
BEER'N'BONES

Volume 2, Number 2.

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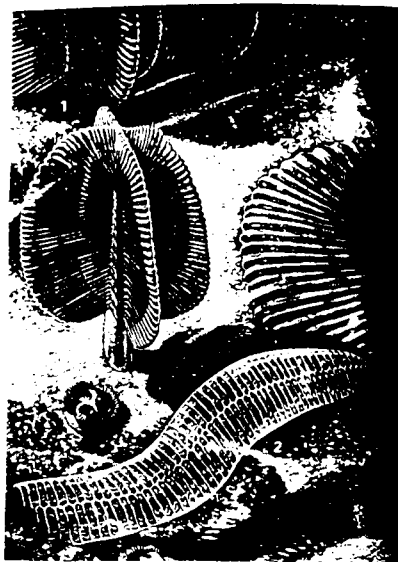
FLINDERS UNIVERSITY PALAEOLOGY SOCIETY

From the president

Second term already? Where does the time go? The Palaeo Soc has certainly been active. The 70's night was a real hoot. While we didn't make a profit (in fact we struggled to break even), the night itself was very much a success. Most people dressed in 70's gear. The prize for best dressed would have to go to **Dan Smith** (who is now finally a member!!) for his spectacular entrance as Barry Gibb of Bee Gees fame. Even the hair was authentic. Thanks to all who helped and especially to those who donated. Without the donations, the stain on the bank balance would have been nasty. Special thanks to **Steve Brown** and his dad **Tony** who once again supplied the meat for the barbecue, to **Inthira** for organising the night and making it happen, to **Sally** for the lights, to her, **Chris** and **Gav** for cooking, to those who supplied salads or donated food, to those who set up and cleaned up, supplied music and music machines, to those who dragged along friends, to **Matt B.**, **Fernando**, **Chris**, **Paul** etc for shaking their little tooshes on the catwalk and to the committee for all their support.

Dave Bart has held 2 well attended sorting sessions to help him with his project. They tell me the food was excellent. Good luck with your Honours project Dave. An abstract of his project and those of our other members are included later in this issue.

The Vertebrate Palaeo Post-grad conference, arranged by **Matt** and **Liz** has finally happened.



Again this event was a great success. Well done guys! A report of this event is also included later. Many, many thanks to **Linda-Marie Hall** who did a fantastic job of organising the catering for this event. It was a huge job and she has proved what a capable and organised person she is, especially on a shoestring budget. She had many compliments from participants. Also thanks to **Raelene**, **Rachel**, **Simone**, **Inthira**, **Chris**, **Dave** and **Kristen** for creating an efficient team. We had compliments on how well we worked together.

I guess it is now time to get on with assignments and projects, as the semester winds to a close. Happy(!) studying.

Lyndlee Turner

Please note
Membership is now overdue.
Please pay you \$5.00 ASAP

MONTHLY MEETINGS

June 3rd at 1:00pm in 028

July 1st at 1:00pm in 028

Write them in your diary or try to find some way of reminding yourselves.

***** Simone Dalgaieris and Dave Bart are now in charge of T-shirts as Fernando has left Uni. The current order is now being processed. However, T-shirts can be ordered at any time. Orders will be placed after every 20 orders.*

Naracoorte Herald
Monday Feb 23 1978

50 fossil experts at Caves

A WORLD leader in palaeontology will be among about 50 delegates to an innovative conference at the Naracoorte Caves on April 15-18.

The vertebrate palaeontology post-graduate student conference is largely being organised by Flinders University PhD students Liz Reed and Matt McDowell. Both are using the Naracoorte Caves as their key research site.

The keynote address will be given by the curator of palaeontology at the American Museum of Natural History, Dr Richard Tedford.

"He's the god of palaeontology," Ms Reed told a Naracoorte Tourism committee meeting last week.

She said it was a real coup to have him at the conference.

While the conference was initially designed for postgraduate students, a number of academics from major Australian universities and professional palaeontologists were now coming because of Dr Tedford's presence.

Ms Reed and Mr McDowell are based at the caves for two to three weeks out of every two months while completing their PhD studies, which they started almost a year ago.

She said the conference was primarily intended for post-graduate students of vertebrate palaeontology and related disciplines - such as archaeology - but it was also open to undergraduates, supervisors and professionals.

Initial expressions of interest had come from 50-60 people from every Australian State and Territory.

The conference will also feature a presentation by the associate professor of palaeontology at Flinders University, Dr Rod Wells, who was one of the discoverers of the fossil deposits in the Victoria Fossil Cave in 1969, and caves park manager Mr Brian Clark.

Mr Clark will speak on the park's management and conservation issues.

The bulk of the conference program will be taken up by the presentation of papers by stu-

dents. However there will also be caving tours and group discussions.

A winery tour has been suggested to give participants a break from the busy conference program and informal get-togethers will be held in the evenings.

Ms Reed said that the conference had started in a relatively small way and "snow-balled".

The World Heritage listed Naracoorte Caves Conservation Park was an ideal venue for the conference because it was one of the most important fossil sites in the country.

She and Mr McDowell also wanted to make sure that people were aware of the construction of the new caves interpretive centre.

