sections of details of lamination in cumulate stromatolites; Trezona Formation, Enorama Creek, taken from the outcrop in (b). The upper thin section is parallel to the cuspatate ridges, the lower is perpendicular. Almost all laminae have concordant stylolites (S559). In the lower section, successive lamina crests are displaced in a northerly direction

(d) Subconical pseudocolumn, Woocalla Dolomite, Pernatty Lagoon; thin section (S309)

(e) Thin section of pseudocolumns with minor interspaces, filled with intramiorite; Trezona Formation, Enorama Creek. Note laminated shale above the stromatolite (S102)

(f) Wavy, banded lamination in broad pseudocolumn, with minor interspaces; Trezona Formation, Bunkers Hut, near Wirrealpa. Thin section (Geology Department collection, S254)

(g) Outcrop section of indeterminate stromatolite; base of the Balconona Formation, Burr Well

(h) Silicified pseudocolumnar stromatolites; Lower Callanna Beds, near Nilpinna, Peake and Denison Ranges. (Specimen from Department of Mines collection)
Plate 33

Miscellaneous stromatolites

(a) Low-conical laterally linked stromatolites; Lower Cambrian, north end of Lake Torrens (photo by Mr. B. Murrell)

(b) Axial longitudinal thin section of low-conical stromatolite; Lower Cambrian, north end of Lake Torrens. (Specimen collected by Mr. B. Murrell, 5546). The lamination is extremely indistinct

(c) Possible deformed stromatolites in cherty, intensely folded dolomite; Montacute Dolomite, Torrens Gorge. Natural size (5413)

(d) Circular transverse sections of pseudocolumns; Trezona Formation, Enorama Creek

(e) Thin section of indeterminate stromatolites with irregular, stylolite-bounded columns and dolomitized interspaces; from outcrop in Pl.32(g), base of Balcanoona Formation, Burr Well (5274)
Plate 34

(a) to (e) Upward-concave structures in the upper (dolomite) member of the Brighton Limestone

(a), (b) & (c) Interlayered intramicrite breccia and laminated dolomites, contorted by lateral compression into upward-concave structures with sharp crests across which laminae are often continuous; Depot Creek.  
(a) and (c) are thin sections

(d), (e) Upward-concave structures in the upper (dolomite) member of the Brighton Limestone, near Hallett Cove, south of Adelaide.  
Note the erosion of a crest prior to deposition of the next layer in (e), centre of photograph

(f) Indeterminate columnar stromatolites, poorly preserved after dolomitization; Balcanoona Formation, 4 miles west of Angepena
Plate 35

(a) Transverse section of upward-concave structure; upper (dolomite) member of the Brighton Limestone, near Hallett Cove, south of Adelaide

(b) Small cumulate stromatolite surrounded by magnesite conglomerate, the intraclasts of which are large and often curled, suggestive of very little transport; Skillogalee Dolomite, Depot Creek

(c) Transverse sections of indeterminate stromatolites resembling Parmites concrescens; Etina Formation, south of the Enoroma Diapir

(d) Longitudinal section of stromatolite bed; as for (c)

(e) Indeterminate stromatolite with rectangular, pelletal laminae; Balcanoona Formation, Nepouie Creek, 5 miles north of Balcanoona. Thin section (S289)

(f) Poorly preserved, dolomitized stromatolite; Balcanoona Formation, from the outcrop shown in Pl.34(g), 4 miles west of Angepena (S467)
(a) Upward-concave structures analogous to those of the Brighton Limestone; Skilligalas Dolomite, Weekeroo

(b) Thin section of dolomitized oosparite, with secondary solution forming voids. Note the dismembered dolomitized ooid rims, and the later infilling of sparry, twinned calcite; Brighton Limestone, Reynella, south of Adelaide

