
BEER'N'BONES

Volume 2, Number 1.

February, 1998

FLINDERS UNIVERSITY PALAEOLOGY SOCIETY

A MESSAGE FROM THE PRESIDENT

The year has started off with a flurry of activity for the Palaeo Society. A large contingent joined the VP 1's on a Naracoorte field trip with a difference. Students were encouraged to assist in digs and screening in Cathedral Cave with Steve Brown & Wet Cave with Dave Bartholomeusz, Victoria Fossil on Liz Reed's taph dig, Starburst with Linda-Marie Hall and the Green Corp people, removing bags of dirt (hard yakka, I can vouch for that) or assisting Matt McDowell in geological work underground or on the surface. This format has given these lucky VP 1's and Palaeo Soc members a chance to experience "the real thing" at Naracoorte. (*Chris L has a full report from the students point of view later*). Good luck to all our new VP 1's (who are now members of the Palaeo Society) with those 3000 word essays.

O-week Fair Day was a great success despite the 39 degree weather. The raffled Jack Daniels was won by one of our new recruits

Scott Barrett

Enjoy the Jack Scott, but remember, you now owe me!!!! Raelene has a full report on the day's earnings later in this addition. It was wonderful to see the majority of the Soc's members participate.



Our next big do is the 70's night so raid your parent's cupboards and see what you can find. No 70's gear will find you fined!!!!

Also good luck to Liz and Matt with the upcoming Australian Palaeontology Students Conference in April at Naracoorte. May its success mirror the amount of energy you guys have put into it.

Lyndlee Turner -President

From the Treasury

by Raelene Sherwin

Our financial status for the start of 1998 is looking quite healthy with a bank balance of **\$555.00**. This is comprised of:-
Membership \$190
Remainder of grants \$23.40
Fundraising \$342.30

Fair Day

Thankyou to all of the people who assisted with the setting up and the taking down of our display for Fair Day and the wonderful job of selling raffle tickets. We raised \$48.80 just from the raffle. 10 new members also signed up on the day, so welcome:

**Angie Turner
Richelle Neighbour
Susan Forrest
Scott Barrett
Joanne Spurrier
Chris Swain
Keith Preston
Phillip Mayes
Andre Garnaut
Julie Ford**

Membership

It is now time for existing members to renew their membership for 1998 and this year we ask that you fill in an application for when renewing your membership as this gives us a chance to update our records. Membership forms will be placed in the Palaeo box in Rod's lab. Membership forms may be left in the Palaeo Soc pigeon hole at Clubs & Societies or given to me at the next couple of meetings

Raelene's Phone No
:82726668
email:
sherwin@bigpond.com.au

ORDER YOUR "PALAEO SOCIETY" T-SHIRT NOW

orders to Lyndlee Turner
phone 82966936
cost approx. \$15

We can only bulk order in lots of 20, so the sooner you order the sooner you'll get them!!!!!!

THE NEW VISITOR CENTRE AT NARACOORTE

by "our-man-on-the-spot",
Ed Bailey

One of the most adventurous and exciting developments is taking shape in the enlarged Caves Reserve. This building is currently under construction and when complete, apart from the entrance facilities, in April 1998, will allow the exhibits to be installed. Brian Clark, the Head Ranger, told me Steve Hayter and his staff will need 3 months for this installation. You may have seen some of his work in progress in the shed alongside Carpark 8 in Biological Sciences. Other work is being done in the Palaeo Lab by the undersigned. The free standing models will move, driven by small motors and pneumatic pistons, the whole exhibit being one of movement, rather than a static display.

The building itself will be 42 metres long and vary between 15 and 20 metres wide, which makes the floor area close to that of the Fossil Chamber. The roof heights will be 10 metres at the far end, reducing to 4 metres at the entrance. The roof configuration will be arched and based on a nearly longitudinal cylinders, which has been cut horizontally to

produce a roof apex line which slopes down to the entrance.

Part of the main display area will be on 2 levels, the upper one will show the animals and vegetation current at the time, approximately 300,000 years BP. The lower level will show a typical cone, with a sand cone below a solution tube entrance. Here will be shown animals that are dead or dying and being attacked and eaten by predators and scavengers. Other exhibits include a wetlands area with a Diprotodon feeding on vegetation and displays of techniques in recovering fossils from within the Victoria Fossil Cave.