"If they want to see it in full flight, they'll have to come back," Mr McDowell said.

They have had a lot of help from the Naracoorte Caves staff to organise the conference and last week also attended committee meetings of Naracoorte Tourism and Naracoorte Chamber of Commerce to talk about plans.

Because many of the delegates will be students, costs have been kept down and the conference package costs only \$100, including all meals, morning and afternoon teas, camping fees at the conservation park and registration for the four days.

Non-package delegates will arrange their own meals and accommodation, and pay \$20 registration, but camping will be available at the Caves park for a special rate of \$2 a night.

There will be a conference dinner at a Naracoorte hotel or restaurant on April 17.

Naracoorte Tourism is posting a package of information about Naracoorte, as well as Coonawarra wineries, to all the potential delegates; and has suggested an alternative tour - to take in Bool Lagoon, Bourne's Bird Museum and other museums and possibly James's Quarry - for one afternoon of the conference.

The chamber invited Ms Reed to let it know if there was any help the conference needed.

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VERTEBRATE PALAEOLOGY POST- GRADUATE STUDENTS CONFERENCE

by Lyndlee of the Catering Corp

This conference was held from 15th to 19th April. It was organised by Liz Reed and Matt McDowell who volunteered in a moment of madness. The Palaeo Soc was asked to volunteer its catering and general odd jobs capabilities and all post-grad members of the Society presented papers. The conference was well attended and we were honoured by the presence of Dr Richard Tedford, one of the original gurus of Australian palaeo, who is now Curator of Vertebrate Palaeontology at the American Museum of Natural History in New York.

We arrived on Tuesday to set up the kitchen and to organise Blanche Cave, where the papers were to be presented. Unfortunately Renniks hire were not so prompt, having only delivered half of the hired gear. We quickly found out how well Linda-Marie and the catering corps could improvise. Liz had arrived with a bus load of interstateers off the plane and others were starting to arrive in dribs and drabs and everyone wanted a cup of coffee (mmm... no cups!!)

Despite this and a few other hassles, Wednesday still arrived and everything was organised. Mornings started with breakfast served from 7:00 am. The mornings were cold and crisp, the fog beautiful. This was before the Girl Guides arrived so we were still able to have a hot shower at this stage. More people were arriving.

The conference began at 9:00am, kicked off by Brian Clark, Caves Manager, who then led a tour of Blanche Cave. After morning tea Dr. Tedford gave the keynote address on the



Conference organisers Matt McDowell and Liz Reed clean the lower jaw of an

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geology and fauna of the Lake Eyre basin. Following lunch Rod Wells related the history of Naracoorte and Kevin Moriarty and Linda Ayliffe (ANU) spoke of dating of the caves. The PM session included a tour of Vic Fossil. Meanwhile the Catering Corp were busy in the kitchen creating gastronomical delights and dealing with the already constant flow of dishes. Night came, a few beverages were consumed in the tent and many sought to evade the cold by congregating in the minibus where stories were related in several broad Scottish accents!!

Thursday started with another beautiful foggy morning and a few hangovers. The morning included the lizards boys, Adam Yates (LaTrobe) who had spoken to the Palaeo Soc last year, continued his temno-spondyl story, Scott Hocknull (UQ) talked about "lizardy bit of the Arcadia Formation" and "fossil frillies". Mark Hutchinson (SAM) on Pliocene lizards from Chinchilla and Craig Williams (Adelaide) surprised people by suggesting you can use dentition as a diagnostic tool for lizard identification. After morning tea Jenni Brammel (UNSW) spoke of Tertiary Possums, Gav P. spoke of the evolution of sthenurine kangaroos, Dave B. related his work so far on Wet Cave and John Barrie described and compared Henschke's Cave to Vic Fossil. I missed all of these as I was on my way to Mt Gambier to take a fellow dole-bludger to DSS to lodge his form.

The afternoon session gave people opportunities to go caving (or sleep). Once again the Catering Corp were having fun in the kitchen creating Chinese chicken and Rach's piss-easy dessert and already compliments were coming in. It was a noisy but efficient team.

Friday. The fog was getting thicker in the morning and the

Girl Guides had used up all the hot water. Driving to Carters, Raelene noticed a kangaroo sitting on the side of the road after we had driven past. I'm glad it decided to sit still as I never saw it. Steve Wroe (UNSW) spoke of his work on carnivorous marsupials, Troy Myers (UNSW) introduced us to cenograms, Steve B gave us an update on Cathedral, Liz R took us through "modern analogues for taphonomic processes in caves", Grant G lead us through Tight Entrance Cave, Esme Webb (Edith Cowan) argued against Tim Flannery's suggestions for megafaunal extinctions and Tim Hamley (UQ), the organiser of the 1st Vert. Palaeo conference on Stradbroke Island in 1996, gave a hilarious but thought provoking discussion on the ? of cladistics.