(c) Isolated ripple marks of coarser silt in thinly laminated siltstones; Tapley Hill Formation, Tapley Hill, south of Adelaide. Note that the appearance of the relief of the ripples in the lower half of the photograph is partly accentuated by compaction, and partly by bleaching due to weathering

(d) Thin section of oosparite; Brighton Limestone, Depot Creek. Note the small "blisters" under the outer lamina, which may indicate either that the outer lamina was a cohesive algal film, or that a small detrital grain was incorporated into the oolitic lamination

(e) Thin section of oosparite; Brighton Limestone, Depot Creek. Note the compound ooids and the authigenic feldspar grown in the outer lamina (immediately below the photograph centre)

(f) Intramicrite filling channels associated with bioherms of Omachtenia utschurica; Brighton Limestone, Depot Creek. Many flat pebbles are dissolved out and replaced by sparite, quartz, or a green, chloritic mineral (appearing black in the photograph)
Plate 37

(a) Probable solution vughs, lined with drusy dolomite and filled with equidimensional, mosaic quartz; near the base of the Skillogalee Dolomite, Depot Creek. Thin section

(b) Void spaces in dolomitized oosparite; Brighton Limestone, Depot Creek; thin section. Note the fine rims of drusy cement

(c) Oosparite affected by late diagenetic or epigenetic dolomitization; at left is the original limestone, at right is dolomite, and the contact is marked by a dolomite vein. Thin section

(d) Cross-bedded oosparites; Brighton Limestone, Onkaparinga Gorge, south of Adelaide. Note the frequent reversals of current directions

(e) Internal sediment (micrite) filling a hollow mud curl (probably a disrupted thin algal mat), since replaced by coarse, twinned sparite. "Hieroglyphic" limestone; Trezona Formation, Enorama Creek

(f) Oosparite with some ooids replaced by sparite. The ooid in the centre was subject to erosion before deposition, but has excellently preserved lamination; from massive oolitic limestone, Brighton Limestone equivalent, Yednalue

(g) Oosparite with large, coated oomicrite intraclasts resembling botryoidal lumps; oolitic-intraclastic facies, Brighton Limestone, Depot Creek
Fig. 1A. Inset. Geographic Location of the Adelaide Geosyncline in Australia.
Fig. 2. Geological Setting of the Adelaide Geosyncline
Fig. 3. Structure and Metamorphism of the Adelaide Geosyncline

1. Unmetamorphosed, little deformed Late Precambrian to Cambrian cover rocks
2. Mildly folded Late Precambrian to Cambrian cover rocks; chlorite grade
3. Moderately folded Late Precambrian to Cambrian cover rocks; biotite grade
4. Strongly folded Late Precambrian to Cambrian cover rocks; amphibolite facies
5. Lower Palaeozoic granites
6. Older Precambrian basement
7. Horizontal strata
8. Fold axis
9. Fault
Fig. 4

Diagnostic terminology found useful in the description of stromatolites. The diagrams illustrate features discussed in Ch.5 and in Appendix I.
MODE OF OCCURRENCE

BIOTHEMS:
- SUBSPHERICAL
- DOMED
- TABLEAU
- TINGING

BIOTROMES:
- TABULAR

BRANCHING AND COALESCEING

COLUMN SHAPE AND MARGIN STRUCTURE

NON-COLUMNAR STROMATOLITES
- FLAT-LAMINATED
- CUMULATE
- UNDULATORY
- LATERALLY-LINKED

COLUMN-LAYERED
- PSEUDOCOLUMNAR
Fig. 5

All reconstructions x 1/3

(a) to (j): *Acaciella augusta*: Brighton Limestone equivalent, Umberatana Group; Southern Flinders Ranges

(a)(b)(d) & (i): S404; Depot Creek

(c),(e): Holotype, S401; Depot Creek

(f): S538; Mundallio Creek

(g),(h): S396; Depot Creek

(j): S537; Depot Creek

(k) to (n): *Acaciella* f. indet., boulders in the Sturtian Tillite, north-east of the Enorama Diapir

(k),(l) & (m): S539

(n): S509, traced from a thin section
Fig. 5

[Diagram of various plant specimens labeled a to n, each labeled with a number and spaced 5 cm apart]
Fig. 6

All reconstructions are natural size.