When complete the entrance area will include, from the right hand side, a room which will have its walls displaying illustrations of various activities associated with research within the reserve. Moving to the left will be a reconstruction of the cave lion, *Thylacoleo carnifex*. This will be mounted in a leaping posture, presumably to make the visitors welcome!!!! Lastly, the remaining space will be occupied with an administrative office and toilet facilities.

Finally, the area will be vegetated and landscaped to provide a concealed walkway from the enlarged parking area to the visitor centre.



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"I see your little, petrified skull ... labeled and resting on a shelf somewhere."

Thanks to Raelene Sherwin
for this little gem.

Hey you guys! I'm sure that you sometimes read things in newspapers or magazines that are relevant to Palaeontology. Share them with the rest of us. Newspaper articles are always appreciated and you'll get your name in the **BEER 'N' BONES!!!!**

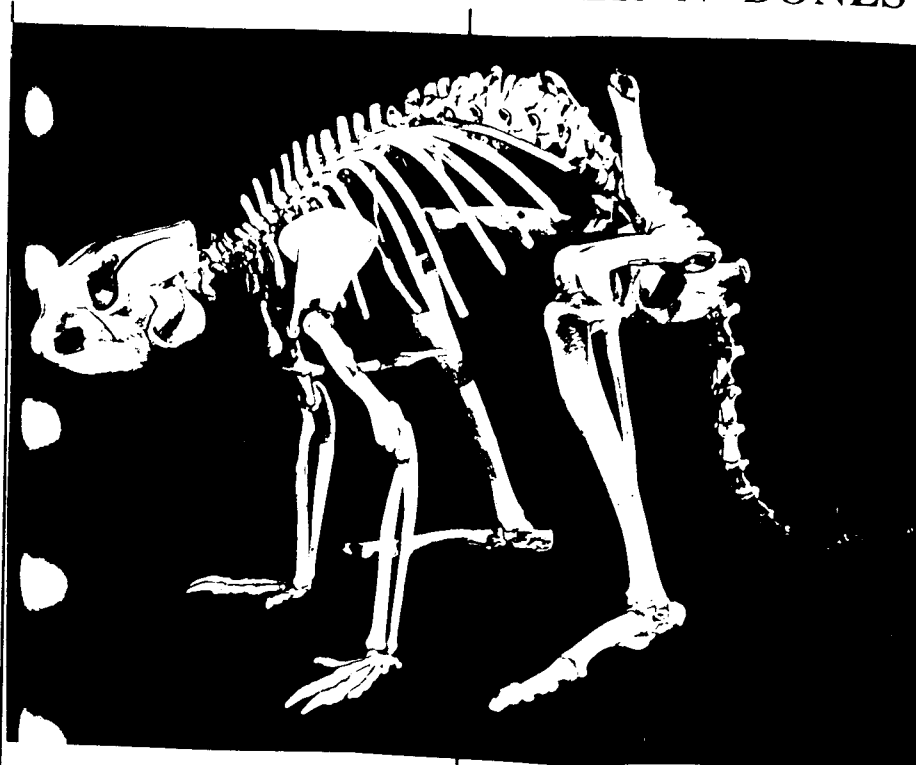
Naracoorte Initiation Field
Trip, December 1997

by *Inthira Thammakhantry*

On the 1st of December, a team of "Professional" palaeon-tologists consisting of Liz Reed, Matt McDowell, a handful of potential / hopeful Honours students (Dave Bartholomeusz, Steve Brown, Simone Dalgairns, Lyndlee Turner and Inthira Thammakhantry), along with Linda-Marie Hall and Angie Turner boarded a brand spanking new Uni vehicle (what was the Uni thinking?) for an expedition to the Naracoorte World Heritage Caves. The purpose of the trip was to help Liz and Matt prospect some caves and collect data for their PhD theses. We were warned that the caves in which we would be prospecting required great agility and skill to get through the tight openings. I must add that Liz and Matt went to great lengths to psyche us out of entering the caves. Unfortunately, they only succeeded in further enhancing our enthusiasm.