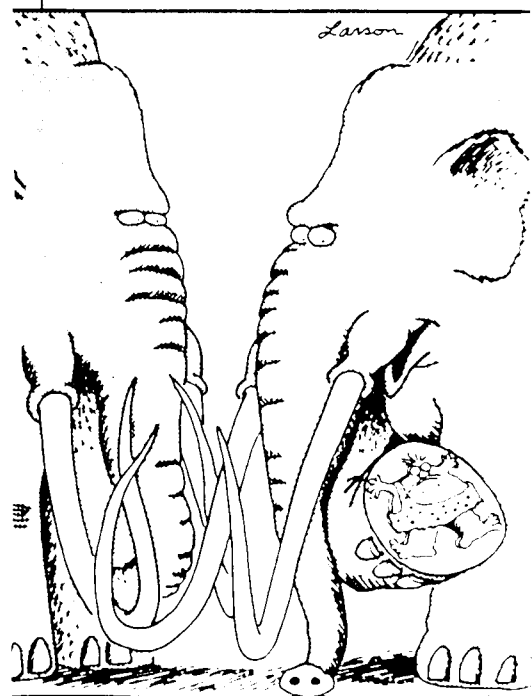
The afternoon session was an own choice. Many returned to the caves or quarries, some did a spot of bat watching at dusk. I volunteered to forsake alcohol to drive Alex Baines (the great wine connoisseur) and a mob of other winos on a wine tasting tour through the Coonawarra and yes, no wine touched my lips but I certainly learnt a lot about wines from Alex. The night was spent wining and dining at the Kingcraig. Sitting at Alex's table has definite advantages. I drank his wine and listened to he and Esme telling tales on each other.

Saturday. Not so cold this morning, its overcast. After chopping up hundreds of onions (I offered, other contact lens wearers will understand why) we returned to Blanche cave. It's geology day. Esme spoke again, Matt Mc presented his work on cones (geologically speaking), Sue White (LaTrobe) spoke of the karst of S-E Australian limestone caves, Pyramo Marianelli (ANU), who many of you would know from his Honours year here at Flinders, presented his research on dating

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techniques using speleothem formation and Tim Barrows (ANU) informed us of the Australian Quaternary Data Archive. Tim Anson was late. He didn't arrive till after lunch so he gave his talk in the lounge room at Carters then left again!! People began leaving after lunch. Others sat in the sun and intermingled. The catering corps had less to feed that night. We started to tidy up and continued to intermingle. I spent the evening watching very bazaar games of cards. We were all starting to suffer from lack of sleep. Later I was surprised how many people could fit into a Subaru.

Sunday and it's raining. We finish packing up the Renniks stuff, in the rain, packed up our tents, in the rain, and returned to Adelaide, where it was raining even harder. Well done Liz and Matt, you can return to your PhD research now. Well done Linda-Marie and crew. Well done presenters. We can be proud of our little corner of the palaeo world. Good luck to UNSW. It's their turn next.



"Well, what the? ... I thought I smelled something."

■ NGS RESEARCH GRANT
**A "New" Jaw Reopens
 Some Old Questions**

This shrew-size mammal (right) lived in what is now Australia 115 million years ago. But to the researchers whose team uncovered its fossilized jaw southeast of Melbourne, the animal was in the "wrong" place at the "wrong" time. That's because its teeth hint that it may have been a

placental mammal. And except for bats, placentals are not known to have entered Australia until five million years ago.

Thomas Rich and Patricia Vickers-Rich found this jaw in a long-term Society-funded search for early Cretaceous fossils. Its



teeth indicate *Ausktribosphenos nyktos* was neither an egg-laying mammal like a platypus nor a pouched marsupial like a kangaroo. "A good case can be made that it is a placental," Rich says. "If so, it will force us to rethink basic ideas about the origin and evolution of mammals."

APRIL 1998

STEVEN MOULTON, ART BY DRAGA

From March edition of National Geographic.

For those of you who are interested in the projects of our post-graduates, the following are the abstracts submitted to the students conference which outline their research.

**David Bartholomeusz
 (Honours Project '98)**

The Stick Entrance sediment cone of Wet Cave (Naracoorte) contains an accumulation of extinct and extant remains in a time series that begins in the Pleistocene and continues to the present day. Sedimentological, faunal and taphonomic analysis of the deposit may yield an insight into palaeoecological change in the region. Sedimentological investigation reveals the complex depositional history of the site, and provides evidence of reworking of the sediments. Preliminary faunal identification confirms the presence of amphibians, reptiles, including the varanids *Varanus varius* and *Varanus gouldii*, the scincids *Egernia cf. whitei*, *Trachydosaurus rugosus* and *Tiliqua nigrolteia*, elapid snakes, and the extinct boid

