DINOSAUR DREAMING 2011 FIELD REPORT




CELEBRATING 20 YEARS OF FLAT ROCKS FOSSILS

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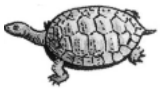

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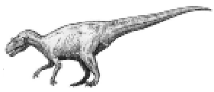

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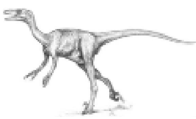

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Cover images (left to right from the top):

FRONT COVER: Synchrotron scan of the holotype of the Ausktribosphenos nyktos jaw, found by Nicola Barton (now Sanderson) in 1997; Peter Trusler's reconstruction of a bird furcula; Typical theropod teeth from Flat Rocks; Tibia of an unidentified dinosaur found at Eagle's Nest by Mike Cleeland and Roger Benson in 2011.

BACK COVER: Maxilla from a small-bodied ornithopod found by Gerry Kool in 2010; Single upper mammal premolar found by Nicola Barton (now Sanderson) in 2007 - until very recently our only upper tooth of a mammal; Side view of an ankylosaur vertebra; Lungfish toothplate from Shack Bay; Holotype of Bishops whitmorei found on Rookies' Day in 2000; Rendition by Peter Trusler of the Corriebataar marywaltersae premolar - the first evidence of a multituberculate in Australia; Top of the skull roof of an unidentified dinosaur (underside view of the left side); Primitive turtle skull found by Anne Leorke and her hole crew; Holotype of Koolasuchus cleelandi found at San Remo; Holotype of Qantassaurus intrepidis, found by Nicole Evered when breaking rock in the back yard at the dig house in 1996.

Dinosaur Dreaming 2011 Field Report edited and compiled by Alanna Maguire and Wendy White

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Dinosaur Dreaming 2011 Field Report

By Lesley Kool

2011 marks the 20th anniversary of the discovery of the Flat Rocks site, near Inverloch, and the 18th annual Dinosaur Dreaming field season.

It is hard to believe that 20 years have elapsed since a group of researchers discovered a four metre wide conglomerate layer exposed on the rocky shore platform, just south of Inverloch, Victoria. The discovery caused great excitement as it was the first time that a considerable number of bones had been found along the Victorian south coast so close together in one fossil layer. Twenty bones were discovered exposed on the surface of the fossil layer, but they proved to be just the "tip of the iceberg". A test dig, which took place in 1992 to explore the potential of the site, resulted in the recovery of over 300 fossil bones and teeth and so the Dinosaur Dreaming site was born.

In the past 20 years many thousands of bones and teeth have been recovered from the Flat Rocks site, making it the richest Early Cretaceous site in Australia. Although it has not produced articulated skeletons, like those from Dinosaur Cove, Eric the Red West in the Otway Group and sites in Queensland, it is the only site in Australia where evidence of three groups of mammals has been found, alongside the bones of at least seven different types of dinosaurs.

The Dinosaur Dreaming 2011 field season differed in a number of ways from the previous 17 field seasons. Since 1994 the Dinosaur Dreaming crew had been fortunate to have access to the same dig house in Inverloch. To many it had become their home away from home. Unfortunately the "dig house" was unavailable for the 2011 field season so a frantic search ensued to find a suitable replacement. Eventually a house in nearby Cape Paterson was found, which fit most of the criteria for housing a large group of people and dig equipment, as well as having a large enough garden to accommodate 3-4 tents and a rock-breaking area. It was also within our budget, a major factor.

Wendy White, the dig's volunteer coordinator, did a splendid job of bed allocation and job rostering, which is not easy in a new dig house. Accommodating 12-15 people each week and explaining where everything is takes very good people management skills and Wendy is well up to the task.

The 2011 field season also differed in that no new volunteers were recruited. This decision was made in the light of the goals for this year's dig. After the 2010 field season there was discussion about whether we would conduct a dig in 2011, as there was a large backlog of unprepared fossil material from the previous field seasons that had not been processed. The original suggestion was to invite a small crew of experienced volunteers to help process some of the 150 polystyrene boxes of fossils in an effort to sort out the scientifically important specimens from those that would provide no new information. It was felt that a two-week period of reprocessing previously collected fossils without excavating for more would be sufficient to decrease the backlog significantly.

However, circumstances occurred later in the year which resulted in a change of plans. In August 2010 the sand along the shore platform near The Caves area was very low and a patch of conglomerate rock was exposed 200 metres north of the Flat Rocks site. A number of bones had been recovered from this layer in the past when it was periodically exposed. A chance visit to the area in August revealed four bones exposed in the layer and (as it was a defined area) it was decided that a small test excavation should take place during the 2011 field season. The layer was given the name "Swim O'clock Rock" as it was situated close to the team's swimming hole.