Dressed in our overalls, protective gear and torch in hand, we headed down Wet Cave. Matt and Liz decided to be kind and introduce us to one of the easier caves (Wet Cave is a self guided cave). In the next few days we explored several other caves in the National Park and on surrounding properties. These were slightly more difficult as they involved getting down on our hands and knees. You certainly didn't want to be claustrophobic in some of these caves!!

The thrill of entering caves and chambers restricted to the general public, as well as squeezing through tight openings, long belly crawls and the simple fact of getting bruised and dirty was enough to make Simone and I



crave for our next caving experience. As a result of our great enthusiasm to crawl through tight squeezes, we inherited the names of Ferret 1 (F1) and Ferret 2 (F2). To my dismay and annoyance the names were allocated according to height and so for the rest of the trip I was known as F2. Furthermore, we became the recipients of many a practical joke (ie. sent down tight belly crawls that lead nowhere). Nonetheless, being short had it's advantages. For example, there were a couple occasions where the ferrets were called on to save the day and prospect potential cave openings and tunnels, where our taller counterparts had no hope of fitting through.

Our enthusiasm enabled us to accompany Liz, Matt and 2 adventure caving guides to Fox Cave - notorious for snakes in the entrance way. This was to be a full day caving trip. It was recommended not to drink too much before the trip, as there were obviously no toilets. A plastic

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bottle was taken for precautions, and there was talk of a collapsible funnel for the girls. It's times like this when I wished I was male!! The purpose of our trip to Fox Cave was to have a look at the sand cones in the cave and also have a look at fossil chamber. The sand cones in the cave were amazing!! I don't think I would be exaggerating if I said they were 10m high!!

We slowly made our way to the fossil chamber, having a guided tour of the cave as we moved along. A few wrong turns were made, but we managed to get back on track. The fossil chamber itself was difficult to find due to the ambiguity of the map. However, thanks to Matt and Andrew's scouting abilities, the fossil chamber was located and a real bitch to get to - pardon the French!! Pieces of vertebra's, long bone and partial jaw could be found scarcely scattered throughout the dig site and along the edge of the cave walls. We didn't spend a great deal of time in the fossil

chamber as we were due out of the cave by mid-afternoon and we needed to allow sufficient time to make our way back out to the entrance. Upon arriving at the entrance, we were greeted by a large Brown snake basking in the sun, which had become rather annoyed at us for disturbing it. As a result of our "rudeness" the snake charged at us or at least to Andrew, who's job it was to make sure the entrance was clear of snakes. Thankfully the snake decided it was a waste of effort to attack and retreated into a hole.

The most important lesson that was learnt on this field trip was never believe anyone that states that caving is easy. The fact is that although it seems easy, it is physically draining and I can guarantee the following day every muscle in your body will ache. Consequently, getting up in the morning was extremely difficult (not mentioning any names!). Admittedly I too found it hard to get up. However, when the guides are looking for someone to pay out for late morning starts, it is a case of fending for oneself, and we were all happy to nominate Steve as the culprit. Consequently, poor Steve was nicknamed the "*nocturnal marsupial sloth*".

Finally, a survival tip. If ever you are dying of thirst, be sure to rescue Liz when she bogs the Uni van. She will reward you with a carton of the finest beer this country has to offer!! You only have to ask Andrew and Allan (Naracoorte cave staff members), who pulled us from the cave that Liz was trying to dig. Not only did Liz buy them a carton of Coopers, but they also got an extended lunchbreak!! Some people get all the luck.

I'd like to take this opportunity to thank Inthira for all the hard work that she puts into the Palaeo Society, even to the point of a new way to recruit new members. Thanks Inthira. L.T

70'S NIGHT

70'S NIGHT

70'S NIGHT

KELLY MORRIS ROOM

FRIDAY MARCH 13th

70'S gear essential

cost \$10:00 (if you are appropriately attired) includes beer, wine & soft drinks. (cost \$15:00 if you are not appropriately attired)

A BARBECUE will be available (on the plaza) from 5:00pm. (Cost \$3:50)

BE THERE!!!!!!!!!!!!!!

