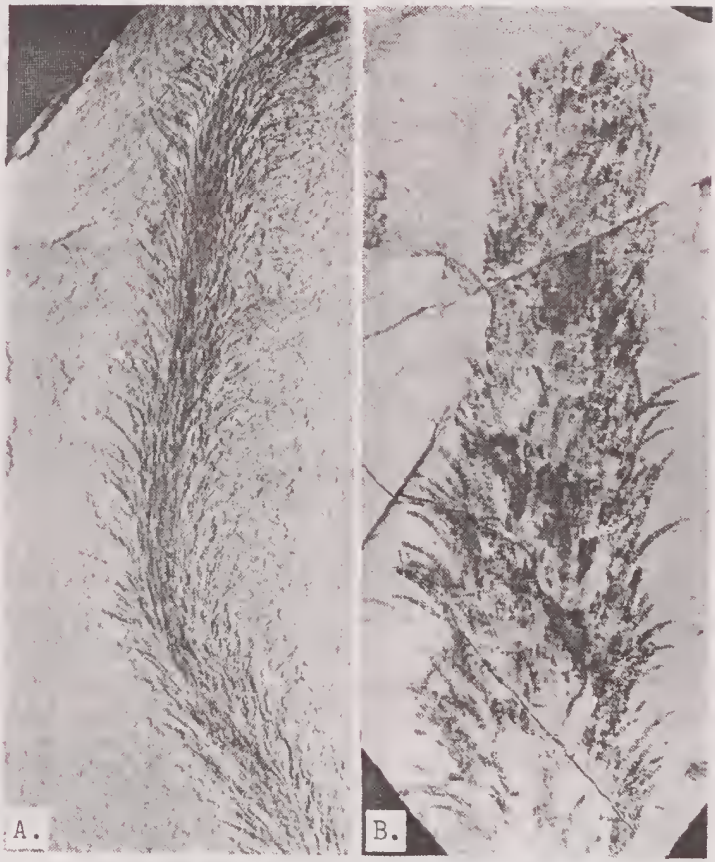
THE FOSSIL COLLECTOR

BULLETIN Nº 25 MAY 1988



Banaguanathia longifolia, A x 0·5, B x 0·75.

Published by
THE FOSSIL COLLECTORS ASSOCIATION OF AUSTRALASIA

THE FOSSIL COLLECTORS' ASSOCIATION OF AUSTRALASIA

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EDITORIAL

It is somewhat amazing that with a membership averaging around 200 for the last few years, we seldom receive questions from members (other than "where can I find perfect trilobites?"), the answers to which, when researched, could, via the Bulletin, be of interest to others. Even ideas for articles are rarely forthcoming, let alone the supply of background information to assist in their preparation.

Unfortunately, feature articles, particularly when they deal with a specific phylum, class or order of fossils, require expert knowledge, not only of the subject matter, but the occurrences and distribution of the various genera and species within Australia.

Even if such information is readily available, which is rarely the case, these articles take many days or weeks of solid work to prepare. There is a limit to the assistance we can fairly ask of our professional friends, after all palaeontology is their livelihood or at least part of it.

The production of this magazine in its current form has, I believe passed out of the realm of an "after hours" exercise, a fact which must make the long term future uncertain without a considerable increase in member involvement.

While our financial situation is extremely healthy, regrettably money is not the solution to the problem.

Frank Holmes

FINANCES

Income and Expenditure for the Financial Year, 1st March,1987 to 29th February, 1988.

Income		Expenditure	
Subscriptions		Postage	491.41
current	921.93	Printing	336.87
advance	717.67	Photocopies,photo's & photo screening	143.40
Donations	7.11	Stationery	9.38
Advertising	-	Sundries	86.10
Bank Interest	83.41	State Rep.expenses	10.50
Sale of Bulletins	138.20	Sub'n.to FOCAMM	20.00
Sale of Car Stickers	3.00	Donations	100.00
		State/Fed.Tax	1.22
		Refunds	12.00
Total	$1,871.32		$1,212.36

Balance at 29th February,1988		
Brought forward from	1986/87	1,185.35
Add income	1987/88	1,871.32
		3,056.67
Less expenditure	1988/89	1,212.36
		$ 1,844.31

When the above figures are adjusted to include 1987/88 subscriptions paid in 1986/87 ($513.00) and to exclude 1988/89 subscriptions ($810.07), income for the Financial Year exceeded expenditure by $361.89.
After deducting total advance subscriptions of $861.07 from balance in hand at 29th February,1988 we are left with a nett reserve of $983.24.

WANTED

Photo's for the front of the Bulletin or even a feature page.

They can be colour or black and white prints as long as they are sharp and have reasonable tonal contrast. Those for use on the front page should have a 12 cm x 10 cm vertical format or be such that they can be reduced or cropped to such a size when a bromide is made. Naturally, we will need at least the generic name of the fossil and the size of the original specimen. Further details such as the general locality from which the fossil originated and its age would be of help.

All photo's will be returned in the condition in which they are received.

F.C.A.A. MEETING

An informal meeting of the F.C.A.A., at the recent Canberra Gemboree (Easter 1988) was attended by 25 members and 3 visitors. Unfortunately, other members present at the Gemboree were unable to attend due to a conflict of activities at the time of our meeting on Good Friday.

After receiving a full report on the outcome of the recent questionnaire those present agreed that it would be wise to consider registration of the name of the Association as soon as practicable. The inclusion of a paragraph in the Membership Application Form and Subscription Renewal Form, restricting the use of the name of the F.C.A.A. by individual members, was noted.

Other matters discussed included reproducing copies of early issues of "The Fossil Collector" for newer members; providing a glossary of terms where necessary at the end of the more technical articles, and; publishing a note explaining the abbreviations used in lists of references, together with details of where members can view or obtain copies of same.

While problems were encountered in gaining entry to the building assigned for the meeting (it was in total darkness and securely locked when members arrived), and in keeping out of draughts (the building only had mesh in the windows); it was gratifying not to be disturbed by other activities as has happened so often in the past.

DINOSAUR COVE STUDY KITS

The Department of Earth Sciences, Monash University, Clayton, Victoria, 3168, now have available "Dinosaur Cove Study Kits" designed for use in High Schools or upper level Primary Schools.

These kits which cost $22.00 include specimens of both rock types and fossils from Dinosaur Cove as well as literature on the site and a series of activity sheets. Fibreglass casts of three of the fossils from the locality are a part of the kit.

Casts of the dinosaur footprint, the only one known from Victoria, are also available for $14.00. Individual casts of fossils from Dinosaur Cove may be purchased separately.

Postage on the items listed above is an additional $2.00 within Victoria and slightly more in other States, depending on distance.

In addition a whole range of "Kadimakara" items including T-shirts, windcheaters, track suits and children's colouring books etc. are for sale.

All enquiries should be addressed to P.V.Rich at the above address.

THE BARAGWANATHIA STORY compiled by Frank Holmes

The following article attempts to set out the history and diversity of Victoria's Late Silurian/Early Devonian land plants, of which *Baragwanathia longifolia*, because of its reported age, has long been the centre of world wide controversy.

Baragwanathia itself, is a Lycophyte, a distant relative of the living club mosses. Although it is one of the earliest vascular land plants known, its ancestral position within the group is still not perfectly clear. The determination of its relative age is to a very large extent dependent on the correct identification of the species of graptolites with which it is found; these latter animals having a world wide distribution but a relatively short species life span.

THE EARLY YEARS, 1874 - 1934

The first record of what we now know to be a specimen of *Baragwanathia*, occurs in a report on the country between Tallarook and Longwood, Victoria, dated 15th April,1874. In this report to the then Secretary for Mines, the author, William Nicholas, states that following the discovery of a fossil during the construction of the railway from Seymour to Avenel, he devoted his Easter holidays to a personal examination of the various cuttings on this section of the line. He goes on to state that in the cutting where the first fossil was uncovered he found amongst the debris which had been excavated, what appeared to be fossilized plant fragments and one complete but indistinctly marked plant. This latter specimen was at the time considered by Professor McCoy to be lepidodendroid. Fortunately, the material collected by Nicholas was donated to the National Museum of Victoria (now the Museum of Victoria) and can be viewed today over 110 years later.

Although during the next 50 years it appears that members of the Geological Survey of Victoria collected fossil plants along with other Late Silurian and Early Devonian fossils, they were not described in the Survey's Memoirs.

Even Baragwanath, who while mapping the Thompson River area collected a specimen of what was to become known as *Baragwanathia*, failed to record the fact in his often cited 1925 paper.

The second reference to a plant which might be referable to *Baragwanathia*, was made by Isabel Cookson in a note on fossil plants included in Frederick Chapman's 1924 paper (published 1926) "On the question of the Devonian Age of the Tanjilian Fauna and Flora of Victoria". In this paper Cookson refers to a species of the widespread Northern Hemisphere genus *Arthrostigma* being typical of some beds at Walhalla. In latter papers, one of these specimens was in turn referred to as being cf. *Thursophyton milleri* and finally in 1935 to being an imperfect example of *Baragwanathia*.

A number of the best specimens of plants from the collections of the Geological Survey and the National Museum of Victoria were sent to England in the mid 1920's for comparison with European material. These specimens collected during the early part of this century came from a number of

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THE BARAGWANATHIA STORY (Cont.)

localities along the Walhalla syncline in Gippsland and were generally considered to be Late Silurian in age. However, even at that time there were reported differences of opinion as to the age and stratigraphy of the beds in the Walhalla syncline; Chapman on palaeontological grounds believing what he considered to be the younger beds of this sequence (then known as the Jordon River beds), Early Devonian in age.