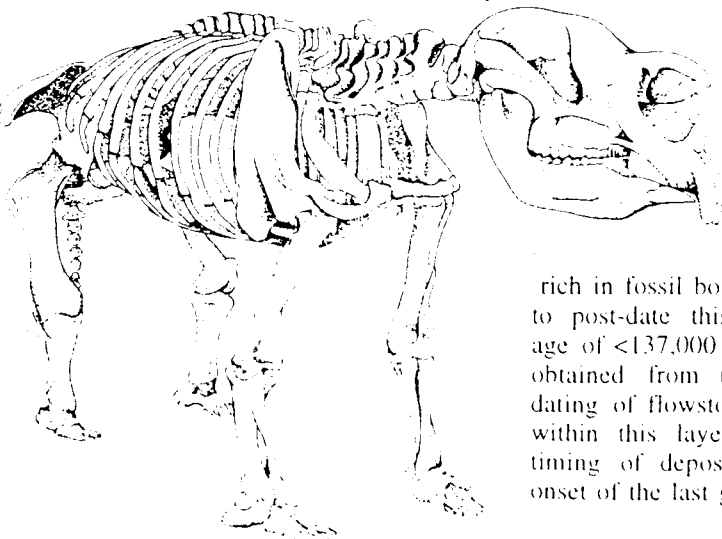
Wonambi naracoortensis, birds, including the tytonid *Tyto alba* and the grallinid *Grallina cyanoleuca*, and a Meliphagid *Lichenostromus cf. virescens*, a plethora of small mammals, including placentals such as the murids *Mastacomys fuscus*, *Notomys sp.*, *Pseudomys apodemoides*, and *P. australis* and the vepertilionid *Miniopterus schreibersii*, and marsupials including the peramelids *Isoodon obesulus*, *Perameles bouganville* and *p. gunnii*, the dasyurids *Dasyurus viverrinus*, *Phascogale sp.*, *Antechinus cf. flavipes* and *Sminthopsis sp.*, the potoroids *Potorous sp.*, and *Bettongia penicillata*, the burramyid *Cercartetus sp.* the pseudocheirid *Pseudocheirus peregrinus* and the phalangerid *Trichosurus vulpecula*, and larger mammals such as the vombatid *Lasiorhinus sp.*, the macropodids *Macropus rufogrisens*, *M. rufus*, *M. giganteus*, *Lagorchetes leporides* and *Petrogale cf. xanthopus*, *Protemnodon sp.* and *Sthenurus sp.*, and the diprotodont *Zygomaturus sp.* Preliminary taphonomic analysis suggests multiple and compound taphonomic imprints on the fossils in some sedimentary layers, and the investigation of the nature and significance of

these effects will be the focus of further research at the site. Once taphonomic biases have been estimated, a tentative palaeo-ecological reconstruction of the site will be attempted. It is hoped that similar research at other sites might be considered in conjunction with the present research to provide a model of community dynamics in the region from the Pleistocene to the present day.

**Steve Brown
 (Honours project 1998)**

Cathedral Cave is one of the many fossil assemblages within the large cave system located at Naracoorte. These fossil accumulations provide a tool from which possible reconstructions of the vertebrate community during the Pleistocene can be inferred. Dating studies (Ayliffe et al in press) have revealed the promise of Cathedral Cave's fossil deposit and prompted a need for more research to be conducted on this fossil accumulation. Age determination was achieved by uranium/thorium dating and flowstone conducted by the Research School of Earth

Sciences at ANU. The dates obtained so far provides a means to 'sandwich' fossil bearing sediment in time. Although research is in it's early stage, a preliminary species list can be presented. Small vertebrates seem to be equally represented along with their megafaunal counterparts. Small vertebrate collected thus far include: *Mastacomys fuscus*, *pseudomys sp.*, *Isoodon sp.*, *Perameles sp.*, *Antechinus sp.*, *Dasyurus maculatus*, *D. viverrinus*, *Thylacinus cynocephalus*, *Varanus varius*, and *Tiliqua sp.* The megafauna present include *Macropus giganteus*, *Sthenurus gilli*, *S. brownei*, *Procoptodon rapha*, *Protomnodon roechus*, and *Zygomaturus trilobus*. Among the birds species, *Dromaius sp.* is the only representative thus far. Taphonomic investigations will incorporate positional patterns, breakage patterns, surface features, age distributions and element and species abundances. The aim of this taphonomic examination is to identify collection agencies and any biasing which may be present during accumulation, thus affecting palaeoecological interpretation.



Grant Gully (Honours Project 1997)

This study examines a Late Pleistocene cave deposit near Margaret River, south-western Western Australia. The recently discovered fossiliferous sediments of Tight Entrance Cave contain 37 mammal species making this the richest and most diverse assemblage of Pleistocene vertebrates in the western half of the continent. A new species of bettong, approx. 30% larger than any species previously known was also recovered from the deposit. Palaeoenvironmental and biogeographical implications are considered based on investigations of the geology of the cave and its contained sediments, and the systematics and taphonomy of the fossilised fauna.

Formation of the cave and accumulation of its sediments are clearly the result of a complex series of events. The lowest fossiliferous layer investigated appears to have accumulated before the collapse of a twin level cave system. The next highest fossiliferous layer is

rich in fossil bone and appears to post-date this collapse. An age of <137,000 years has been obtained from uranium series dating of flowstone interbedded within this layer, placing the timing of deposition near the onset of the last glacial.

The fauna present in these lower layers suggests a surrounding environment similar to that present prior to European settlement, i.e., an array of open

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and closed sclerophyll forests and woodlands with a shrubby understorey, and adjacent coastal heath. The density of faunal remains low in the stratigraphic section may imply relatively high productivity in the area at the time of deposition. The comparatively sparse upper fossil layers may point to decreased productivity associated with the onset of more arid conditions during the early development of the last glacial period. However, presence of flowstone nearer the top of the section suggests that periods of high precipitation continued intermittently.