Travels and Travails of an Engineer

by Ed Bailey

.....As you may recall, we left Ed (August edition) on the banks of Lake Kalamurra amongst the persistent flies and with dingoes stalking his food box. His journey along the Warburton continues.....

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.....We had planned a long trip the following day so after the usual 6:30 breakfast, we were away, travelling down the river for about 50km to a place where reports had said Diprotodon skeletons could be found. we walked about 8km of river bank but found nothing. The journey wasn't wasted though, as we saw some interesting geology. We also went to a marked spot on the river bank and dug up 2 full jerry cans of water, which were cool, fresh and very welcome. The previous expedition to this area 3 years ago on which some of this year's party had participated, had buried this water and marked its position. This had been done for the benefit of Warren Bonython, who at that time was planning a walk across the Simpson Desert, which he eventually did. The grid reference for this water cache had been given to him, so he knew where the water was if he was in difficulties. Presumably he didn't need the water, so it came in useful to eke out our supplies. During the day we saw 2 emus, but very little other wildlife. We spent all Sunday digging away a projecting portion of river bank to find fossils, but found very few.

Monday 9th May, we had breakfast, then packed up camp and moved to the new Kalamurina homestead. we were allowed to use the aircraft hanger to sleep in, so there was no need to erect tents. By the hanger, which was some distance from the homestead, was a typical outback dunny, I thought "That's for me in the morning". Be a change from wandering off after breakfast with a roll of paper in one hand and a spade in the other. Some mornings there was a queue for the spade. we were allowed to take turns in having a hot shower up at the homestead - what bliss..

We had breakfast the next morning at 6:30, then Peter, the station owner came over to provide flights over the district, so likely fossil sites could be pinpointed from the air, much easier than endless bushbashing. The plane was small, so we had to take turns for our airborne observations. After the first flight left at 7:45. I saw an opportunity to pay a call on that dunny. When I walked up to it, I saw to my surprise, it was locked with an enormous padlock. I couldn't understand this, here we were right out in the bush, and the only dunny for miles around was locked. How perverse can some people get. I was not to be thwarted though, I thought if I could find a piece of fencing wire and there were always plenty of bits around, I could unpick the lock so I slowly started inspecting the ground, almost like looking for fossils. As I wandered about, I gradually moved towards the rear of the dunny, when to my consternation, I noticed the back was missing. So grabbing the roll of toilet paper, the rusty nail inside was empty naturally, I hopped through the timber framing and for once, appreciated one of the delights of civilisation. After this luxurious interlude, I rejoined Paul and gave him a hand rearranging the food boxes.....

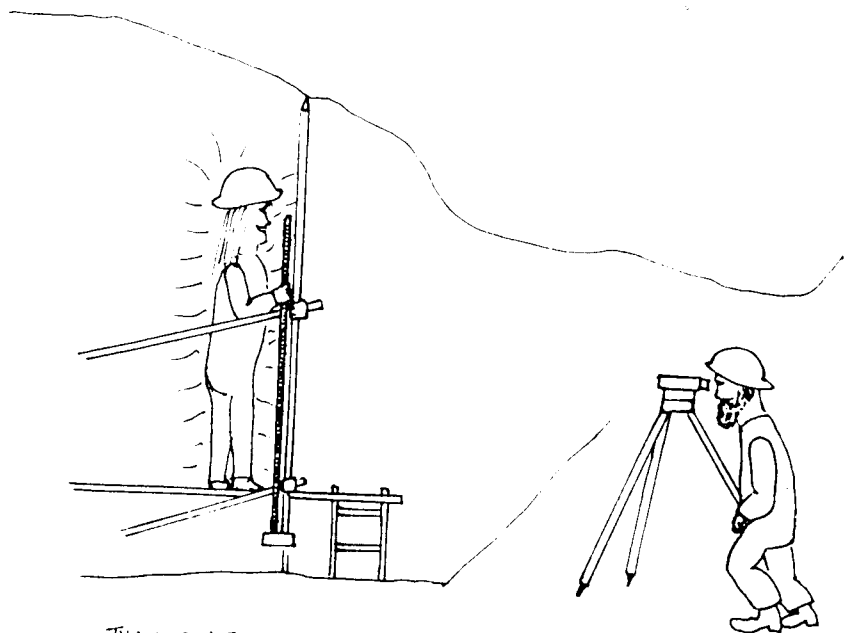
.....Eventually it came our turn and Paul and I were soon airborne and were amazed at the twists and turns the Warburton takes, no wonder we spent so much time bush bashing. As a result of our flight, we realised there were several promising looking sites along the Warburton, which to our knowledge, had never been visited before, so instead of moving on, we returned to the bore, near our old camp.