Lang and Cookson (1927), illustrated the cf.*Thursophyton* specimen, referred to previously, together with several examples of *Hostimella* sp., and a number of specimens from the Jamieson district which could not be compared with any known Northern Hemisphere pre-Carboniferous plant. Although briefly described, the latter specimens were left unclassified, the lack of any detail of the reproductive organs rendering their systematic position uncertain. Eight years later specimens similar to these were to be described as *Baragwanathia longifolia*.

Proabably one of the most important surveys relating to the occurrence of these plants, was made during the period between Lang and Cookson's 1927 and 1935 papers. Although the details of this survey were not published until 1941, the authors, Harris and Thomas, together with Keble, Tilson, Edwards and Broadhurst from the Mines Department of Victoria, visited the Yea-Alexandra district in 1929 to "secure additional data regarding the plant and graptolite association of the Silurian rocks of Victoria".

THE OLDEST VASCULAR PLANT?, 1935 - 1965.

The information gathered by Harris and Thomas together with previous assertions of plant-graptolite associations in the Walhalla district made by Whitelaw (1916), Chapman (1924), and Baragwanath (1925) - confirmed by Skeats (1928), form the basis for the major work by Lang and Cookson (1935) in which *Baragwanathia longifolia* is formally described and assigned a Late Silurian age.

This major work "On the Flora, including Vascular Land Plants, associated with *Monograptus*, in the Rocks of Silurian age, from Victoria, Australia" is one of three papers (Lang and Cookson, 1930, 1935 and Cookson 1935) which describe or identify most of the then known "Silurian/Early Devonian plants of Victoria" - see table 1.

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TABLE 1. SILURIAN/EARLY DEVONIAN PLANTS RECORDED BY 1935.

New genera and species

Baragwanathia longifolia	Lang and Cookson 1935
Yarravia oblonga	Lang and Cookson 1935
Y. subsphaerica	Lang and Cookson 1935
Hedeia corymbosa	Cookson 1935

New species of already established Northern Hemisphere genera

Zosterophyllum australianum	Lang and Cookson 1930
Sporogonites chapmani *	Lang and Cookson 1930
Pachytheca sp. *	(General ident. by Cookson 1935)
Hostimella sp. *	(General ident. by L.& C. 1927 & 1930)

* These genera are non-vascular Thallophytes (Algae).

FIGURE 1.

DISTRIBUTION OF *BARAGWANATHIA LONGIFOLIA* IN VICTORIA (△)

THE BARAGWANATHIA STORY (Cont.)

It is at this point in time the problems associated with establishing the correct age of the *Baragwanathia* flora really began.

In describing *Baragwanathia* and *Yarravia*, Lang and Cookson (1935) used material from four localities; the Yarra Track, Alexandra, Killingworth (near Yea) and the Thompson River area. Numerous specimens of graptolites associated with the plants from the first two localities were submitted to Dr. G.L. Elles who placed their age "beyond doubt" as Early Ludlow (Early Late Silurian). Even though it appears that Keble and Thomas were uneasy about Elles' specific identification of *Monograptus uncinatus*, the Early Ludlow age was accepted. It would have been extremely difficult to contest this age, as graptolites were then unknown from rocks younger than the Silurian.

For this reason *Baragwanathia* had to be considered the oldest recorded vascular plant in the world, since the earliest specimens of vascular plants then known with certainty from the Northern Hemisphere, were regarded as Early Devonian.

Apart from the previously mentioned 1941 paper by Harris and Thomas and two papers by Cookson (1945 and 1949) little work on the early flora was carried out during the 30 years between 1935 and 1965.

However, it is interesting to note that both of Cookson's papers refer to Early Devonian plants from what is known as the *Baragwanathia* flora. The first paper records all the species then known from the various Victorian localities, of which the Centennial Beds at Walhalla were considered to be Early Devonian and the second (1949), the "Yeringian (Lower Devonian) plant remains from Lilydale, Victoria", which include *Zosterophyllum*, *Yarravia* and *Hedeia* but not *Baragwanathia*.

Although the stratigraphy of the Melbourne Trough was undergoing continued review during the latter half of this period, probably the most important item to affect the supposed Silurian age of *Baragwanathia* was the publication in the late 1950's of information on monograptids from the Lower Devonian of Bohemia.

This and subsequent work on graptolites in Europe, resulted in a complete reappraisal of the *Monograptus* species found associated with the plants, particularly those from the Yarra Track localities.

THE CASE FOR AN EARLY DEVONIAN AGE, 1966 - 1977

Jaeger (1966) in his paper "Two late *Monograptus* species from Victoria" records *M. aequabilis* (a key fossil found in the Lower Devonian of Bohemia) from the 20 mile quarry and describes a new species *M. thomasi* from the type locality for *Baragwanathia longifolia*, the 19 mile quarry. This latter graptolite is the species referred to by Elles in Lang and Cookson (1935) as *Monograptus uncinatus* var *orbatus* and which originally gave rise to the belief that *Baragwanathia* was Early Late Silurian.

Later papers note that *M. thomasi thomasi*, Jaeger extends throughout the Wilson Creek Shales while *M. aequabilis notoaequabilis* Jaeger and Stein occurs only in the upper half of the bed and in the overlying Norton Gully Sandstone.

Based on reports by Harris and Thomas (1941) and Talent and Banks (1967), it was generally considered that all the plant-graptolite beds were at the same bio-stratigraphic level, the greater majority occurring in the Wilson Creek Shales. This assumption placed the *Baragwanathia* flora clearly in the Early Devonian (Pragian) and not the Late Silurian (Ludlow), a fact which appears to have given considerable relief to Northern Hemisphere palaeobotanists who could not accept a comparatively advanced type of early plant such as *Baragwanathia*, preceding the occurrence of primitive Rhynophytes in Europe.

Cont...

FIGURE 2.

Palaeogeography of the Late Silurian showing extent of land (hatched) and location of plant localities: 1. Mudgee, 2. Yea, 3. Yarra Track (Matlock). (Adapted from White, 1986)

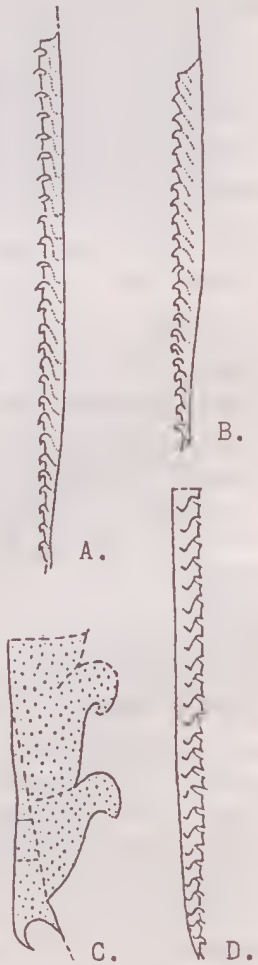


FIGURE 3 (right).

A & B, *Monograptus thomasi*, x 2·2, 19 mile quarry, Yarra Track, Victoria. C, *M. thomasi*, x 14, detail of specimen A. D, *M. aequabilis*, x 2·2, 20 mile quarry, Yarra Track, Victoria. Figures from Jaeger (1966).

THE BARAGWANATHIA STORY (Cont.)

Unfortunately, for those who would prefer to see *Baragwanathia* remain as just another Early Devonian plant, this was not the end of the story. It was in fact only the beginning of the main controversy - the battle to reassert a Silurian age for part of the *Baragwanathia* flora based on the evidence for two distinct plant-graptolite horizons.

EVIDENCE FOR A LATE SILURIAN LOWER PLANT ASSEMBLAGE, 1978 -

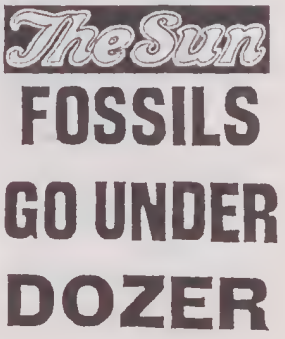
While studying the Late Silurian to Early Devonian stratigraphy of the Yea-Molesworth district of Victoria, Couper (1965) noted the occurrence of two distinct plant-graptolite beds; an upper bed located immediately below a conglomerate in the Flowerdale Sandstone Member (Williams 1964) and a lower bed, also below coarse clastics which was to be named by Garratt (1977), the Rice's Hill Sandstone Member.

Couper considered that the two beds were separated by 2,750 m. (9020 ft.) of dark grey unfossiliferous siltstone. Garratt on the other hand, while confirming the occurrence of the two beds when mapping the area in the mid 1970's, records the intervening thickness as 1,700 m (5,580 ft.). Either way it was obvious that a considerable time must have elapsed between the two depositions, both of which contain *Baragwanathia*.

Based on the discovery of species of Silurian graptolites previously unrecorded from the lower plant beds, Garratt (1978) proposed a Ludlow (Late Silurian) age for the earliest *Baragwanathia* flora from the Yea district.

Although there are two major outcrops of the lower plant-graptolite assemblage (Ghin Ghin and Limestone Roads) it is material from the latter that has been used in subsequent descriptive work of the flora from the lower beds.

Fortunately, extensive in situ collections were made from the Limestone Road cutting (adjacent to Brackley's Cutting of Harris and Thomas) during 1977 and 1978, as on July 28th.,1979 the Melbourne "Sun" reported the bulldozing by the Shire Council of this unique fossil bed, with the excuse that the road-building rock was of great importance to the area and represented an investment of about $2,000 in council equipment costs! However, the huge pile of rubble did yield considerable additional material.



Associated with the Late Silurian age graptolites, namely *Bohemograptus* sp., and *Pristiograptus* sp., from Limestone Road and *Monograptus* aff. *uncinatus* from the northernmost locality of the Lower Plant Assemblage, Garratt records the presence of the bivalve *Necklania*, undescribed gastropods and orthocerids, the pteropod *Hyolithes* and the brachiopod *Maoristrophia lanksi*. He also notes that Schleiger had found ?*Saetograptus* sp., on strike with the Lower Plant Assemblage.