As a result of this change in plans we decided to conduct a three week field season, including a five day exploration dig at Swim O'clock Rock, continued excavation at "Far East" (part of the Flat Rocks site) and processing the backlog of specimens at the dig house when the team was unable to access the site at high tide. All freshly excavated rock was processed or stored on site and no rock was brought back to the house at the conclusion of each day's work.

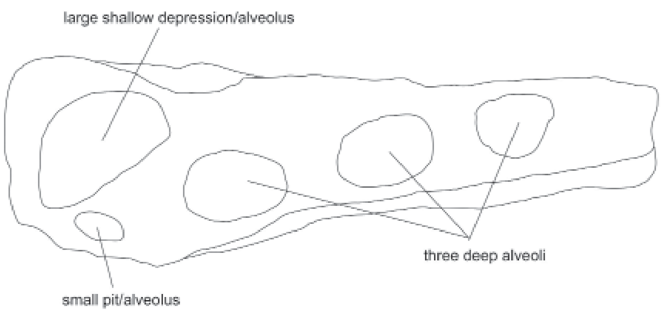
Another reason for conducting a shortened field season at Inverloch was the decision to conduct two field seasons at the Eric the Red West site in the Otway Group, southwest of Melbourne. The discovery of a fragment of mammalian maxilla (upper jaw) at the Eric the Red West site in 2010 had Dr Tom Rich eager to return to find more.

Excavations at the Flat Rocks site continued with emphasis on the most easterly end of the site, closest to the sea. As mentioned by John Wilkins in the Dinosaur Dreaming 2010 annual report, the fossil layer appeared to be "lensing out" at the most easterly edge. Continued excavations at Far East (see map on page 12) in 2011 indicated that this was indeed the case. The area was carefully surveyed by Dean Wright whose results and experiences are included in this annual report.

A shorter field season resulted in the discovery of fewer fossils than in a normal field season, but some well preserved specimens were found including a number of dinosaur limb bones and teeth, as well as a complete turtle skull.

The turtle skull represents a group of primitive turtles that lived in the Inverloch area around 120 million years ago. Their shells ranged in size from about 20 to 50 centimetres and they had bumps on the tops of their heads. Turtle skull fragments have been found at the Flat Rocks site in the past, but nothing as complete as the skull found this field season. The skull has been prepared and is currently being studied in Sweden. It possesses a number of archaic characters that are found in much older turtles that lived in the Jurassic, including a fully roofed skull with lots of lumps and bumps. We can confirm it represents a new genus and species and we hope to publish a paper in 2012.

One of the bones "re-discovered" during the reprocessing of some of the back log of material from previous years was a partial lower jaw from an unknown animal. Unfortunately, no teeth were preserved in the jaw, although there were four distinct alveoli (holes) where teeth had once been situated. The jaw measures only 3.5 millimetres in length and appears to be the front half, so there is no way of knowing how long the entire jaw was. It is narrow but deep and there is no trace of a Meckelian groove common to dinosaur jaws. Three of the four alveoli are quite deep and in line along the jaw. The fourth and largest alveolus is offset from the following three and much shallower. At the time this report was written the jaw is still unidentified.



The unknown jaw with a diagram indicating the main structures

A bone that was found by Mike Cleeland north of the Flat Rocks site a number of years ago was finally prepared by preparators at Museum Victoria in Melbourne. The bone turned out to be part of the maxilla (upper jaw) and palate of a large amphibian, probably *Koolasuchus cleelandi*, and caused quite a stir. Until this bone was prepared it was thought that the large amphibians were limited to the western outcrops of the Early Cretaceous Strzelecki Ranges, around San Remo. The discovery of this skull fragment north of the Flat Rocks site and close to Inverloch means that these animals were not as geographically restricted as was thought. Although no identifiable amphibian bones have been found at the Flat Rocks site, the discovery of Mike's bone suggests that there is no reason why more specimens should not be found in the future.