First morning at the new camp on 11th May, was a cold one. This produced an unexpected bonus, we had breakfast at 6:15 and had cleared away before our first fly appeared. We then went on a full day trip to a new area which had been spotted from the air. This was about 35km away and we went over some very rough country to get there. the effort was well worth it as we found plenty of fossils, including the snout of an extinct species of crocodile. A short time later, we found a crocodiles skull complete with jaw, but with the snout missing. This was of the same species as the snout found earlier, but unfortunately, they did not match. Got back to camp late and had dinner round the camp fire. Cool evening with fresh southerly blowing, which kept the mosquitoes away. Night sky was brilliant and could see the Milky Way right down to the horizon.

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After a 6:30 breakfast the next morning, the day was almost a carbon copy of the previous day. I spent all day working on the crocodile skull. Will return the following day to complete the work.....

(One unfortunate incidence on the VP 1 field trip occurred when Liz got a kick from an electrical cord in the lab. It was enough to stop her expedition to Sand Cave & those who know Liz understand the significance of this. This occasion has been historically recorded by Ed in this cartoon!!!)



THANKS LIZ, YOU CERTAINLY KNOW HOW TO LIGHT UP

A BLOKE'S STAFF!

ED.

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.....We are staying at this camp until Sunday 15th so we can complete excavation of the skull and do other work. This means that our original plan of visiting the Kalacooopa Creek will not take place. We will now head south on the Birdsville Track on Monday, when we plan to meet Dr Molly Whalen, who is a botanist at Flinders, she is coming up this way on a field trip. we have been in touch with her by radio and asked her to bring vital supplies, namely matches and washing up liquid, amazing it's the little things that one misses most.

We had breakfast at 6:15, then raced off over the same rough bush route, now well defined by our wheel tracks. I continued to work on the skull, for most of all the day, finally getting it completely encased in a plaster jacket, so we could safely carry it back across the dry river bed and place it in one of the vehicles for the bumpy ride back. I spent the remainder of the day digging out a kangaroo pelvis. We will be coming back here tomorrow as the others have also found interesting fossils.

Breakfast the following morning at 6:40 then back to the same site to find more fossil. I found a small kangaroo jaw, the mosquitoes also found us and they were numerous and aggressive. they must have been enforced vegetarians until we arrived. They didn't quite outnumber the flies though. I noticed the flies were more polite than the mosquitoes. The latter would follow you everywhere, but the flies wouldn't follow you into your tent, they politely wait outside until you re-emerge.

Sunday 15th, we had a late breakfast at 6:45, must be getting slack. Then went to the bore, had a bath and washed my hair, then dirty clothing. We made a sort of bath in the pool by the bore, by sinking a large plastic sheet in the water, without this we would have been sitting in warm, sticky mud. When we were dry our hair stood up like punk rockers. We then started the long process of breaking camp and packing everything on to the vehicles ready for leaving in the morning. Mosquitoes very fierce, attacked

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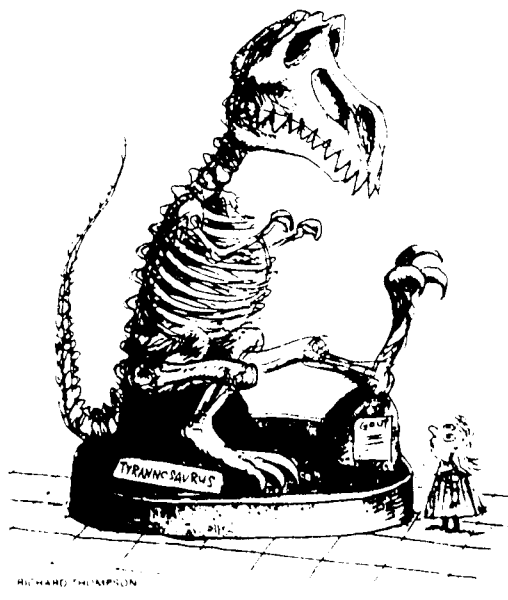
through corduroy trousers. Mid afternoon we received a visit from a dingo, he howled and approached to within 50m. We howled back and after looking at us for a while, turned around and trotted off.....