Lower Plant Assemblage beds, Limestone Road, Yea, Victoria, June, 1977.
Photograph of site before bulldozing by Shire Council.

Garratt's 1978 reassertion of a Late Silurian age for *Baragwanathia* resulted in an immediate response from United Kingdom palaeobotanists. Edwards et al (1979) state, that they consider there are considerable anomalies in Garratt's published evidence, in particular the fact that "graptolites and plants at the lower horizon do not occur in intimate association and are not found at the same bedding planes" and that the bivalve *Necklania* and the brachiopod *Maoristrophia barksi* firmly indicate an Early Devonian age.

Even a counter reply by Garratt (1981) giving further information in support of the 1978 evidence, specifically the close proximity between the plants and Late Silurian graptolites, failed to satisfy Hueber (1983) in his paper describing a new species of *Baragwanathia* from Canada.

Finally Garratt, this time in conjunction with Tims, Rickards, Chambers and Douglas (1984), again set out the biostratigraphic and lithostratigraphic evidence for the Ludlow age of the Lower Plant Assemblage. At the conclusion of the paper the authors note that fossil fragments which might prove to be of vascular plant origin (but which have not yet been investigated) are found in beds as low as 500 m (1,640 ft.) below the Lower Plant Assemblage.

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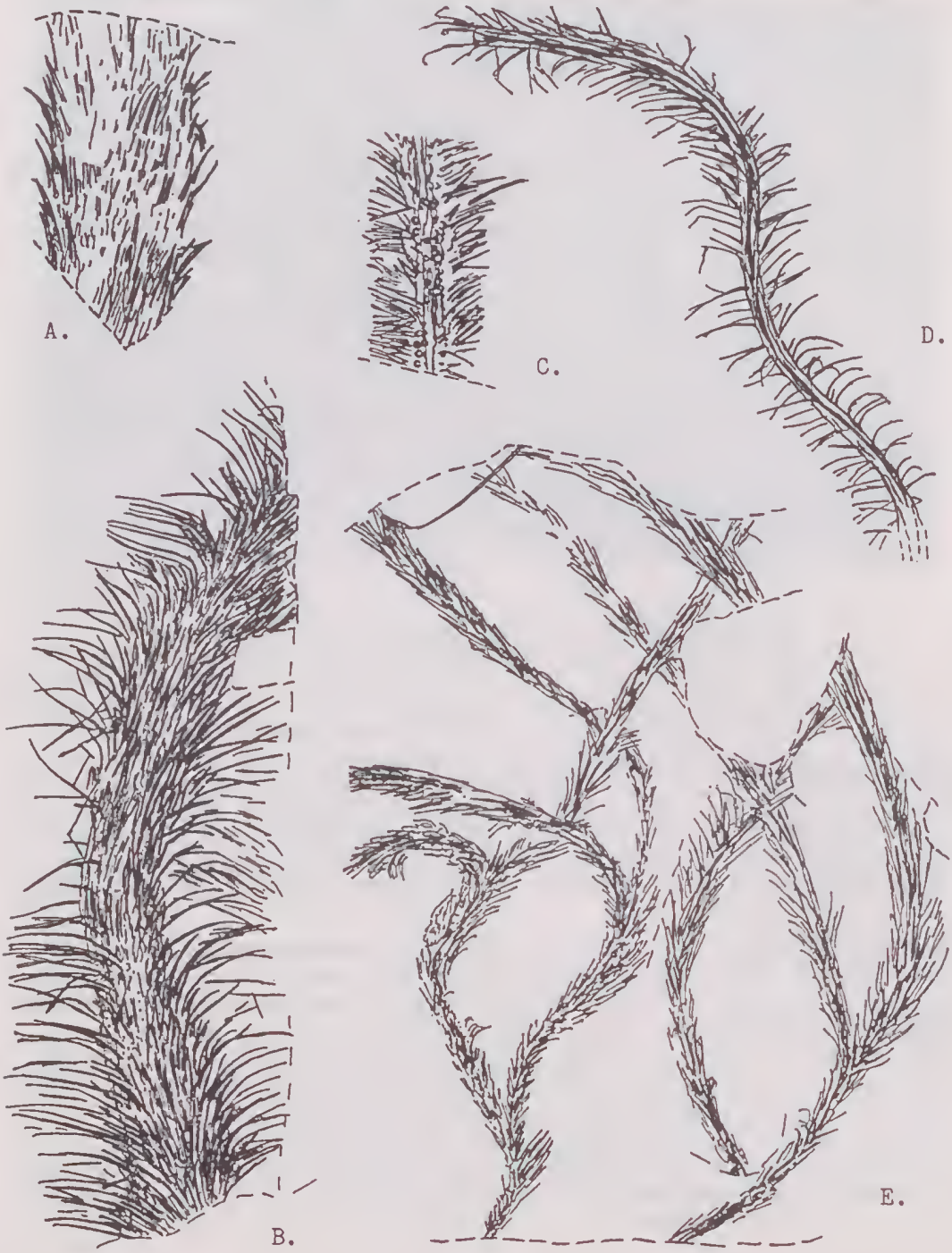
THE BARAGWANATHIA STORY (Cont.)



THE DIVERSITY OF THE BARAGWANATHIA FLORA

Unfortunately, the age controversy has tended to obscure further work carried out to determine the extent and diversity of the *Baragwanathia* flora itself.

This situation is exacerbated by the fact that most of this work is included in unpublished manuscripts by Tims (1974, 1980) and consequently to avoid "nomina nuda" (invalid names), new generic and specific names cannot be cited.

Of all the new material discussed in the above manuscripts only *Salopella australis*, *Salopella caespitosa* and *Dawsonites subarcuatus* have been formerly described (Tims & Chambers 1984). The first of these *S. australis*, is recorded from both the Lower and Upper Plant Assemblages, while the latter two have only been found in the Upper (Early Devonian) beds. Both genera were first recorded in the Northern Hemisphere.

Table 2 lists the plants which currently form the Late Silurian-Early Devonian *Baragwanathia* flora and includes forms of algae, one of which *Yeaia flexuosa* is described from the Lower Plant Assemblage at Limestone Road (Douglas 1983a).

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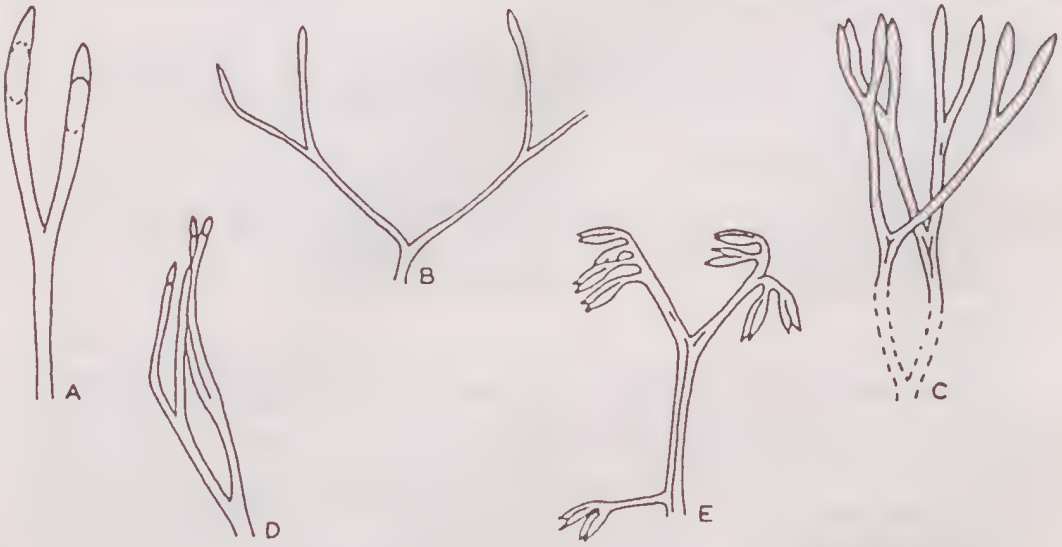

FIGURE 4. A, *Salopella australis*, x 1·6, diagram of holotype, Frenchman Spur. B, *S. australis*, x 0·7, diagram of large branched specimen, Limestone Rd. C, *S. australis*, x 0·8, reconstruction of possible branch structure, Limestone Rd. D, *Salopella caespitosa*, x 0·7, branching axis bearing sporangia, Frenchman Spur. E, *Dawsonites subarcuatus*, x 2·1, reconstruction of holotype, Frenchman Spur. Figures from Tims & Chambers (1984).

FIGURE 5 (left). *Baragwanathia longifolia*, x 0·5, specimens C, D & E, from Limestone Road, Yea. Drwgs. from Douglas, Garratt & Tims.

THE BARAGWANATHIA STORY (Cont.)