Temnospondyl maxilla (probably Koolasuchus cleelandi)

On almost the last working day of the dig, Mike decided to prospect an area called the "Honey Locality" just around the corner from the Flat Rocks site. It gets its name from the colour of the exposed fossil bones at this particular site which, once exposed for any length of time, start to fade from a chocolatey-brown to honey-brown. He came back with a backpack full of bones, 11 in total. These were bones that had been exposed on the shore platform so none of them were complete and some were mere fragments. They included a dinosaur phalanx or toe, a caudal (tail) vertebra and a cross-section through a centrum (part of a vertebra). There were also two fragments of turtle carapace (shell), which may be diagnostic. The most interesting bones were a small process, possibly from a skull and a bone that may be from the back of a jaw. Further preparation of these bones may improve the possibility of identification.

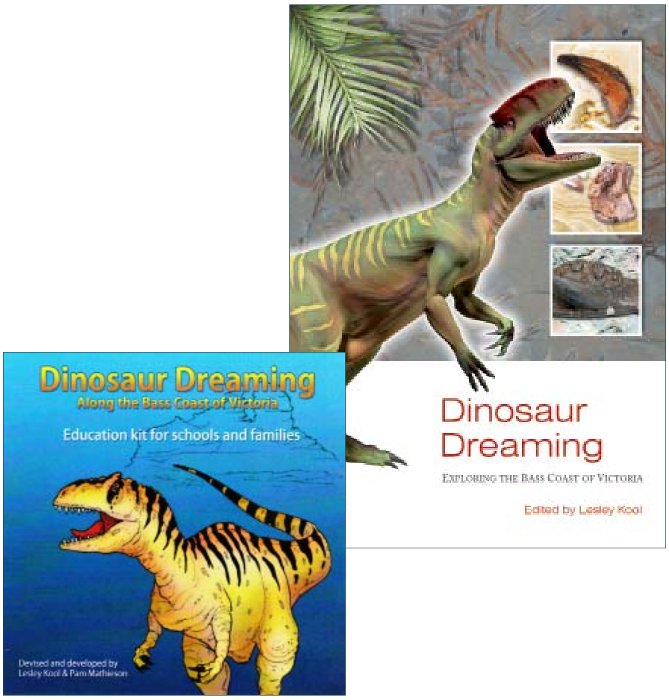
Turtle shell from Honey Locality

A number of international researchers visited our collection over the ast twelve months, including English palaeontologist Dr. Roger Benson, who joined the Dinosaur Dreaming team at Eric the Red West in the Otways in late March. Roger specialises in the study of theropod (meat-eating) dinosaurs and after his return from the Otways he spent some time looking at the Early Cretaceous vertebrate collection at Museum Victoria. He was able to identify a number of theropod bones in the collection. Roger also took the opportunity to spend a few days with Mike Cleeland exploring the Bass Coast. Mike took Roger to Eagle's Nest, the site of Australia's first dinosaur bone, and they discovered a large dinosaur limb at the base of the Eagle's Nest rock stack. Preparation of the bone revealed it to be a large tibia, probably from an ornithopod dinosaur.

Tibia discovered by Mike and Roger at Eagle's Nest

Roger has summarised his preliminary findings in this report and has greatly increased our knowledge of the different types of theropod dinosaurs that once roamed southern Victoria. Now we just have to find that articulated theropod skeleton for him…

The new book "Dinosaur Dreaming: Exploring the Bass Coast of Victoria" was officially launched earlier this year. It has proved to be extremely popular, particularly with visitors to the Bass Coast and the 600 Million Years – Victoria Evolves Exhibition at the Melbourne Museum, where some of the fossils mentioned in the book are on display. It is available at a number of outlets including the Melbourne Museum bookshop, the Monash Science Centre and the Bunurong Environment Centre in Inverloch.



The Dinosaur Dreaming booklet and CD of Dinosaur Dreaming activities

In addition to the Dinosaur Dreaming book we have produced a CD of Dinosaur Dreaming activities, in collaboration with the Bunurong Environment Centre. It includes 30 dinosaur related activities for primary school students and families and is available from the Monash Science Centre and the Bunurong Environment Centre.

Plans are well underway for Dinosaur Dreaming 2012. Once again we are planning a three week field season at Inverloch in February, followed by a 10 day dig in the Otways at the end of March.

ACKNOWLEDGEMENTS

We would like to extend our usual thanks to Dom and Tracey Brusamarello and the friendly staff at the Inverloch Foodworks Supermarket for their support of the dig. We would also like to thank Lee-Anne and Michelle from Blundstones for once again organising the delivery of steel-capped boots for the Dinosaur Dreaming team.

Local optometrist, Dennis O'Donnell donated a number of hand lenses to the dig this year, following on from his generous donation of a portable microscope in 2010. Many thanks Dennis.