To be continued.....



FROM FEBRUARY 1998
NATIONAL GEOGRAPHIC
(below)

GEOGRAPHICA



Did Gout Really Get to *T. Rex*?

"If you step on a needle, that's painful," says Bruce Rothschild of the Arthritis Center of Northeast Ohio. "Imagine what it's like stepping on thousands of needles. That's gout." Now imagine the pain endured by a dinosaur with gout.

Looking at a cast of the forelimb bones of a *Tyrannosaurus rex* in the Denver Museum of Natural History, Rothschild saw lesions that signal the ailment's presence, then found others in a bone of a tyrannosaur at Canada's Royal Tyrrell Museum—the first time gout has been detected in dinosaurs.

Gout is caused by excess uric acid deposits that form needlelike crystals; it can be brought on by lead poisoning or by eating foods high in biochemicals called purines. High levels of purines occur in a major component of the diet of the carnivorous dinosaurs: red meat.

**AUSTRALIAN
PALAEOONTOLOGY
STUDENTS CONFERENCE**

**15th to 18th April
Naracoorte Caves World
Heritage Reserve**

*see Liz Reed or Matt
McDowell in the Palaeo
Lab for detail.*

*Please note: meeting for
those involved with
catering will be held within
the first couple of weeks of
March. Date & time to be
advised.*

For the Palaeobotanists.

**HISTORY AND
EVOLUTION OF S.A.
WOODLANDS**

By R. Boardman.

".....A sustained record which shows the extent of the forests and woodlands, much in the form we know them today in Australia, does not appear in S.A. until the Mesozoic era, 190 million years ago. Glaciers had covered much of the land in the present-day southern half of the state during the preceding Permian period

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(evidence for this is found at Inman Valley, Hallett Cove and in the rocks beneath the Coorong), when it appears that this part of the super-continent was near the South Pole, a result of the continental drift. Although there was an arid climate in the times that followed, there were widespread plains with slow meandering rivers, mostly flowing eastwards to the ocean. The swampy fringes of these riverinas were forested with cone-bearing trees, a modern counterpart of these riverina forests would be swamp cypress forests in the south-eastern part of the USA.

Changes appear to have been very slow and only very gradually did the more highly evolved woody perennial plants gain ascendancy. The cone-bearing kinds replaced the cycads, tree ferns and the lesser cone-bearing plants, such as the Gnetales, of which only one living species remains. During this time, erosion would have been general and leaching processes would gradually cause soils to supply less and less nutrients to the plants. This is a feature with which the trees were able to cope through their symbiotic associations with fungi and bacteria.

Drastic changes to the land surface took place after 70 million years of the Mesozoic time had passed. Sea levels rose world-wide to unprecedentedly high levels, never attained since. By the early Cretaceous period, 110 million years ago, almost half of the present day continental Australia was flooded by shallow seas, dividing it into 3 large islands. One of these was in central and south-eastern Western Australia, one extended from the Kimberley region into the Victoria desert of today and the third, a relatively narrow reverse "C"- shaped island extended from Cairns into south-

Final Orders re:

Field of Bones
THE ULTIMATE ENCOUNTER

You know the drill

Cammo, masks, heavy weapons and performance enhancing drugs

You know the venue

**Skirmish War Games Paintfield, Deep Creek Conservation Park
(map supplied)**

The fourth dimension

Sunday 5 April 1998, 1000hrs

RV

Darlington Macdonald's, South Road.