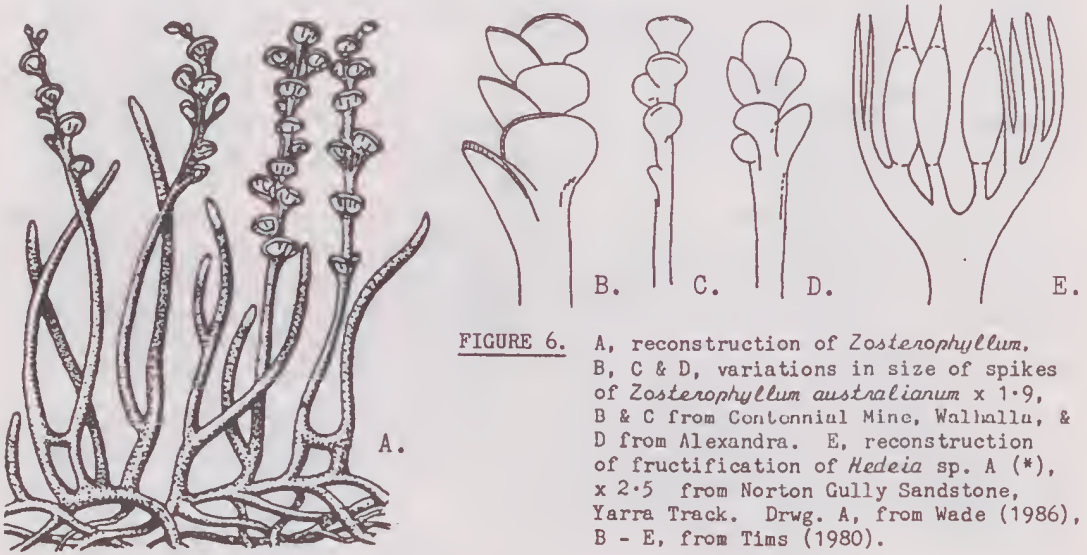

FIGURE 6. A, reconstruction of *Zosterophyllum*. B, C & D, variations in size of spikes of *Zosterophyllum australianum* x 1·9, B & C from Centennial Mine, Walhalla, & D from Alexandra. E, reconstruction of fructification of *Hedeia* sp. A (*), x 2·5 from Norton Gully Sandstone, Yarra Track. Drwg. A, from Wade (1986), B - E, from Tims (1980).

TABLE 2. LATE SILURIAN/EARLY DEVONIAN *BARAGWANATHIA* FLORA

THALLOPHYTES - Algae	
Buthotrephis trichotoma	Kinglake (Humevale Fm.)
B. walhalla	Walhalla.
Hostimella sp.	Yarra Track, Turton's Creek (TCI), Walhalla.
Pachytheca sp.	Alexandra, Walhalla.
Sporogonites chapmani	Lilydale, Walhalla.
Yeaia flexuosa	Limestone Road (LPA).
TRACHEOPHYTES	
RHYNIOPHYTES	
Hedeia corymbosa	Alexandra, Lilydale. Also from Mathinna Beds (Tasmania).
Hedeia sp. A (*)	Frenchman Spur, Limestone Rd. (LPA), Yarra Tk.
" spp. B (similar to *H. corymbosa*)	Coles Clearing, Frenchman Spur, Yarra Track.
Salopella australis	Limestone Rd. (LPA), Frenchman Spur.
" *caespitosa*	Frenchman Spur.
Yarravia oblonga	Alexandra, Coles Clearing, Frenchman Spur, Lilydale, Yarra Track.
Yarravia subsphaerica	Yarra Track.
Rhyniaceae gen. et sp. (*)	Coles Clearing.
ZOSTEROPHYLLOPHYTES	
Zosterophyllum australianum	Alexandra, Lilydale, Walhalla, Woods Point, Yarra Track.
" sp. A (*)	Tyers (BS).
" sp. B	Frenchman Spur.
Zosterophyllacea gen. et sp. (*)	Limestone Rd. (LPA).

ZOSTEROPHYLLOPHYTES (Cont.)

Probable Zosterophyllophytes	
gen. et sp. A (*)	Frenchman Spur.
sp. B	Limestone Rd. (LPA).
sp. C	?
sp. D	Limestone Rd. (LPA), Tyers (BS).
TRIMEROPHYTE	
Dawsonites subarcuatus	Frenchman Spur.
LYCOPHYTES	
Baragwanathia longifolia	Alexandra, Big River, Gobur, Coles Clearing, Eildon, Frenchman Spur, Ghin Ghin Rd. (LPA), Killingworth, Limestone Rd. (LPA), Mansfield, Thompson River, Turton's Creek (TCI), Tyers (BS), Seville, Seymour, Warburton, Yarra Tk. Also from Mudgee, New South Wales.
Baragwanathia sp. A (*)	Frenchman Spur, Tyers (BS).
" sp. B	Limestone Rd. (LPA).
" sp. C	Alexandra, Limestone Rd. (LPA).
Probable Lycophyte	
gen. et sp. A (*)	Limestone Rd. (LPA).
Indeterminate Lycophyte	Frenchman Spur.

NOTE: * = New genera and/or species described and named by Tims (1980) in an unpublished Ph.D. thesis (see previous comment re. "*nomina nuda*"). Other species lettered A,B,C etc., are also recorded in this work but are unnamed.

BS = Boola Siltstone, LPA = Lower Plant Assemblage, TCI = Turton Ck. Inlier.

Generally other localities occur in the Wilson Creek Shale, the Norton Gully Sandstone or their Early Devonian (Pragian) stratigraphic equivalents.

Plants listed in the literature with the prefix "cf" (to be compared with) or "aff" (having affinity with but not identical with) have been excluded from this table.

PALAEOECOLOGY

The early land plants with which this article deals are all from localities within the Melbourne Trough (fig.2), an area of marine deposition which occurs in central Victoria and ranges in age from the Cambrian to Middle Devonian. This Trough forms part of the Tasman Geosyncline which extends from Tasmania to New South Wales.

Of the various hypothoses put forward to explain the palaeoenvironment in which these early land plants lived, the most probable is one consisting of marsh or low lying periodically inundated river flats and deltaic swamps (Tims 1980). A river system passing through such low lying land, as postulated for the origin of the sediment of the Wilson Creek Shale would, in times of flood have removed the vascular plants from their place of growth and deposited them some distance from the shore in anaerobic mud. However, the sediments and flora of the Tyers area indicate a neritic (shallow water) environment of deposition close to the shore.

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FIGURE 7. Reconstruction of a Late Silurian palaeoenvironment as probably existed in the area of Limestone Road, Yea, some 418 million years ago. In the left foreground strands of a Thallophyte (alga) flow with the gently moving water, while on the silty and sandy bank to the right are the long strap like branches of a Zosterophyll. Across the channel (mid.left) can be seen the long slender stems and sporangia of the *Salopella* plant between the thick semi-submerged growth of *Baragwanathia*.
Drawing by Carol Healy from Douglas (1983b).

In spite of the fact that the fossil plants are found in marine sediments, the structure of the various species (Banks 1972) clearly indicate that they grew on land and not in the water.

SUMMARY

The lycopod genus *Baragwanathia* is now known to have existed for a period of about 30 million years, having appeared in the Late Silurian (Ludlow) of Australia approximately 418 million years ago, as evidenced by the graptolite association in the Lower Plant Assemblage at Yea, Victoria, and been recorded as late as the Early Devonian (Emsian) of Canada (Hueber, 1983).

Of all the species that constitute the *Baragwanathia* flora of Victoria, only three are reported to occur in both the Lower and Upper Plant Assemblages; *Baragwanathia longifolia*, *Salopella australis* and *Hedeia* sp.* (ref. note to table 2.).

The only plants known from pre-Ludlow strata which are considered to be vascular, are small erect fertile specimens assigned to the genus *Cooksonia*. These are recorded from the Late Wenlock of Ireland (Edwards et al, 1983). In "The Greening of Gondwana" White (1986) mentions the presence of *Cooksonia* in Siluro/Devonian beds at Mudgee, New South Wales and in the Mount Daubeny Group further west near Broken Hill, however, supportive evidence has yet to be published in a scientific journal.

Although our knowledge of *Baragwanathia* goes back over 110 years, the story is still not complete. We know virtually nothing of its ancestry.

ACKNOWLEDGEMENTS

The writer wishes to thank Dr. J.G. Douglas of the Department of Industry Technology and Resources, Victoria, for loaning material for the article and for his helpful comments on the draft.

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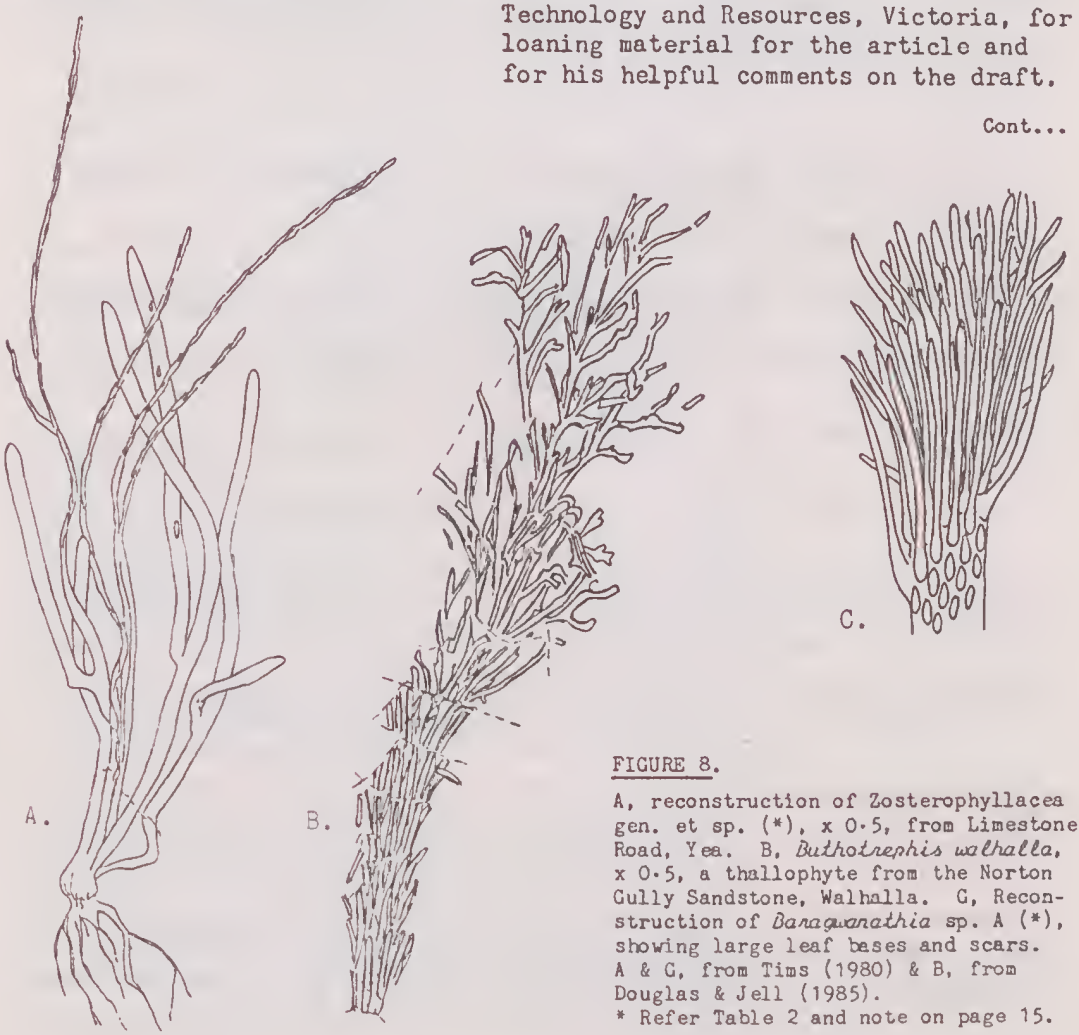

FIGURE 8.