Matt McDowell PhD thesis

Caves are the smallest and possibly the most complex of all sedimentary environments. They are subject to a wide range of depositional processes and invariably possess very complex geometry that further complicates interpretation. Several depositional environments have been identified within caves but my interests lie primarily with the "Entrance Environment" and the "Interior Environment" where elastic sediments are trapped in the vadose zone. The sediments (and fossils) that are preserved in the karst caves of the south-east of South Australia represent a proxy climatic record for the region that has been largely derived from the surrounding surface sediments. No single cave appears to contain a continuous sedimentary record, but as caves open and close episodically the deposits from several caves may be pieced together to compile a more complete history. In order to accurately interpret the sedimentary records preserved within the Naracoorte caves system we must understand the processes and circumstances that have controlled their

deposition. We must also understand the chronological relationships of the different deposits. The dynamic processes of cave sedimentation and their implications for time resolution of fossil deposits are discussed in this paper.

Gavin Prideaux
PhD thesis

The Sthenurine is a subfamily of extinct kangaroos present in Australian terrestrial vertebrate faunas of the Pliocene and Pleistocene. It includes *Sthenurus* and *Procoptodon*, but has recently been expanded to include the late Miocene *Hadronomas puckridgi*, the Pliocene genus *Troposodon* and the extant banded hare wallaby, *Lagostrophus fasciatus*. Nevertheless, no all-inclusive review of the subfamily has been undertaken in the last 30 years, a duration in which many new *Sthenurus* species have come to light along with a greater appreciation of the most taxonomically useful characters. Following a redescription of all sthenurine taxa, I find strong support for the monophyly of *Hadronomas*, *Sthenurus* and *Procoptodon*, but none for the inclusion of *Troposodon* and *Lagostrophus*. They are macropodines that appear closely related to each other and *Protemnodon*. *Hadronomas* is the plesiomorphic sister group to *Sthenurus* and *Procoptodon*, and must have arisen soon after the evolution of the group in the medial to late Miocene. The similarly derived Pleistocene stage of evolution expressed by most of the 22 *Sthenurus* species makes it exceedingly difficult to establish a phylogeny for the genus, however, certain distinct lineages are apparent and I consider the importance of heterochrony in their evolution. The groupings are generally similar to those proposed

previously but misconceptions identifiable because many more species are now known suggest the abandonment of the subgenera *Simosthenurus* and *Sthenurus sensu stricto* as defined. While it is itself monophyletic, *Procoptodon* appears to have arisen within a branch of *Sthenurus*. With the monophyletic, sthenurines re-established, I consider their position within the remainder of the Macropodoidea and review higher level systematics as well as homologies of several dental features. From a functional perspective, the changes that typify sthenurine evolution support the long held view that sthenurines evolved to browse on tough vegetation.

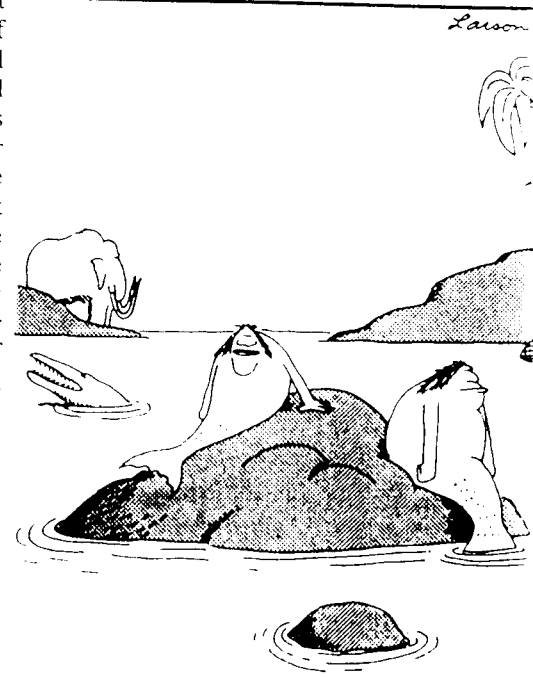
Liz Reed
PhD thesis

A great deal of taphonomic research has concentrated taphonomic processes as they operate today, and using them as analogues for the past. While this is a profitable method, it can often be difficult to find sites which provide such analogues. Wombat cave provides an excellent opportunity for this type of research, as it contains fossil and recent bone material accumulated by processes analogue to those responsible for the accumulation of many of the bone deposits in the caves at Naracoorte and other sites. The cave consists of 2 large chambers connected by a low crawlway. The first chamber contains recent bone material of kangaroos and other fauna collected via the entrance which has acted as a pitfall. An active stream channel (fed by the entrance during periods of high rainfall), operates to concentrate and disperse bone material further into the cave, providing an opportunity to study hydrodynamic transport within the cave environment.