(a) to (i): *Acaciella angepena*, from Lower Cambrian limestones; Flinders Ranges

(a) : Holotype, S460; 2 miles south of Angepena H.S.

(b) : S458; 2 miles south of Angepena H.S.

(c), (e) & (i) : S459; 2 miles south of Angepena H.S.

(d) & (g) : S8; 3 miles west of Italowie Gorge (collected by Sir Douglas Mawson)

(f) : S44; 3 miles west of Italowie Gorge (collected by Sir Douglas Mawson)

(h) : S564; near Old Wirrealpa (collected by Mr. P. G. Haslett)

(j) : Possible *Acaciella angepena*, 3 miles west of Italowie Gorge
Reconstructions (a),(b),(d),(e),(f),(g),(h),(i),(j),(k),(l),(m) x 1/6

(a) to (m) : *Baicalia burra* : Skillogalee Dolomite, Burra Group; Southern Flinders Ranges

(a) & (c) : Holotype S222; 2 miles west of Yatina

(b) : S218; 2 miles west of Yatina

(d) : S151; 8 miles south-west of Worumba H.S.

(e) & (f) : S150; 8 miles south-west of Worumba H.S.

(g)(i)(j) : S221; Dutton's Trough H.S., 9 miles south of Burra

(h) & (l) : S314; Dutton's Trough H.S., 9 miles south of Burra

(j) : S533; Dutton's Trough H.S., 9 miles south of Burra

(k) : S534; Dutton's Trough H.S., 9 miles south of Burra

(m) : S383; float specimen, River Broughton, west of Spalding
Fig. 8

All reconstructions $\times \frac{1}{3}$

(a) to (n) : *Baicalia burra*  Skillogalee Dolomite, Burra Group

(a) : 5533;  Dutton's Trough H.S., 9 miles south of Burra

(b) : 5534;  Dutton's Trough H.S., 9 miles south of Burra

(c) : 5383;  River Broughton, west of Spalding

(d) : 5456;  4 miles south of Arkaroola

(e) : 5457;  4 miles south of Arkaroola

(f) : 5493;  1$\frac{1}{2}$ miles east of Myrtle Springs (upper member)

(g) : 5494;  1$\frac{1}{2}$ miles east of Myrtle Springs (upper member)

(h) : 5496;  1$\frac{1}{2}$ miles east of Myrtle Springs (upper member)

(i) : 5489;  1 mile east of Myrtle Springs (lower member)

(j) : 5487;  1 mile east of Myrtle Springs (lower member)

(k) : 5319;  the Avondale Mine, Lyndhurst (collected by Mr. P. J. Binks)

(l) : 5302;  West Mount Hut, Willouran Ranges

(m) : 599;  West Mount Hut, Willouran Ranges (collected by Mr. C. R. Dalgarno)

(n) : 597;  Chintapanna Well, Willouran Ranges (collected by Mr. C. R. Dalgarno)
Fig. 9

All reconstructions x $\frac{1}{3}$

(a) to (f) : *Baicalia burra*: Skillogalee Dolomite, Burra Group; NW Flinders Ranges

(a), (b) & (f) : S96; Chintapanna Well, Willouran Ranges (collected by Mr. C. R. Dalgarno)

(c) : S98; West Mount Hut, Willouran Ranges (collected by Mr. C. R. Dalgarno)

(d) : S496; 3 miles west of Copley

(e) : S301; West Mount Hut, Willouran Ranges
Fig. 10

All reconstructions $\times \frac{1}{3}$

(a) to (h) : *Boxonia melrose*: Brighton Limestone equivalent, Umberatana Group; $\frac{1}{2}$ mile west of Melrose