A, reconstruction of Zosterophyllacea gen. et sp. (*), x 0·5, from Limestone Road, Yea. B, *Buthotrephis walhalla*, x 0·5, a thallophyte from the Norton Gully Sandstone, Walhalla. C, Reconstruction of *Baragwanathia* sp. A (*), showing large leaf bases and scars. A & C, from Tims (1980) & B, from Douglas & Jell (1985).

* Refer Table 2 and note on page 15.

THE BARAGWANATHIA STORY (Cont.)

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IN THE NEWS

SCIENTISTS FIND A NEW KIND OF DINOSAUR

Paleontologists announced yesterday that a dinosaur skull, unearthed 46 years ago but erroneously identified at the time, is actually that of a previously unknown genus, a pygmy tyrannosaur possibly related to modern birds.

The announcement at the Cleveland Museum of Natural History culminated a year-long study of the skull by three scientists who recognised it as a fossil of extraordinary importance.

Many paleontologists believe that the dinosaurs never entirely died out but evolved into birds, and the identification of the new genus supports that theory. However, differences persist as to which dinosaurs might have been the ancestors of birds.

The skull was found in Montana in 1942 but had never stirred any scientific interest because it was assumed to have come from a gorgosaur, a large flesh-eating dinosaur of which many specimens have been collected.

Over the years several scientists questioned this assumption, but it

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IN THE NEWS (Cont.)

was not until last year that Dr, Robert Bakker of the University of Colorado challenged the label on the skull.

He enlisted Dr. Michael Williams of the Cleveland museum and Dr.Philip Currie of the Tyrrell Museum of Paleontology in Alberta, Canada, to help him.

According to Dr. Bakker, this animal was much more like a tyrannosaur than a gorgosaur, even though it weighed only a tenth as much as tyrannosaur.
Since the bones in the skull are all completely fused, it must have been an adult and not a baby. The brain case, riddled with air canals used to cool the brain, is strikingly similar to that of a full-size tyrannosaur.

Tyrannosaurus rex, considered to have been the largest of all carnivorous dinosaurs, grew to a length of 16 metres and weighed about six tonnes.

The newly-established relative, now known as *Nanotyrannus* ("pigmy tyrant") *lancensis*, would have been five metres long and weighed half a tonne.

The beast looks to be very ancestral to birds, which also have extensive air canals in the brain cases of their skulls. In addition there are striking similarities.

Dr. Bakker believes that the discovery of an entirely new genus of tyrannosaur-like dinosaurs underscores the fact that the fossil record known to scientists barely hints at the diversity of dinosaurs.

In the whole history of paleontology, he said, only about 20 complete *Tyrannosaurus rex* skeletons had been collected.

New York Times report in the Sydney Morning Herald. Saturday, 9th April,1988.

ANCIENT "FROGS" REAPPEAR

In the last Bulletin (No.24) we included an item on page 6 under the heading "Ancient frog reappears in a blaze of amber".

Member, Alan Graffham of Geological Enterprises Inc., Ardmore,Oklahoma, has written to say that the note, based on a report in "New Scientist" dated 10th September,1987, is incorrect in stating that the frog in question"is the first documented case of an amphibian found in amber".

Alan states in his letter that there are at least 10 frogs known from Dominican amber and at one stage he owned one himself, a photo of which can be seen on page 340 of Gerard Case's book "A Pictorial Guide to Fossils" published in 1982.

He also notes that one was sold at the Tucson Show in 1987 by the same dealer that is reported to own the one mentioned in the article.

In addition to the frogs, Alan goes on to say that there are several documented cases of lizards in amber from the Dominican Republic. In fact on one trip he was offered three for sale. He believes that eight or more lizards have been found to date including a gecko which was sold at this year's Tucson Show.

Apparently not all these animals would be of Oligocene age as Dominican amber is known from various Cainozoic epochs including the Pliocene.

FOSSIL PLANTS IN LOCAL PARK

In Berwick's Wilson Botanic Park (42 kms.south-west of Melbourne, Victoria), fossil rich deposits dating back millions of years hold the potential for the park to become an education resource without equal in Victoria, according to a Melbourne palaeobotanist.

Fossil expert Neville Green says the former quarry is a site of considerable scientific significance which could give people the chance to see remnants of plant life which existed 22 million years ago.

Among the plants unearthed are examples of perhaps the earliest eucalypts found in Victoria, preserved in "fossil mud" which was once a tropical rainforest.

Remains of pollens, leaves and seeds have also been found at the park site which 22 million years ago had a high rainfall and stable temperatures similar to today.

According to Mr. Green there is also evidence of erupting volcanoes and a major flood.

He has suggested to the City Council that a "walk in" type display be set up so that people can see the relationship between ancient fossils and living species in the rainforest section of the park.

The deposits could be enclosed in a separate annexed area, where visitors could study the evolution of Australian flora.

However, rock faces containing fossils should first be stabilised, to protect them from the weather.

Report from the Berwick Banner, 13th April,1988.

DID YOU KNOW?

In southern Japan, crinoids are frequently brought to the surface on the long lines used for deep water fishing in Sagami Bay. Here unstalked crinoids, because of their beauty and delicacy of form, are called "Komachi" - a name originally borne by an exceptionally well-favoured lady of the Court upward of a thousand years ago. The stalked form of crinoid was known as the "bird's foot".

Austin H. Clark, "Monograph of existing crinoids". Bulletin No. 82, U. S. National Museum, 1921.

AUSTRALIAN PERMIAN BRACHIOPODS by Neil W. Archbold

PART 3

The Superfamily Strophalosiacea of the Order Productida Class Articulata

This large Superfamily of concavo-convex productid brachiopods is characterised by the presence of hinge teeth or denticles in the ventral valve and sockets in the dorsal valve. The ventral valve has a well-developed interarea with a pseudodeltidium closing the delthyrium (see fig.1). The dorsal valve has a low interarea. The ventral valve is usually cemented to the substrate at the umbonal region - the valve is flattish at the region of attachment which is called a cicatrix. The ventral valve usually carries spines (often rhizoid or root like). The dorsal valve carries fine spines or is smooth, at times with dimples or even capillae. Growth lines may be prominent.

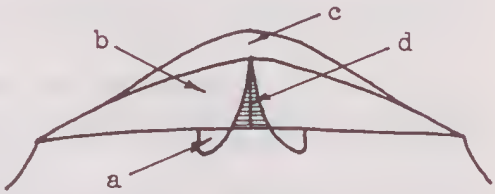

FIGURE 1. Umbonal region of ventral valve of a strophalosiid brachiopod. a = tooth, b = interarea, c = umbo, d = pseudodeltidium.

Large strophalosiid brachiopods are characteristic of the cooler-water faunas of the Permian world. They are abundant in the 'Gondwanan' faunas of Tibet, the Salt Range, the Himalayas, Western and eastern Australia and New Zealand and the cool faunas of Northern and North-eastern Siberia and Arctic Canada.

The following genera of strophalosiid brachiopods have been described from Australian Permian faunas - see figs. 2 & 3 :-

Strophalosia : Ventral valve with spines, dorsal valve without spines. Some 3 species known from Western Australian Sakmarian - Aktastinian (Early Artinskian) faunas. 2 species known from Asselian - Sakmarian eastern Australian faunas. Not known from New Zealand.

Heteralosia : Tiny species, large cicatrix of attachment, no dorsal spines. Some 5 species known from Western Australian Sterlitamakian (Late Sakmarian) to Kungurian faunas.