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The second chamber of the cave contains extensive formation and rockfall, and also recent bone material from grey kangaroos and possums. Fossil specimens have been collected previously from this chamber during the late 1960's and early 1970's and are held in the collections of the Flinders Uni and the S.A. Museum. Species represents include: *Protemnodon* sp., *Progura naracoortensis*, *Sthenurus browni*, *S. gilli*, *Macropus giganteus*, *M. rufogriseus*, *Vombatus ursinus*, *Dasyurus viverrinus*, *Perameles gunnii* and *Trichosurus vulpecula*. Fossil deposits remain in this chamber and appear to have been concentrated by mechanisms similar to those still active in the first chamber. The author hopes to excavate in this chamber in order compare taphonomic information between the 2 chambers.

Thanks again to Raelene Sherwin for these copies of Far-side cartoons.



Early Pleistocene mermaids

You'd think they were finding gold



Flinders University palaeontology students put their studies into practice in the fossil chamber of the Fossil Cave at Naracoorte Caves Conservation Park.



Flinders University students Clare Munro (left) and Sophie Brown search for fossils in a small tunnel in the Victoria

Above : From Naracoorte times, March 1998

Right : From Advertiser February 1998

By Josie Collins

LIGHTS, dustpans, dig!

That was the order of the day at Naracoorte Caves Conservation Park last month.

The park hosted a two-week field trip - with a focus on vertebrate palaeontology - from third-year Adelaide university students.

Most of the 25 students - from a range of scientific backgrounds - were from Flinders University.

Two were from Adelaide University and one was a US exchange student.

Six staff and 10 volunteers accompanied the students, who returned to Adelaide a week ago.

Flinders University PhD student Liz Reed, who

was involved in supervising the students, said it was a "closely guided hands on" field trip.

It involved a series of lectures backed up with

'It may be the first time they have ever seen a cave and a fossil...'

practical assignments as well as exploratory work in the caves, largely the fossil chamber in the Victoria Fossil Cave.

The students also got to prepare fossil specimens.

"They get to practise

being a real scientist," Ms Reed said. "We can't drag some of them away!"

"They often ask, 'Can't we stay just a little bit longer?'"

Fellow PhD student and supervisor Matt McDowell said: "The students get so excited about it. It's really nice to watch that."

Ms Reed said it was one of the first field trips that many of the students had been on as part of their studies.

"It may be the first time they've ever seen a cave and a fossil."

Ms Reed said the students had to keep log books of their daily activities.

Once they returned to Adelaide, they also had to write essays on key issues from the field trip.

World



Excitement over 'bird dinosaur'

MILAN When an Italian shoemaker found the remains of an ancient creature preserved in limestone in southern Italy, he wrote it off as just another fossil and put it in his cellar.

And, until he saw Steven Spielberg's epic dinosaur film *Jurassic Park*, he really considered what his find might be uninteresting. In the end, it turned out to be the preserved dinosaur ever unearthed.

Italian palaeontologists yesterday unveiled a 113-million-year-old remains, complete with skin, intestines and internal organs.

"This is an incredible specimen which almost went forgotten in a fossil collector's cellar," said Cristiano Sasso, a palaeontologist at the Natural History Museum in Milan.

Palaeontologists named the baby dinosaur *Scipionyx Samniticus*, which is a distant cousin of the powerful dinosaur *Tyrannosaurus Rex* and *Velociraptor*. It is believed to be an early ancestor of birds.

It was discovered in stone in the Benevento province of southern Italy and may have been weeks old when it died.

Although the exact date of death is unknown, Mr Sasso suggested it had tumbled into a cave during a storm.

UNIQUE FIND: Although just a 10cm baby when it died, the armoured dinosaur could have grown to a length of about two metres had it not met death in a lair

NATIONAL GEOGRAPHIC magazine ranked 2 domains that exist in the spectrum of life with Australia as the key player. March issue presented "The Rise of Life on Earth" and argued cases for primordial Earth as freezing, temperate or steamy (see below)

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DID LIFE BEGIN IN A BALL OF ICE?

1,000 feet of ice
Ice caps the ocean and shields it from UV light. At the base of the ice, pockets of water bring organic compounds together for possible reaction.

Formaldehyde
Ammonia
Deep-sea vent

LANDSCAPES BY JONATHAN HERBERT, CHEMICAL REACTIONS BY KEN EDWARD

Although many scientists believe carbon dioxide in the atmosphere kept the world warm, some envision a global winter. "Let it freeze," says Jeffrey Bada, a biogeochemist at Scripps Institution of Oceanography in La Jolla, California. "The colder the temperature, the more stable the compounds." Interplanetary debris, hydrothermal vents, and atmospheric reactions could have provided compounds such as formaldehyde, cyanide, and ammonia. These then combine in water within a lattice of ice (above) a process that results in an amino acid called glycine. A huge meteoric impact ultimately could have thawed this frozen world.

... A POND?