(a), (e), (g) & (h) : S502

(b), (c) & (d) : Holotype, S503

(f) : S504

(i) : *Conophyton garganicum garganicum*: from a dolomite raft in the Paratoo Diapir. Part of a large column, S528

(j) to (o) : *Gymnosolen ramsayi*: limestone boulders in conglomerate, Tapley Hill Formation, Umberatana Group; 5 miles east of Wilson

(j) : S390

(k), (l), (m) : S388; vertical columns are interpreted to be derived from a bioherm centre
Fig. 11

All reconstructions x $\frac{1}{3}$

(a) to (e) : *Gymnoceplen ramsayi*: limestone boulders in a conglomerate, Tapley Hill Formation, Umberatana Group;
5 miles east of Wilson

(a) : S388; vertical columns are interpreted to be derived from a bioherm centre

(b) & (d) : S387; inclined columns interpreted to be derived from a bioherm margin

(c) & (e) : S389, S390; irregular and frequently coalescing columns

(f) & (g) : *Inzaria cf. tjomusi*: Wundowie Limestone, Umberatana Group; Burr Well, Northern Flinders Ranges. S479
Fig. 12

All reconstructions x $\frac{1}{3}$

(a) to (g): *Inzeria cf. tjomusi*: Wundowie Limestone, Umberatana Group; Burr Well, Northern Flinders Ranges

(a), (b) & (c): S542

(d), (f) & (g): S480

(e): S479

(h) to (m): *Inzeria conjuncta*: Brighton Limestone equivalent, Umberatana Group; Depot Creek

(h), (i) & (j): Holotype S402; broad, basal columns, branching into narrow columns

(k): S403; elongated inclined columns from bioherm margin

(l) & (m): S398; narrow, upper columns
Fig. 13

All reconstructions x \( \frac{1}{3} \)

(a) to (m) : \textit{Inzeria multiplex}: Brighton Limestone equivalent, Southern Flinders Ranges

(a), (c), (d), (e), (f) : Holotype, S385; 5 miles north-west of Mt Remarkable

(g), (h), (i)

(j) & (k) : S499; float specimen, 7\(\frac{1}{2}\) miles east of Yednalue H.S.

(l) & (m) : S490; 7\(\frac{1}{2}\) miles east of Yednalue H.S.
Fig. 14

All reconstructions $\times \frac{1}{3}$

(a) to (h): *Jurusania burrenensis*: Wundowie Limestone, Umberatana Group, Burr Well; Northern Flinders Ranges

(a) : S481; basal columns arising from undulatory stromatolite

(b) & (c) : S483; irregular columns at bioherm margin

(d), (e) & (f) : Holotype, S543; regular, narrow, upper columns

(g) & (h) : S482; regular, broad basal columns

(i) to (o): *Katavia costata*: Brighton Limestone, Umberatana Group; Depot Creek, Southern Flinders Ranges

(i), (j), (l), (m), (n) & (o) : Holotype, S175; narrow, subcylindrical columns

(k) : S519; basal columns arising from undulatory stromatolite
Fig. 15

All reconstructions x 1/3

(a) to (m): *Kulparia kulparensis*: Etina Formation equivalent, Umberatana Group; 4 miles south of Kulpara, Northern Yorke Peninsula

(a), (b), (c): Holotype, S380; from unit C (Fig. 29j)

(e) & (f): S419; junctions between contiguous domes, unit C (Fig. 29j). (m) is cut by a sand-dyke, including stromatolitic fragments

(f) & (g): S420; from unit E (Fig. 29j)

(h): S271; from unit C (Fig. 29j)

(i): S381 from unit A (Fig. 29j)

(k) & (l): S270 from unit A (Fig. 29j)
Fig. 16

All reconstructions x $\frac{1}{3}$

(a) to (h) : *Linella ukka*: Balcanoona Formation, Umberatana
Group; Burr Well, Northern Flinders Ranges