Echinalosia : Ventral and dorsal valves with external spines. Subovate to elongate in outline. 2 species

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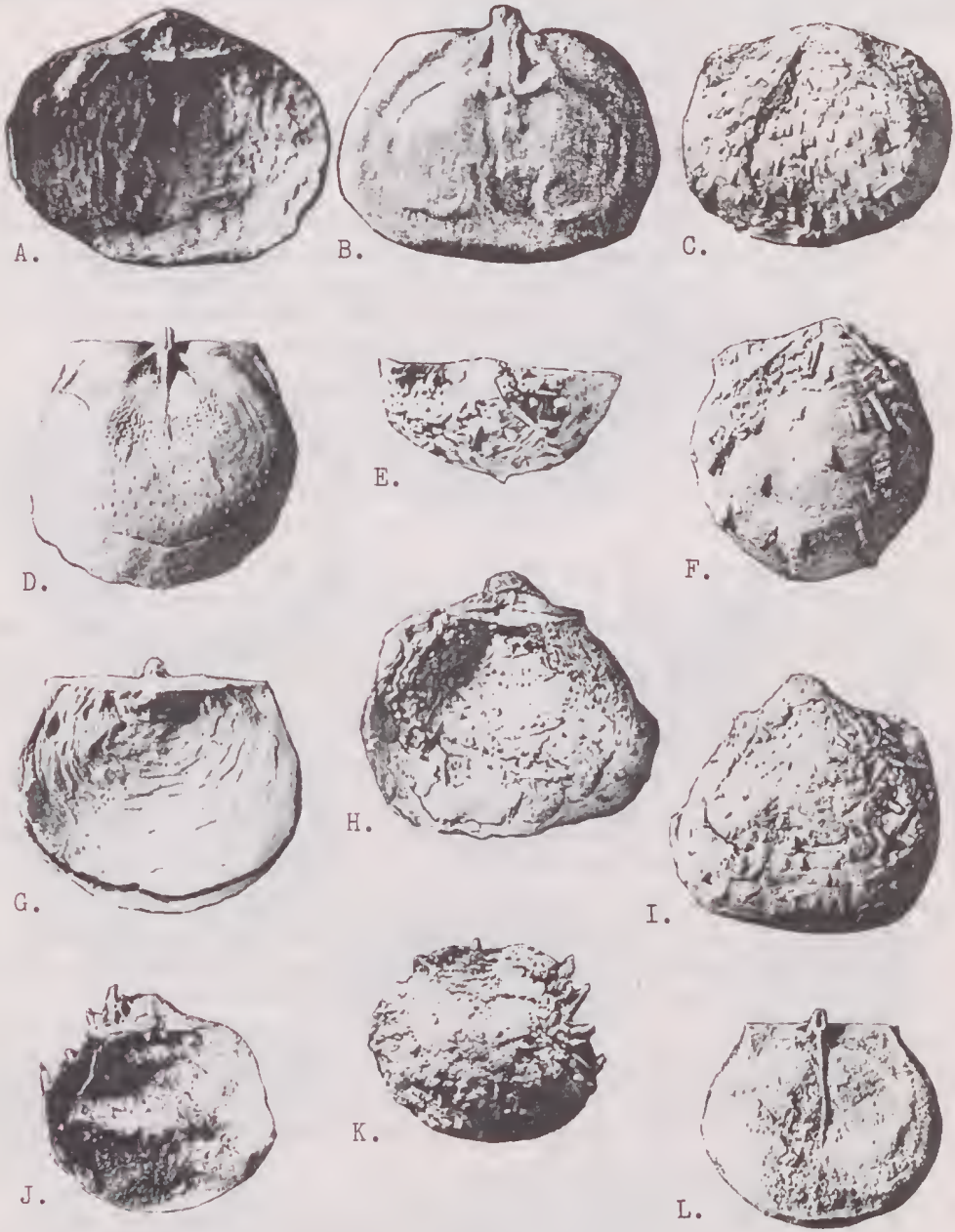

FIGURE 2. A & B, *Strophalosia subcircularis*, x 1·0, Tasmania Basin. C, *Strophalosia irwinensis*, x 1·2, Perth Basin. D - G, *Heteralosia etheridgei*, x 4·5, Carnarvon Basin. H & I, *Echinalosia prideri*, x 1·0, Carnarvon Basin. J - L, *Notolosia dickinsi*, x 2·0, Canning Basin.

AUSTRALIAN PERMIAN BRACHIOPODS (Cont.)

known from Western Australia (both Early Baigendzhinian = Middle Artinskian in age). Many species (12 +) reported from eastern Australian and New Zealand Permian faunas (Artinskian to Kazanian in age).

Notolosia : Produced as a subgenus of *Echinalosia* this genus is characterised by a large ventral cicatrix and numerous ventral rhizoid spines. Dorsal spines minute. 2 species known from the Late Permian (Chhidruan) of Western Australia.

Acanthalosia : Another subgenus of *Echinalosia* with flatter dorsal valve and tangled dorsal spines. 1 species known from the Artinskian of Queensland.

Costalosia : A peculiar genus with ventral costae developed. Known by 1 species from the Asselian of Tasmania.

Wyndhamia : A large genus with a long hinge line, ventral spines, fine dorsal spines and a wedge shaped (in cross-section) dorsal valve. 2 species known from the Artinskian of Western Australia. 4 or more species reported from Artinskian or younger faunas of eastern Australia and New Zealand.

Lialosia : No ventral or dorsal spines. Cicatrix of attachment small. Capillate micro-ornament. 1 species known from the Late Baigendzhinian (Late Artinskian) of Western Australia.

Liveringia : A very large genus with fine ventral spines, no dorsal spines but well demarcated dimples and fine capillae on the dorsal exterior. 1 species known from the Late Permian of Western Australia.

Mingenewia : A small bizarre genus from the Early Baigendzhinian (Middle Artinskian) of Western Australia. 1 species known. No external spines, no cicatrix of attachment. Pronounced dorsal growth lamellae.

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FIGURE 3. A & B, *Costalosia apicallosa*, x 1·4, Tasmania Basin. C,D,E & G, *Wyndhamia colemani*, x 1·0, Carnarvon Basin. F & I, *Liolosia kimberleyensis*, x 1·2, Canning Basin. H,L & M, *Liveringia magnifica*, H & M x 1·0, L x 2·0, Canning Basin. J,K & N, *Mingenewia anomala*, x 3·5, Perth Basin.

AUSTRALIAN PERMIAN BRACHIOPODS (Cont.)

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CINCINNATI PREPARES FOR A NEW ICE AGE

Specialists at the Cincinnati Museum of Natural History in the United States, are shaping an exhibit that will allow visitors to walk through a reconstruction of the Ice Age environment that existed in the region 19,000 years ago.

The $US2.8 ($A3.7) million exhibit will cover nearly 1,860 quare metres (20,000 sq.ft.) and will feature a landscape filled with replicas of the animals and vegetation of the Late Pleistocene Epoch, the last period when glaciers covered much of North America.

Over a period of nearly 2 million years Pleistocene glaciation affected the Ohio Valley's natural history more than other geological phenomenon, turning some of the region's rivers, including the Ohio and the Licking, in what is now northern Kentucky, into freshwater lakes by blocking and damming them. Just 29 kms (18 miles) south of Cincinnati is Big Bone Lick, Kentucky, now a state park, and the first internationally known vertebrate fossil locality in the United States.

Greg McDonald, the Museum's Curator of Vertebrate Palaeontology is working with experts on the period and artists who are crafting scale models of the exhibit animals. Information about the prehistoric vertebrates is being obtained from scientific literature and excavation sites such as the one mentioned above.

Gravel deposits in these sites hold valuable clues left behind when the region's glaciers melted and withdrew, clearing the continent for the appearance of modern man.

The exhibit will be unique because of its size and scale. Visitors will enter an interpretive area where they will learn about the palaeoecology, animal migration, extinction and survival of these early creatures as well as being able to view skeletons of the sabre toothed cat, stag moose,dire wolf, long horned bison and the ground sloth amongst others, in a display devoted to anatomy.

They will also obtain their first glimpse of the walk through palaeoenvironment by means of viewing windows discretely positioned

between the various displays before finally walking back through time to a huge crystalline ice cave.

Emerging from the freezing cold and creaking ice, visitors will be able to feel the wind and hear dire wolves howling in the distance; view the outwash plain as they pass a stream fed from the melting glacier; and see caribou, musk oxen, dire wolves and many extinct Pleistocene mammals. Finally, as they traverse the changing palaeolandscape they will pass a mastodon caught in a mud bog while a huge ground sloth watches.

A special mastodon exhibit and an area devoted to glacial geology are also to be included in the overall exhibit.

The project is not due to open until 1991 when the museum and the Cincinnati Historical Society move into the former Union Railroad Terminal which is being converted into a historic centre with the help of a public bond issue, after failing as a shopping centre.

Although the idea for the project was first envisioned in 1978, work on the site won't begin until 1989, although design documentation and the construction of the life size animal replicas is well under way.

The ultimate goal is to make the exhibit as realistic as possible, and to encourage scientific interest in youngsters by getting them to see science as a discovery, not just a memorization of facts.

Incredible detail down to the footprints of caribou and castings of musk oxen droppings will be included in areas such as the outwash plain.

It will take the diorama artist about two years to paint realistic background scenes on the 465 quare metres (5,000 sq.ft.) of wall and ceiling that will surround the exhibit. To appreciate the size of the project, you will have to walk 200 metres (660 ft.) just to pass through the exhibit and that is without deviating from the shortest route to look at all the individual displays and dioramas.

There will be no rails or barbed wire to keep people away from exhibits only natural barriers, such as the stream, to protect areas susceptible to damage. It will indeed enable visitors to step back in time.

Acknowledgements

The Editor wishes to thank the Cincinnati Museum of Natural History and in particular Greg McDonald for explaining details of this exciting project during a visit to the Museum last May (1987) and for forwarding newspaper articles and copies of floor plans to assist with the preparation of this article.

REPORT ON THE OCCURRENCE OF THE ECHINOID *SISMONDIA MURRAVICA* IN THE GIPPSLAND BASIN by Frank Holmes

The following article compares the external morphology of specimens of the echinoid genus *Sismondia*, found in the Gippsland Basin, Victoria, with the type description of *Sismondia murravica* Tate, 1893, which was based on specimens from the River Murray cliffs of South Australia. It is written to assist amateurs in understanding the requirements for identification of a specimen and the need for background material.

Locality and occurrence

Sixteen specimens have been collected from a single locality in the Bairnsdale Limestone Member of the Gippsland Limestone at Nowa Nowa in eastern Victoria.

They occur at the base of the upper shelly unit of the Bairnsdale Limestone Member which is typified by the presence of the bivalves *Spondylus* and *Ostrea*, the large echinoid *Clypeaster* and terebratellid brachiopods.

Measurement

Specimens collected range in size from 6.5 mm to 15.35 mm, the average being less than 10 mm in length.