The price of war

**35-50 creds, depending on carnage factor
Hearty lunch, liquid caffeine supplements supplied**

To prevent death or serious injury

**BYO Strong shoes, sunblock, cap, gloves, groin guard,
riot shield, tear gas (cams & masks supplied)**

Secure your position

By contacting the purple child on 83582324/82012630 any time

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eastern Australia and westwards to include all but the northern parts of South Australia. South Australia then formed a large part of one of these 3 land refuges for plants.

These times and those that followed, over the next 50 million years or so, saw 2 major developments. Firstly, the climate, although "Australia" was still joined to "Antarctica" and in the higher latitudes, was warm and equitable, conducive to healthy, vigorous plant growth especially for perennials and for trees in particular. Secondly, the events which initiated the geological changes which were so profound also elicited a high degree of evolutionary divergence in plants and animals. Angiosperm plant families proliferated and there were many new genera. Species tended, however, to remain few in number in these genera in contrast to the earlier developments when the tree ferns, cycads and cone-bearing plants themselves developed 200 million years before. The separation of the island refuges from each other would have assisted in this process and would also have limited the directions in which the new plant groups could spread as they radiated from their original centres.

During the 150 million year period that spans the Jurassic period to the present, the fossil remains of the trees reveal their presence in S.A. This record shows that the whole range of forest conditions now found in the world, have existed at some time or another in S.A. The earliest remains are those of lush rainforests. Today, at the other extreme, closed forests are mostly remnants restricted to Mount Lofty Ranges and the lower south-east and struggling to survive.

From "The ecology of the Forests & Woodlands of S.A." ed H.R. Wallace (1986) D.J. Woolman, Government Printing Press, S.A.

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Desperate Dave the Lonely Labrat

Proudly sponsored by the Sleep Deprivation Research Unit

In association with a pair of ferrets, Silent 'Bub and a rather smelly three-toed sloth

presents

a Shit I've Only Got 8 Months To Go production

"Sorted"

AN EXTRAVAGANZA OF TASTE

This event is to be held at "The Queer House" Entertainment Venue
1/274 Sturt Rd. Marion
Monday 9 March 1998
Doors open: 6pm 'til late. Dress to Impress

ON THE MENU

Starter

Mediterranean style platters - olives, fetta, marinated delicacies, sun dried sundries, dips & sauces.

Entree

A choice of pork & leaf coconut curry with a hint of chilli, or Sri Lankan yellow curry with snow peas & cashew nuts, on a bed of saffron rice, sided with a traditional sour salad

Main

Russian Style fish pie with lemon glaze & hollandaise, with seasonal vegetables vinegrette

Dessert

Mocha fudge pudding with rich chocolate icecream, freshly whipped cream & raspberry glaze, lightly garnished with dried walnuts and shards of dark chocolate

Platter

A selection of Australian and imported cheeses, surrounded by fresh and dried fruits

And for those still able to move...

A selection of evil delicacies: chips, dips, chocolates, sweets

*A limited selection of beer and wine will be provided.
For best results, BYO to finish the job.*

The catch

Eating means sorting in The House of David

RSVP by Friday 6 March 1998 to the Elves at the Magic Cave
83582324/82072630



Restoration of a typical pterosaur — note fur covering the body. The Western Australian pterosaur had approximately a 5 metre wingspan.

BEER 'N' BONES

MEETING DATES

Please put these in your diary. All meetings will be in Biol 028 unless otherwise stated.

They are the first Wednesdays of the month and all are at 1:00pm

*March: Committee only
 April: 1st, 1:00pm
 May: 6th, 1:00pm
 June: 3rd, 1:00pm
 July: 1st, 1:00pm.*

NEXT ISSUE OUT SOON!!!!

Editor: Lyndlee Turner

*Articles always appreciated.
 Phone 82966836*

F.U. PALAEO SOCIETY

PRESIDENT ; Lyndlee Turner

VICE PRESIDENT ; Steve Brown

SECRETARY ; Narelle Craig



RESEARCH UPDATE

Dating fossiliferous cave deposits

Rich sediments at Naracoorte yield clues to climate and megafauna

Limestone formations in caves are providing rare insights into the nature of terrestrial environments in southern Australia over the past few hundred thousand years. Dr Linda Avliffe from RSES has been investigating the ages of cave formations (speleothems) and associated fossil-rich sediments at Naracoorte Caves in South Australia using the U/Th dating method. This method, used in Professor Malcolm McCulloch's laboratory at RSES since 1991, relies on high precision measurement of two naturally occurring radioactive compounds uranium and thorium, and is most suited to dating inorganic carbonates.