Long time "Friend" of Dinosaur Dreaming Rob Huntly provided his van and muscles to help us transport the dig equipment from its storage shed in Wonthaggi to the new dig house and back. Thanks again Rob.

Of course, the annual digs would not happen without the unswerving support of the many volunteers, from all walks of life and all age groups. Their enthusiasm and hard labour make the dig a success year after year.

On behalf of all the Dinosaur Dreamers we would like to wish Alanna Maguire "bon voyage" on her exciting trip to Ghana. Alanna joined the Dinosaur Dreaming team in 2000 as a Monash University undergraduate and has been with us ever since. Over the years she has taken on more and more responsibility during the dig, including making the signs for the annual "Friends of Dinosaur Dreaming" day. Three years ago she took over the role of editing the Dinosaur Dreaming Annual Report with her good friend Wendy White. Alanna will be taking on the daunting task of a Disaster Risk and Reduction and Climate Change Adaptation Officer for the United Nations World Food Programme in Ghana. A very worthwhile job for an amazing person. We miss her already, but know that our loss is Ghana's gain. Good luck Alanna.

Swim O'Clock Rock Report

By Lesley Kool & Alan Tait

There is a small area of mudstone conglomerate approximately 250 metres north of the Flat Rocks site, which is periodically exposed when the sand level drops. The area is at the top of the beach, adjacent to the swimming hole that is frequented by the Dinosaur Dreaming team (and members of the public) on hot days during the annual digs. So the site was given the name "Swim O'Clock Rock" because of its close proximity to the swimming hole. The conglomerate layer covers an area of approximately 35 square metres, roughly 6 metres by 6 metres, and over the last ten years or so a number of fossil bones have been found, exposed on its surface.

In August 2010 the sand was particularly low and the whole area was exposed. Six bones were discovered, two of which were removed at the time. Along the northern edge of the area lies a large fossilised tree trunk. On the south side of the tree trunk a layer of conglomerate is preserved in which four bones were exposed on the surface. But on the northern edge of the tree there is only sandstone, indicating that the tree may have acted as a barrier at the time the river channel was flowing, 120 million years ago. So it was decided that a small exploratory excavation should take place at the start of the 2011 annual dig to discover the extent of the association between the tree and the fossil layer.

By February 2011 the layer was once again partly covered by sand, but a couple of hours preparation uncovered the area and it was carefully mapped using a one metre grid system and a metre square quadrat. The saw cut marks from where previous bones had been removed, as well as the currently exposed bones, were marked on the map.

Careful observation of the area indicated that the conglomerate had been deposited in at least five separate layers. The lowermost conglomerate (C1) filled a scour hollow at the southeast edge of the outcrop and contained two large transported tree stumps with associated soil claystone. The south side of the outcrop had a band of conglomerate in three units (C2, C3 and C4) separated by discontinuous sandstone layers. C3 had two saw cut marks and C4 had three saw cut marks. Four claystone masses, one with a tree stump in it, were discovered in C3 and C4. The uppermost conglomerate (C5) was concentrated in the area south of the fossil tree, along the northern edge of the outcrop and was the thickest of the conglomerate layers. C5 had four saw cut marks and one tree stump with associated soil claystone. The tree along the north of the outcrop had a large mass of soil claystone around its roots. The upper parts of C4 and C5 were mainly plant fragments. Test excavation areas were dug in conglomerate layers C2 to C5 and the rock removed was broken down by the Dinosaur Dreaming team.

The results of five days work at the Swim O'clock Rock, including two days mapping and three days excavating, yielded a total of 26 bones and one tooth. Four of the bones were already exposed on the surface, whilst the rest were found during excavation and processing of the rock. Most of the recovered bones were fragments of fish and turtles, including a fish scale, fish skull fragments and turtle shell fragments. A couple of dinosaur bones were identified, including two small toe bones and a partial ornithopod dinosaur tooth.