To assist the identification of the genus, measurements of length, width and height were taken with a vernier calliper to an accuracy of 0.05 mm.

Other dimensions used to determine the position of the peristome (mouth), the periproct (anus) and the apical system in relation to the length, and the length of petals etc., were measured with a calliper where possible or use of a drafting scale under the microscope.

Because of the size and state of preservation of the specimens such measurements although estimated to 0.1 mm are quoted only as the average of the 16 specimens, there being no noticeable variation in proportion or position of features between large and small specimens.

Systematics of the genus *Sismondia*

Class	: Echinoidea Leske, 1778
Order	: Clypeasteroida A. Agassiz,1872
Suborder	: Laganina Mortensen, 1948
Family	: Laganidae A.Agassiz, 1873*
Genus	: *Sismondia* Desor,1858.
Type species	: *Scutella occitana* Defrance,1827; subsequent designation, Pomel 1883.

Generic description

Durham (1966) in the Treatise on Invertebrate Paleontology Part U, lists the main external features of this genus as small, margin inflated, petals open of length about 0.75 radius; 4 genital pores, hydropores in groove; periproct 0.4 distance from margin between 1st and 2nd pair of coronal plates; food grooves indistinct; about 6 interambulacral and 8 ambulacral coronal plates per column on oral surface and basicoronal interambulacral plates larger than ambulacral.

Specific description of Australian species

Sismondia murravica Tate 1893

To date this is the only recorded Australian species of this genus and was described from "several examples" found in the River Murray cliffs.

Tate's description of the species published in the paper "Unrecorded genera of the older Tertiary fauna of Australia", is as follows:-

> "Outline subdecagonal, broadly elliptical, being a little longer than wide, width greatest in front of apex coinciding with a plane through the ends of the antero-lateral ambulacra; actinal (oral) and abactinal (aboral) surfaces flat with a high abruptly-rounded margin; apical disc subcentral, posterior forming a slightly raised boss; genital pores four; petals elliptic, the width about two-thirds the length, extending for about two-thirds of the radius of the upper surface. Ornament finely and closely scrobicular. Periproct at about one half the distance from the peristome to the margin."

At the end of the description he notes that *S. murravica* differs from the type species *S. occitana* (Defrance) by its less tumid (inflated) margin, more depressed shape, and raised, not sunken, apical disk.

This Australian species does not appear to have been formerly redescribed. It receives a brief mention in Clark (1946), to the effect that "It looks more like a laganid than a fibulariid, but the petals are more like a *Fibularia*"; and is completely overlooked in Mortensen (1948), no mention being made of the occurrence of *Sismondia* in Australia.

Durham (1955), however, notes that the Australian species has fewer plates on the oral surface than the type species and includes a drawing of the plate structure on the oral surface (Fig. 1A) based on a hypotype **. Unfortunately, there is no reference to the origin

* In The Treatise of Invertebrate Paleontology Part U, Durham (1965), includes the genus *Sismondia* in the family Laganidae, as shown here. However, Nisiyama (1968), considers the genus to be a highly specialized form of the family Fibulariidae Gray, 1855, the family in which it was placed prior to Durham (1955).

** described or figured specimen used in publication to extend or correct the knowledge of a previously defined species.

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REPORT ON THE OCCURRENCE OF THE ECHINOID *SISMONDIA* (Cont.)

of the hypotype although it most likely originated from the River Murray area.

Sadler et al.(1983) give a simple description in their book "Fossils of southern Australia. Part 1: Sea Urchins of the Murray River Cliffs."

Discussion of material from the Gippsland Basin

Outline of test ranges from elliptical to subdecagonal (ten sided) as described by Tate, however, only one of the sixteen specimens was prominently subdecagonal. Several display a subpentagonal profile with gently rounded intersections between the finely curved "sides". Posterior end of most specimens, including those that tend towards a simple elliptical outline, is noticeably flattened.

Width is always less than length, although only marginally so, ranging from 90% to 97·5% of the length (average 94%). Maximum width is generally anterior to the centre of the peristome (mouth) and at or slightly posterior to the centre of the apical system. In smaller specimens the maximum width appears to occur on line with the centre of the peristome. The apex (highest point of the test) occurs marginally posterior to the centre of the apical system.

It should be noted that the centre of the apical system, the centre of the peristome, the apex and the maximum width all occur very close to each other and the lateral plane through the centre of the test as is shown by the following measurements: Centre of peristome as a percentage of the length ranges from 49.4 to 54.6 with an average of 51.8% (measured from anterior margin). Centre of apical system ranges from 43.8 to 49.8 with an average of 47.3% (similarly measured). These latter figures show that the apical disc is slightly anterior to the centre and not posterior as inferred by Tate.

Some specimens show a slightly raised boss at the apex. The fact that this is not noticeable on all specimens is probably due to the state of preservation. Where damage to specimens occur, this is nearly always on the aboral surface at or adjacent to the apex and apical system.

Oral surface concave for about 70% of the length; aboral surface convex (fig.1E). Margin thick and well rounded.

Four genital pores, petals almost fully open extending approximately 60% to 70% of radius on apical surface. Pore pairs follow a gently curved line and do not appear to be conjugate (connected by a groove).

Periproct (anus), submarginal (on oral surface), predominantly circular and situated 0.33 to 0.48 (average 0.41) distance from posterior margin to edge of periproct, between 1st and 2nd pairs of coronal interambulacral plates. This differs slightly from Tates description of the periproct being halfway (0.5). The predominantly circular shaped periproct also varies from Durham's illustration of the hypotype oral surface (fig.1A).

Two specimens are sufficiently etched on the oral surface to show that 3 or 4 coronal plates per column occur on the posterior interambulacra

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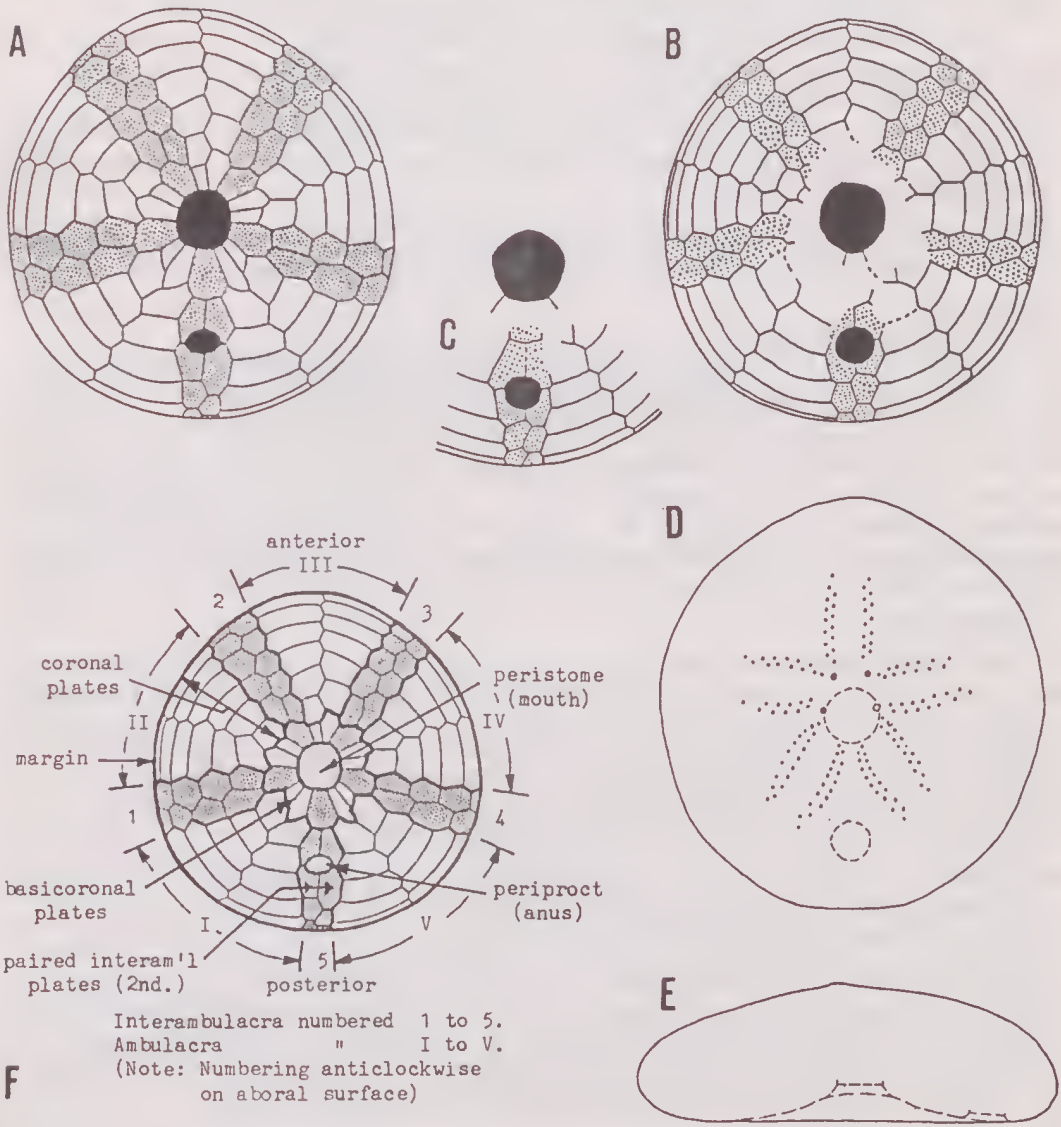

FIGURE 1. *Sismondia murravica* Tate. A, oral view of hypotype, x 4·2 (from Durham 1955); probably from Lower Miocene Mannum Fm., River Murray Cliffs, Sth. Australia. B, oral view of specimen No. 9, x 6; Middle Miocene Bairnsdale Limestone Member, Nowa Nowa, Victoria. C, part oral view of specimen No. 3, x 5, showing reversal of 2nd., 3rd., & 4th. pair of coronal plates in posterior interambulacra 5; loc. as B. D, aboral view of specimen No. 7, x 6, showing relative position of peristome and periproct on oral surface (broken lines); loc. as B. E, side view of specimen No. 7, x 6, showing transverse section through peristome and periproct (broken lines); loc. as B. F, oral view based on A, illustrating terms used in this article. Interamb'l plates dotted.