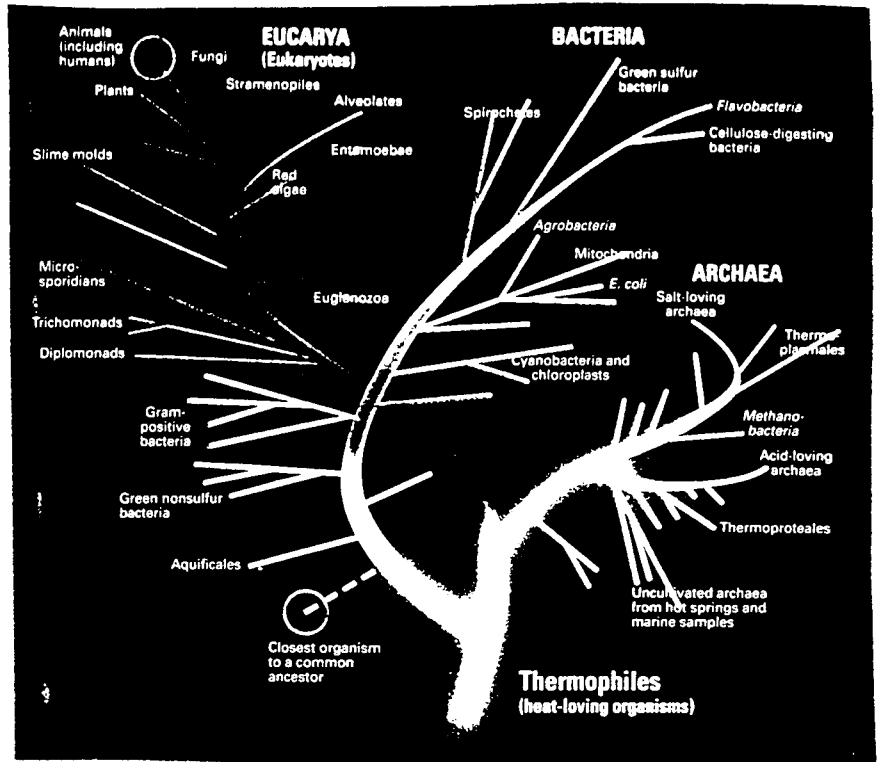
Methyl phosphine
Aldehyde phosphine
Organic vapors, rocks, glaciers, and interplanetary debris supply compounds to water that collects in ponds and shallow basins.

... As Darwin and his contemporaries imagined life evolving in a small body of water, perhaps a pond, an idea still viable today. "Runoff collected in a small volume is the most likely means of achieving the necessary concentration of ingredients," says Gustaf Arrhenius, a geochemist at Scripps Institution of Oceanography. The pond may have further concentrated compounds on the internal surfaces of sheet-like minerals, which attract molecules and act as a catalyst in the subsequent reactions: hydrophosphate molecules thus united (above) form a nucleic phosphate, a possible precursor to RNA.

... OR A CAULDRON?

Hot spring
At volcanoes sites such as hydrothermal vents and geysers, gases deliver vital compounds to the surface, where reactions ensue.
Carbon monoxide
Methyl group
Deep-sea vent

After accretion Earth may have been a fiery orb of magma. Even when it became somewhat cooler, the atmosphere would have shimmered with heat when life began. "It was volcanic everywhere," says Günter Wächtershäuser, a chemist in Munich, Germany. "Gases released from the molten magma would have been constantly seeping from the surface, leaching out vital compounds." Resting on a stabilizing surface of pyrite, carbon monoxide and a methyl group combine (above), one step in the formation of activated acetic acid, a crucial chemical for synthesizing other organic compounds.



It discussed "our microbial origins", primordial RNA and cell formation 4 billion years BP. They then moved to early oxygen producers and noted that the oldest known yet are the 3.46 billion year old fossils found in Australia. They resembled strands of photosynthetic cyanobacteria *Oscillatoria*. The article quotes ".....At the time of the Apex fossils 3.46 billion years ago, Earth would have been almost completely unrecognisable to modern eyes. The planet was spinning so much faster then that each day lasted less than 15 hours. A pale young Sun hung in the sky, its glow noticeably dimmer than the more mature star we see today. There were no continents, just archipelagos of volcanic rock jutting above the waves. There were no buzzing insects, no smiling leaves, little but the sound of the rumbling volcanoes, and the wind screaming over the barren peaks. Strange shapes, some as big as cars, littered the beaches, and shallow water. Called stromatolites, these immobile objects could have prepped for

boulders, but they were actually alive with microbes; they were the most abundant form of life during the Precambrian....."

The article presented a tree of 3 domains of life, with plants, fungi and animals at the top, one celled eukaryotes in the middle and the prokaryotes at the bottom. This replaces the original 5 textbook kingdoms. Genetic comparisons have also shown that all the oldest known lineages thrive in heat. (see diagram)

The case example of malaria cells was recognised. Their ancestral cells lived like plants. "Today each contains a relic from that time, a chloroplast, normally a center of photosynthesis. What the chloroplast does for the modern-day malaria is unclear. Deprived of light in the human body, it cannot photosynthesize. Yet scientists puzzling out this intricacy of life believe it plays an indispensable role and that someday one of history's most ancient scourges may be eliminated by something as simple as a herbicide."