This research forms part of a broader scientific programme aimed at mapping faunal and environmental change at Naracoorte over the last 500,000 yrs. Prof. Rod Wells, Dr Kevin Moriarty and PhD students Matt McDowell and Liz Reed from Flinders University as well as PhD student Pyramo Mananelli from RSES (see Student Research) are other core members of this multi-disciplinary research team.

Many of the fossils represented in the sites are from extinct members of Australia's megafauna including giant kangaroos, marsupial lions and massive snakes up to 7 m long (see cover). Animals fell on to sediment cones in the caverns through solution tube holes in the cave ceiling (Fig 1). In several caverns, sediment and bone deposits occur in association with speleothems, and U/Th dating

of this material helps constrain the timing of sediment and bone accumulation. To date, all the fossil sites investigated by Dr Avliffe are >80 ka and potentially up to 400,000 yrs old, spanning at least the last three glacial cycles (Fig 2). These and other fossil deposits at Naracoorte could therefore be very important for establishing the impact of climate change on Australia's fauna prior to the arrival of humans, and may help reconcile ongoing arguments about the cause(s) for the demise of Australia's megafauna. The search is now on for younger deposits within the cave system which could be used to constrain the timing of megafauna extinction in this area.

Dating of speleothem growth also provides a measure of the water balance status in the Naracoorte region back through time. Speleothems are produced by chemical interactions between rain water, biogenic CO₂ and the limestone bedrock. The extent of their formation is dependent on a number of interrelated environmental variables. The quantity of infiltrating rainwaters, regional temperatures, and the partial pressure of CO₂ are known to strongly influence the extent of speleothem deposition. In arid-semi-arid climates, plant productivity (and therefore soil CO₂) will be mainly controlled by effective precipitation (rainfall minus evapotranspiration), whereas in more temperate climates regional temperatures are likely to assume a

greater importance in determining CO₂ levels, and therefore speleothem deposition. Speleothem growth at Naracoorte, lying close to the margins of the semi-arid interior, is most likely to give a measure of the local hydrological balance.

Nearly 50 speleothem samples from several caverns in the Naracoorte cave system have now been dated by Dr Avliffe and PhD student Pyramo Mananelli. These results suggest that speleothem growth at Naracoorte has been highly episodic throughout the last 500,000 yrs (Fig 2). Based on the temperature record from the Southern Ocean, speleothems appear to have predominantly grown at times when average regional temperature was about 3°C lower than at present. In contrast, interglacial periods (such as the present) and glacial maxima are characterised by a lack of speleothem growth. The research suggests speleothem growth at Naracoorte provides an effective measure of precipitation back through time with speleothems mainly formed at times when temperatures were lower and/or rainfall was greater relative to modern conditions. The researcher's findings, soon to be reported in the journal *Geology*, provide one of the most precisely dated chronologies for many late-Quaternary deposits in Australia. ■

For further information:

Dr L.K. Avliffe Phone: 029 9249 5472

Email: Linda.Avliffe@anu.edu.au



Figure 1. Large sediment cones are typical of the Naracoorte cave system, and some contain fossil bones from Australia's extinct megafauna. U/Th dating of limestones intercalated with these sediments is helping to constrain the ages of sediment and bone accumulation.

Figure 2 (right). U/Th ages of limestones (coloured circles, error bars $\pm 2\sigma$) constraining the age of bone-bearing sedimentary units in the Naracoorte caves. Phases of massive speleothem growth (histogram, 45 samples), and the SPEO-MAP composite $\delta^{18}O$ data for marine sediments (a proxy for past sea levels; higher values reflect higher sea levels and less polar ice) are also shown. Phosphate dating suggests periods of sedimentation (shaded vertical bands) correlate with glacial maxima (troughs in the $\delta^{18}O$ data). Periods of speleothem growth (indicated by peaks in the U/Th age-probability histogram) are interpreted to correlate with increased effective precipitation and soil CO₂ productivity.