REPORT ON THE OCCURRENCE OF THE ECHINOID *SISMONDIA* (Cont.)

(1, 4 & 5) and 4 or 5 on anterior interambulacra (2 & 3). Similarly posterior ambulacra I & V have 5 or 6 coronal plates per column and anterior ambulacra II, III & IV have 6 or 7 (figs. 1B & C). Unfortunately, specimens do not show sufficient detail to illustrate the basicoronal plates (those around the peristome), however, they appear to be similar to the hypotype.

Detail of plates on the aboral surface is also insufficient for illustration although petals are well defined on one of the specimens (fig. 1D).

Conclusion

Although there are minor variations between the specimens collected from the single locality in the Gippsland Basin and Tate's description of the type species from the Murray Basin they are considered to be well within the range of variation to be expected within a species. This is confirmed by the close similarity between the plate structure on the oral surface and that illustrated by Durham (1955). Therefore, on the basis of the evidence currently available to the author the presence of *Sismondia murravica* Tate is recorded from the Bairnsdale Limestone Member of the Gippsland Basin, Victoria.

Distribution

At this stage there does not appear to have been any published record of the occurrence of *S. murravica* outside the Murray Basin, where they are reported as rare within the Mannum Formation (Sadler et al. 1983) and the occurrence discussed in this article. It is hoped that a more detailed study of the numerous other localities within the Gippsland Basin and elsewhere in similarly aged Tertiary sequences will shed more light on the distribution of this species.

Being small they are easily overlooked or initially mistaken for the more common *Scutellinoides patella* that is fairly widespread in mid Tertiary echinoid collecting localities.

Echinoids found associated with *S. murravica* near Nowa Nowa are *Clypeaster gippslandicus* (abundant); *Scutellinoides patella* (fairly common); a single specimen of *Lovenia* sp; fragments of two species of spatangoids, one of which is clearly a member of the family Pericosmidae; unidentified regular echinoids (uncommon) and large spines.

Age

The specimens from the River Murray cliffs described by Tate (1893) as Eocene in age are now known to be from the Lower Miocene, Mannum Formation (Longfordian). Those from the Bairnsdale Limestone Member are Middle to Late Middle Miocene (Bairnsdalian).

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BOOKS & BOOK REVIEWS

POSSUMS & OPOSSUMS : STUDIES IN EVOLUTION, edited by Michael Archer, published and printed by Surrey Beatty & Sons P.L., in association with The Royal Zoological Society of New South Wales, November,1987.

Recommended retail price AUS$112.00 plus $9.00 postage within Australia and overseas US$112.00 including postage.

For someone whose knowledge of possums, until recently, consisted only of the devious and underhanded ways that one of their taxa has of entering upon one's premises at unmentionable hours of the night; it came as a considerable surprise to be asked to review a book on marsupial evolutionary relationships and in particular the Phalangarida. To make matters worse the reviewer is not exactly familiar with that "other" group of animals known as vertebrates which don't seem to have familiar characteristics such as three lobes,pentamerous symmetry or even an external bivalve shell. What's more they are so infernally young; the oldest recorded marsupial, so we are told on page 161, comes from the Upper Cretaceous Milk River Formation of Alberta in western Canada and is a mere 83 or so million years old. Still, I guess that predates the first flat roof!

To be more serious a first glance at this folio sized two volume book, apart from giving one an initial shock at the complexity of marsupial ancestry and the extent of the detail it sets out to record, reveals that the first part of the title "Possums and Opossums" doesn't give a full indication of the contents.

While the work is primarily concerned with these particular creatures the book contains many papers on other marsupial groups within the Order Diprotodontia including the Koalas, Wombats, Diprotodons and

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POSSUMS & OPOSSUMS : STUDIES IN EVOLUTION (Cont)

relatives of everyone's old friend *Thylacoleo*. What is possibly the most important contribution is "A New Syncretic (attempted unification of differing schools of thought) Classification of the Marsupialia" although most Invertebrate Palaeontologists would be taken aback by the number of taxonomic units listed between Class and Order - 10 to be precise.

The book consists of 47 separate papers each having a bearing on the phylogeny (evolutionary history) of the marsupials. Each paper is written as a separate entity although in many cases they cross-reference each other without the need to consult the primarily systematic index.

Biomolecular and palaeontological subjects predominate a text which includes articles on such diverse subjects as immunology, parasitology and embryology of living groups. Of the four sections into which the book is divided; 1, Synthesis and overview; 2, Intercontinental phylogenetics and non-Australian marsupials; 3, Australian families - focus on living and fossil Australian diprotodont marsupials; and 4, Placentals are not marsupials; it is the third section that covers the descriptions of the many new fossil marsupial discoveries that fall within the scope of this book.

Much of the material described stems from the Miocene deposits of Riversleigh in the north-west of Queensland and Tarkarooloo and Lake Eyre Basins in northern South Australia, and the Early Pliocene deposit at Grangeburn near Hamilton in Victoria.

It is impossible in this review to mention all the new taxa described in the 800 or so pages, let alone give even a brief review of each paper.

This is a mammoth work which to read and digest page by page, assuming one has the educational background in all the zoological and biological disciplines, would take weeks.

"Possums and Opossums" is not a book for those who want something to browse through at random or even to read a single paper without first gaining a reasonable appreciation of the other material in the book. Even Archer & Aplins' "Synthesis and Overview" is a major work in itself.

While the general layout is conventional in following the normal format for scientific papers, the inclusion of twelve exquisit colour plates (the dust cover refers to 11) of fossil marsupial reconstructions by artist and palaeontologist, or is it palaeontologist and artist, Peter Murray, helps lift the visual appeal.

The numerous black and white photographs and anatomical drawings are

generally excellent, although occasionally photographs lack clarity and some line drawings of teeth are scrappy and of little value.

Two other minor distractions relate to the variation in size of the letters used to identify individual drawings, which appears to be due to inconsistency in the scale of reduction from the originals; and to a combination of the use of too small a type horizontally and vertical printing of words at the top of a couple of tables, which makes them virtually unreadable.

However, these are minor criticisms of what must be considered an exceptional review of the current knowledge of the evolutionary relationships of both American and Australian marsupials. There can be nothing but praise for the scientific effort behind this book.

Finally, and this is not a criticism of this work in particular, but rather scientific publications in general, a plea to our academic friends and indeed albeit surreptitiously to publishers having a financial interest in the outcome of their labours.

By developing and using, mostly without definition or explanation, a scientific jargon only fully understood by workers within one or two similar disciplines, you are not only self restricting the distribution of information among other professionals associated with the multi-disciplinary world of natural history, but to a wide range of laypersons interested in the natural sciences. What is more important to the advancement and understanding of this research, particularly when it is not "materially" related, is the fact that such laypersons may have a financial interest in the expenditure of grants, even if it is only as a humble taxpayer.

Accepting that many scientific and descriptive words do have a special and particular meaning that cannot be conveyed by a single word in common usage, then an attempt must be made to include simplified introductory and conclusionary sections to papers or chapters and where necessary a short glossary or diagrammatic explanation of terms.

Science is rapidly digging a moat between itself and the rest of the community - if this continues we will all suffer in the end.

Both the Editor and the Publishers are to be congratulated on the final outcome of this project, prepublication of which was listed in "The Fossil Collector" back in October,1985!

This book is available direct from the Publishers - Surrey Beatty & Sons Pty.,Ltd., 43-45, Rickard Road, Chipping Norton,N.S.W.,2170.

Review by Frank Holmes with assistance on scientific matters from David Middleton, Resident Veterinarian, Healesville Sanctuary, Victoria.

PREHISTORIC NEW ZEALAND by Graeme Stevens - with contributions by Matt McGlove and Beverley McCulloch.
Publisher: Reed/Methuen (NZ). Approx. price $NZ39.95.

This new book, due to be published in September,1988, represents an exciting new approach to the understanding of ancient New Zealand, tracing it from its genesis through the various geologic periods to the present time. Of particular note will be the dramatic reconstructions of what ancient environments and life forms probably looked like at different periods of time.

The principal author, Graeme Stevens, is Chief Palaeontologist at the New Zealand Geological Survey of the D.S.I.R. and a distinguished research scientist. He is also author of the award winning books New Zealand Adrift and Rugged Landscape.

The book is divided into 8 chapters, the first three covering the Palaeozoic and Mesozoic Eras and the other five, the Early Tertiary to Recent period, the last chapter dealing with the human impact and the extinction of the moa.

The text will also include three inset articles covering the evolution of marine life, New Zealand flora, and New Zealand birdlife and a fourth devoted specifically to the moa.

VICTORIAN GEOLOGY EXCURSION GUIDE

Enquiries or orders should be directed to the Australian Academy of Science, G.P.O. Box 783, Canberra,A.C.T.,2601. Price $29.95.

The new Victorian Geology Excursion Guide will be of interest to anyone who would like to see and know more of the Victorian countryside.
The Guide has been written to cater for a wide audience ranging from school teachers and tertiary students to interested amateur geologists, field naturalists and tourists.

Twenty five excursions are included, most being one day excursions departing from Melbourne. Each is presented in a separate chapter within which each of the sites covered is described in terms of geological features present.

The Guide includes information on travel directions, special conditions, permits needed and dangers involved. There is an abundance of illustrations, maps, diagrams and plates to provide an overall perspective of the areas studied as well as an extensive index.