(a), (b), (e) & (g) : S478

(c), (d) & (h) : S477

(f) : S541

(i) to (q) : *Linella mungallina*: Wundowie Limestone, Umberatana
Group; Roebuck Bore, Northern Flinders Ranges

(i), (j), (k), (m) & (n) : S431

(l) : S430

(o) & (p) : S428

(q) : S427
Fig. 17

All reconstructions x 1/3

(a) to (v) : *Linella mnyallina* : Wundowie Limestone, Umberatana Group, Northern Flinders Ranges

(a), (c), (d) : S486; Burr Well

(m) & (o) : S435; Burr Well

(b) : S484; inclined columns from the bioherm margin; Burr Well

(f), (g), (i), (j), (k), (l) : Holotype, S495; 5 miles east of Myrtle Springs H.S.

(n) & (p) : S549; Lake Arthur, south-western Willouran Ranges (collected by Mr. B. Murrell)

(q) : S556; West Mount Hut, Willouran Ranges (collected by Mr. B. Murrell)

(r) : S552; Lake Arthur, south-west Willouran Ranges (collected by Mr. B. Murrell)

(s) : S555; West Mount Hut, Willouran Ranges (collected by Mr. B. Murrell)

(t) : S556; 6 miles NW of Termination Hill (collected by Mr. B. Murrell)

(u) : S544; 2 miles east of Copley

(v) : S294; Munyallina Valley, 9 miles south of Arkaroola
Fig. 18

All reconstructions x 1/3

(a) to (c): S471; possible Linella munyallina: Wundowie Limestone, Umberatana Group; Wundowie Bore, Northern Flinders Ranges. Column margins have been obliterated by stylolites (shown by cross-hatching)

(d) to (g): Omachtenia utachurca: Brighton Limestone equivalent, Umberatana Group; Depot Creek, Southern Flinders Ranges (not all bridges could be shown on the diagrams)

(d), (e) & (f): S399

(g): S392

(h) to (n): Tungussia etina, Umberatana Group, Northern and Central Flinders Ranges

(h): S157; Etina Formation, Enorama Creek

(i) & (j): S158; irregular, tuberous column, Etina Formation, 3 miles east of Blinman

(k): S286; Wundowie Limestone; Teatree 0.5.

(l): S522; Etina Formation; Arkaba Hills

(m): S526; Balcunouna Formation, 1½ miles east of Mt Chambers

(n): S561; Etina Formation, SW of the Enorama Diapir
Fig. 19

All reconstructions x 1/3

(a) to (i): *Tunquasia etina*: Umeratana Group, Northern Flinders Ranges

(a) : S444; Wundowie Limestone, Teatree O.S.

(b) : S440; Wundowie Limestone, Teatree O.S.

(c), (e), (i): Holotype, S435; Balcanoona Formation, 1 1/2 miles east of Mt Chambers

(d) : S441; Wundowie Limestone, Teatree O.S.

(f) : S436; Balcanoona Formation; 1 1/2 miles east of Mt Chambers

(g) : S525; Balcanoona Formation; 1 1/2 miles east of Mt Chambers

(h) : S524; Balcanoona Formation; 1 1/2 miles east of Mt Chambers
Fig. 20

All reconstructions x $\frac{1}{3}$

(a) to (g): *Tunquaia wilkatanna*: Skillogalee Dolomite, Burra Group, Southern Flinders Ranges