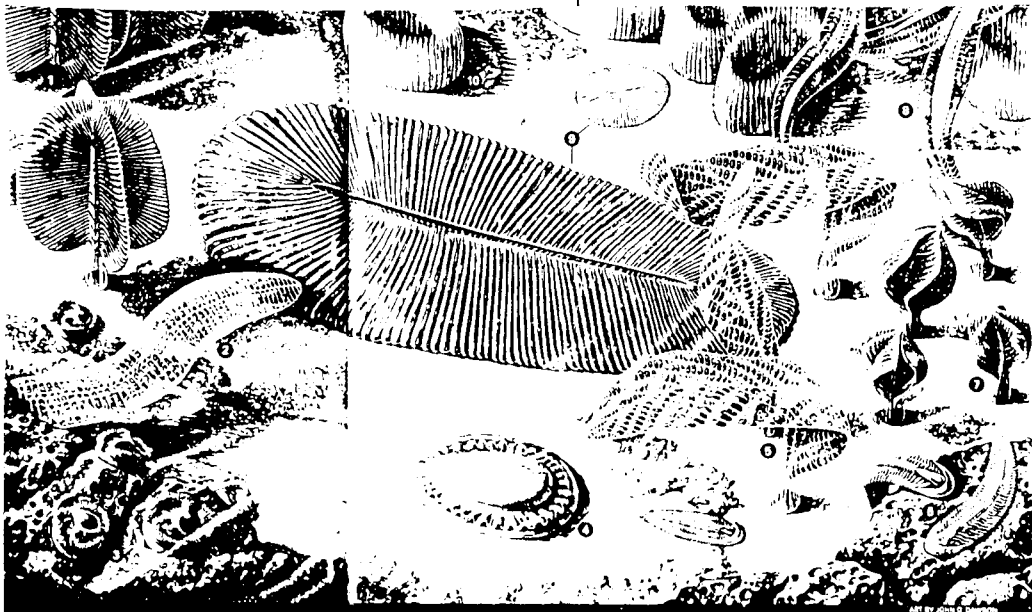
The second article in the April edition was entitled "Life Grows Up" an article of the Ediacaran Fauna, based on the Flinders Ranges examples but also describing work done in Namibia and recent finds in Nevada and Russia. The article quoted

".....Sprigg's discovery of Ediacaran fossils was hailed as the long sought solution to Darwin's problem. Scientists felt that they had finally found the simple ancestors of modern animals - an initial budding of the groups that would blossom in the Cambrian explosion.

It was a tidy story, but it didn't last. In 1983 an influential German palaeontologist named Dolf Seilacher attacked the idea that the Ediacaran organisms gave rise to modern animals. They were too simple and too strange to have anything to do with animals, he thought.

Even the most basic animal, the sponge, is divided into parts, with a mouthlike opening leading to a compartment for digesting food. More complicated animals have specialized organs and appendages. The Ediacaran fossils though, show none of these features. "We don't see any indications of organs," Seilacher says. "We see no legs, no mouths, no anuses, no digestive tracts, nothing to stop shoe-horning them into categories of modern animals." He described them as immobile, jelly-filled organisms and made up the term Vendobionts to label them. Unable to eat, the Vendobionts absorbed sunlight or nutrient from seawater.....

Since then, researchers have mined rich Precambrian sites in northern Russia, Namibia, Newfoundland, northwestern



A peaceable kingdom

Between 600 million and 540 million years ago, no predators hunted with claws and teeth; softer life-styles prevailed. Russian paleontologist Mikhail Fedonkin calls organisms attached to the bottom like *Tribrachidium*, 3, and *Rangia*, 7, "economical." They may simply have feasted on plankton that drifted by in abundance. The large body surfaces of others

may have served as green-houses for colonies of photosynthetic bacteria that functioned as internal food factories. Small, mobile *Kimberella*, 4, probably grazed on bacterial carpets growing on the seafloor.

This illustration shows representatives of some of the world's widely scattered Ediacaran species. No one site preserves all the organisms shown, and though

Ernieite, 10, for example, occurs in clusters, other species are found more widely dispersed. Did *Preridinium*, 8, rise up from the seafloor? We're not certain. Specimens as long as two feet are known, but none has both ends intact. Did *Phyllozoon*, 2, undulate freely through the water, or was it anchored? Again, the evidence leaves room for debate.

1. *Schwartzia*
2. *Phyllozoon*
3. *Tribrachidium*
4. *Kimberella*
5. *Charlesia*
6. *Spriggia*
7. *Rangia*
8. *Preridinium*
9. *Dikinesia*
10. *Ernieite*

BEER 'N' BONES

Canada and Australia....

A consensus is emerging that the Ediacaran organisms fall into 2 main categories. 'Some were certainly animals,' says Jim Gehling. 'Others were truly bizarre.....'

Stop Press

- ◆ Inthira is now on the Clubs & Society Executive. Any questions regarding anything to do with the Association or running of the club, please see Inthira.
- ◆
- ◆
- ◆ If ever you're in Naracoorte as a tourist, take a look at the video on sale. You just may recognise the "tourists", the "adventure cavers", the "guide", in fact most of the faces will look familiar. The video was shot during the VP 1 trip, thus we were well utilised. The front cover stars Paul Koch
- ◆
- ◆ Filming in Naracoorte?
- ◆ Find out who's on what TV program next issue.
- ◆ The lab recently was involved in a trip to Mairs Cave in the Flinders Ranges.

And the information Centre at Naracoorte, my how it's growing. I'm glad it's not me that has to suspend 10 metres up to paint the ceiling. Have fun, Steve H.

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