(a) : Holotype, S412; Depot Creek

(b) & (e) : S169; Depot Creek

(c) : S209; Depot Creek

(d) : S410; Depot Creek

(f) : S323; Mundallio Creek

(g) : S408; Depot Creek
Fig. 21

Representative examples of lamina shape

(a) *Acaciella augusta*; (b) *Acaciella f. indet.*;
(c) *Acaciella angepenn*; (d) *Baicalia burra*;
(e) *Boxonia melrosa*; (f) *Conophyton gerganicum gerganicum*;
(g) *Gymnacolen ramsayi*; (h) *Inzeria cf. tomosi*;
(i) *Inzeria conjuncta*; (j) *Inzeria multiplex*;
(k) *Jurusania burrensie*; (l) *Katavia costate*;
(m) *Kulparia kulparensis*; (n) *Linella ukka*;
(o) *Linella munyallina*; (p) *Onachtenie utschurica*;
(q) *Tungussia etina*; (r) *Tungussia wilkatanna*
Fig. 21  REPRESENTATIVE EXAMPLES OF LAMINA SHAPE
SOUTH AUSTRALIAN COLUMNAR STROMATOLITES
Fig. 22

Histograms of lamina convexities. The convexity of a lamina is the ratio of the height of that lamina to its diameter \( h/d \). Histograms are plotted for each stromatolite form at intervals of 0.1. \( n \) is the number of measurements made for each form.

(a) *Acaciella augusta*; (b) *Acaciella* f. indet.;
(c) *Acaciella angepena*; (d) *Baicalia burra*;
(e) *Boxonia melrose*; (f) *Conophyton garganicum garganicum*, not measured;
(g) *Gymnosolen ramsayi*; (h) *Inzeria* cf. *tjonusi*;
(i) *Inzeria conjuncta*; (j) *Inzeria multiplex*;
(k) *Jurusania burranea*; (l) *Katavia costata*;
(m) *Kulpara kulparensis*; (n) *Linella ukka*;
(o) *Linella munyallina* (p) *Omachtenia itschurica*;
(q) *Tungussia etina*; (r) *Tungussia wilkatanna*.
Fig. 22. HISTOGRAMS OF LAMINA CONVEXITIES

- HISTOGRAMS FOR VARIOUS SAMPLES WITH DIFFERENT N-VALUES
Fig. 23

The diagnostic characters of *Conophyton garganicum garganicum*.

(a) The traces of the crestal lines of two specimens (S214 at left and S532 at right) drawn from thin sections (x ½).

(b) to (g) Frequency distributions of thicknesses of light laminae $L_1$ and dark laminae $L_2$ for six separate specimens.

(h) Pooled frequency distributions of lamina thicknesses for all six specimens. The overlay shows the corresponding distributions for Russian *Conophyton garganicum garganicum*.

(i) The frequency distribution of the ratio of thicknesses of adjacent dark and light laminae ($L_2/L_1$), pooled for all specimens. The overlay shows the corresponding distribution for Russian *Conophyton garganicum garganicum*.

(j) The frequency distribution of the coefficient of thickening of laminae in the crestal zone, compared with the corresponding distribution for Russian *Conophyton garganicum garganicum* on the overlay.

(k) Contour diagram of the frequency distribution of dark and light laminae (contoured in numbers of measurements). A corresponding plot for Russian *Conophyton garganicum garganicum* is shown on the overlay.
Fig. 23. DIAGNOSTIC CHARACTERS OF CONOPHYTON
CONOPHYTON GARGANIUM GARGANIUM, S.A.

S277
n = 27

Figs. b to h

S531
n = 40

S214
n = 65

S213
n = 23

S532
n = 56

S278
n = 35

combined; n = 246

n = 246

MARGIN OF FIELD

WVP '70
The geology of the Brighton Limestone equivalent, Depot Creek, based on detailed mapping. For the location of the area, see Fig. 28. Note that only the larger bioherms, including all from which specimens have been taken, are shown on the map. The numbers prefixed S- refer to specimens collected.
Figs. 25 to 29 (see map pocket)

Geology and specimen locality maps of parts of the Adelaide Geosyncline, based on Mines Department maps. The numbers prefixed S- refer to specimens collected.

In Fig. 29, (a) refers to part of the Peake and Denison Ranges, (b) to the south-western Willouran Ranges, (c) to the Beltana area, (d) to the Spalding area, (e) to the Wekeroo area, (f) to the Paratoo area, (g) to the Pernatty Lagoon area, (h) to the Burra-Robertstown area, (i) & (j) to the Kulpara-Port Wakefield area and (k) to the Adelaide Hills area.
Fig. 30

Isopach map of the Skillogalee Dolomite. This map is compiled from maps by Forbes (1955). The outcrop pattern of the formation is taken from more recent Mines Department maps, and my stromatolite localities are also shown.
ISOPACH MAP OF THE SKILLOGALEE DOLOMITE

REFERENCE

Outcrop of Skillogalee Dolomite
Non-carbonate deposition at Skillogalee time
Isopach contour (after Forbes, 1955)
2,400,000 map contours
Distribution of stromatolites
B. Barcroftia burna
T. Tungassia wickiana
Margin of uplift, beyond which the Skillogalee Dolomite was eroded off before tillite deposition
1% Percentage of magnesite in the section (after Forbes, 1955)
Current directions (after Forbes, 1955)
The thicknesses of part of the Umberatana Group between the top of the lower glacial and the top of the upper glacial were measured approximately from Mines Department maps. Thickness measurements in the southern part of the area are especially unreliable, due to tight folding.
ISOPACH MAP OF PART OF THE UMBERATANA GROUP

between the top of the lower glacials and

the top of the upper glacials

REFERENCE

Scale: 0 10 20 30 40 50 miles

- Thickness measurement
- Isopach contour
+ 1:250000 map corners

A-B-C Line of section
An interpretative cross-section, Orroroo 1:250,000 Sheet (along the line of section A-B-C on Fig. 31), based on stratigraphic sections measured at the localities shown. At Yednelue, the thickness of the Tapley Hill Formation is uncertain, due to folding. At Melton, the top of the section is not exposed.
FIG. 32. INTERPRETATIVE CROSS-SECTION, ORROROO 1:250000 SHEET
FOR PART OF THE UMBERATANA GROUP (DIPS RESTORED TO HORIZONTAL)

DEPOT CREEK SPRINGFIELD UROONDA YEDNIALIE PRINCE ALFRED BAGALOWIE YELEADA MELTON WARRIGOOLDA

SILSTONE Siltstone Siltstone Siltstone Siltstone

TAPLEY UROONDA LOCOWIE Siltstone TERRINGTON WALLACOOLEY

HILL FORMATION FORMATION FORMATION FORMATION

5000 ft 4000 3000 2000 1000 0

SCALE: 5 10 15 20 miles

WVP '70
Fig. 33

The outcrop pattern of the Brighton Limestone and its equivalents was deduced from Mines Department maps. Thicknesses were partly measured accurately in the field and partly estimated from the maps. Current directions were measured from the Brighton Limestone, the overlying Willochra Formation and the underlying Tapley Hill Formation.
Fig. 33.

ISOPACH MAP OF THE BRIGHTON LIMESTONE

Umberatana Group

REFERENCE

Scale: 0 10 20 30 40 50 miles

- Thickness measured accurately in the field
- Thickness measured approximately from maps
- Isopach contour

† 1:500000 map contours

© Outcrop of the Brighton Limestone and its equivalents

Abundance of Brighton Limestone at the same horizon (note that the Etina and Balcanonco formations north of latitude 32° may be partly time-equivalent to the Brighton Limestone)

Distribution of stromatolites

A. Astravia costata
B. Acrodello augusta
C. Igeria conyuncta
D. Igeria multiplex
E. Omocteria utahurica
F. Barania melrose

(8) Brighton Limestone
(7) Mylly Hill Fm
(6) Wanschro Fm

Current directions

WVP^70
Outcrop patterns and thicknesses were deduced in the same way as for the Brighton Limestone (Fig. 33). The overlay compares the distribution of diapirs with that of the Etina Formation and its equivalents. Also shown on the overlay are the distributions of red-beds and of stromatolites.
OVERLAY TO FIG. 34

1. Diapir

Distribution of red beds, interbedded with and immediately below the Elina Formation

2. Current directions

Distribution of stromatolites

1) Tonnassa retia
2) Linaia ulaco
3) Linella mungaling
4) Jepora of gomai
5) Juravena burnensis
6) Kulipara kudobensis
7) Miscellaneous
8) Omochwea utshurica?
Fig. 34
ISOPACH MAP OF THE ETINA FORMATION AND ITS EQUIVALENTS

REFERENCE

Scale: 0 10 20 30 40 50 miles

* Thicknes measured accurately in the field
** Thickness measured approximately from maps

Isopach contour

+125,000 map corners

Outcrop of Etina Formation or equivalent

Absence of Etina Formation at the same horizon

WUNDOWIE LIMESTONE AND BALCANOONA FORMATION

ETINA FORMATION

MARINO ARKOSE
Fig. 34(b)  
ISOPACH MAP OF THE ETINA FORMATION AND ITS EQUIVALENTS

REFERENCE

Scale: 0 10 20 30 40 50 miles

- Thickness measured accurately in the field
- Thickness measured approximately from maps
- Isopach contour

41,500,000 map corners

Outcrop of Etina Formation or equivalent

Absence of Etina Formation at the same horizon

OVERLAY TO FIG. 34

- Diapir
  Distribution of red beds, interbedded with and immediately below the Etina Formation
- Current directions
  Distribution of stromatolites

1. Addina etina
2. Limella uleca
3. Limella munyinga
4. Ingeria crassidens
5. Jurupana burrunensis
6. Kulpina russvadensis
7. Miscellaneous
8. Omachiella utsuricoi

MARINOL
ARKOSE
Figs. 35 to 38 (Maps A to H)

Palaeogeographic reconstructions of the Adelaide Geosyncline during the time interval between the two Late Precambrian glaciations. The interpretations are discussed in Ch. 11.
C. Late Tapley Hill–Early Brighton time: regressive.

- Stromatolites
- Shallow marine calcareous silts, minor carbonates
- Intermittent exposure and stromatolite growth
- Basinal muds and silts
- Gawler Platform

D. Mid Brighton time: regressive, with intermittent uplift in diapiric areas.

- Oolitic limestone
- Sandy limestones
- Ooid banks
- Sand influx
- Basinal muds and silts
- Gawler Platform

Fig 36
E. Late Brighton time: regressive

- Ooid and Stromatolitic Banks
- Supratidal Dolomite
- Shallown Marine Silts
- Gawler Platform

F. Early Willochra time

- Shallow Marine Muds
- Local Carbonate Banks
- Red Mud Flats
- Shallown Marine Silts
- Gawler Platform

Fig. 37
G. Mid Willochra time

**Alternating green muds, sandy tidal channel deposits and stromatolitic bioherms**

**Tidal channel deposits**

Gawler Platform

Kui

H. Late Willochra time: minor transgression

**Approximate extent of Trezona Formation**

**Reddish sands and silts**

**Shallow marine silts grading to basinal**

Gawler Platform

BASINAL MARINE MUDS AND SILTS

WVP '70
Fig. 39 (see map pocket)

Fence diagram based on sections measured accurately in the field. All locations are on the Copley 1:250,000 Sheet. Important facies changes are the change from green and grey shales and siltstones in the west to red in the north-east, the lensing out to the west of the Westootla Dolomite and the intertonguing of the Wundowie Limestone with shales. An unconformity possibly exists below the Elatina Formation in some areas. The predominantly oolitic Balcanooona Formation is secondarily dolomitized in its very thick sections at Wundowie Bore, Burr Well and Angopene, but not at Myrtle Springs or Maynards Well where the thickness is reduced. The possibly early diagenetic (?) supratidal dolomites of the Arkaroola-Balcanooona region do not occur elsewhere.