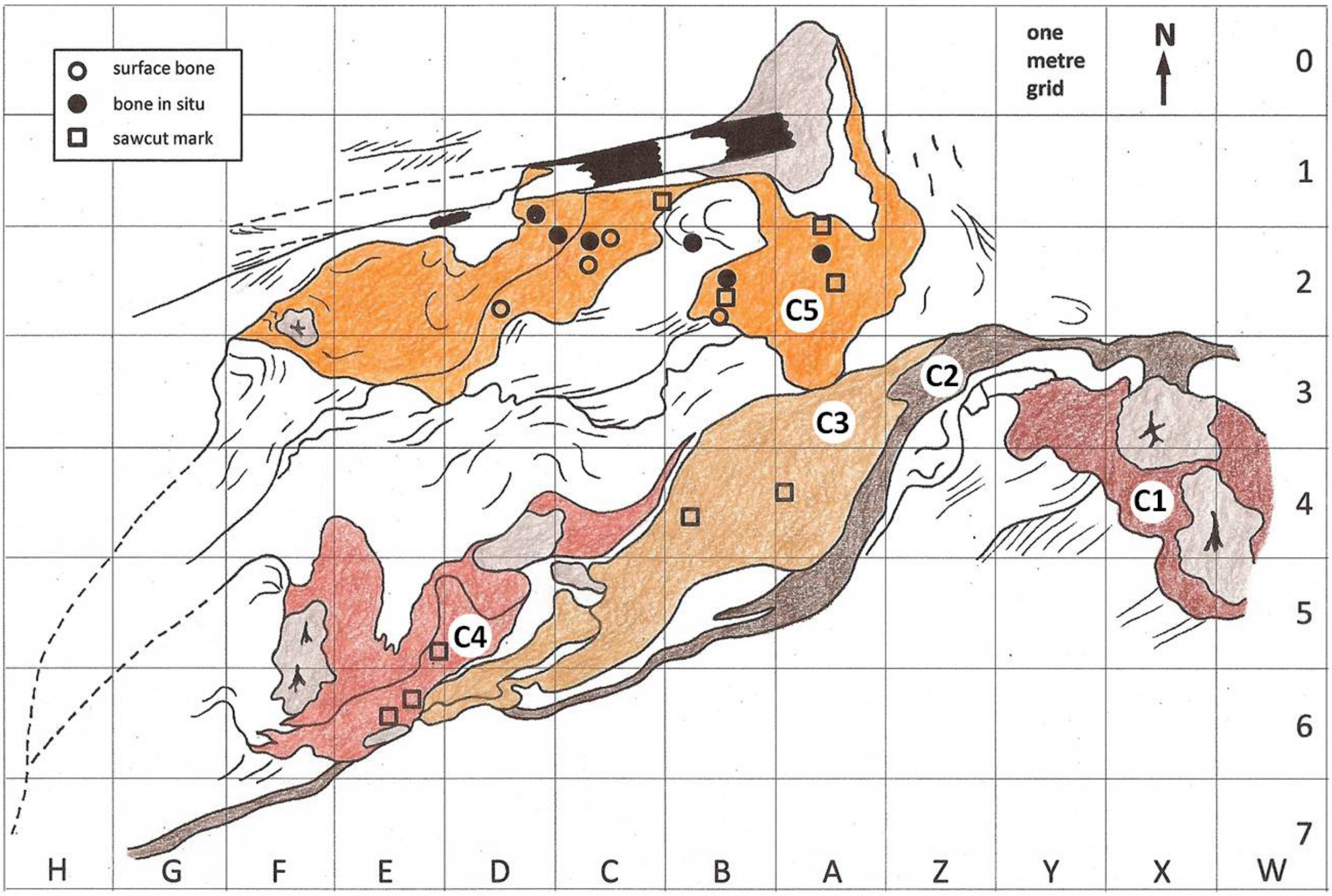
The most interesting bone was a small dinosaur limb, possibly a radius (bone from the forearm). Although only 3 cm long, it is well preserved and it may be possible to determine which group of dinosaurs it belongs to.

Interestingly, most of the unexposed bones were found in the uppermost conglomerate layer (C5) next to the tree trunk, though this was the last layer to be deposited.

During the mapping, sedimentologist Alan Tait followed the conglomerate layers out onto the shore platform where a couple of rocksaw cut marks were located, indicating that bones had been collected from these layers in the past. A small amount of rock was collected from close to the sawcut marks and, in the process of breaking it down, another small bone fragment was recovered. This layer of conglomerate was at the base of the channel and was either deposited before the other layers discussed above or is part of C1. All of the conglomerate layers are close to or at the base of the river channel, similar to the main dig site at Flat Rocks.

RESULTS

The conglomerate layers have irregular shapes because they were deposited during the turbulent water flow of a river flood. They fill scour hollows or were deposited as layers which were cut into by the intermittent scouring action of the flood. They contain eroded tree stumps (and in one case an entire tree) which has protected part of the uppermost conglomerate layer (C5) from erosion. The western end of C5 and the part of it north of the tree have been removed by erosion during the same flood or a later one. It was lucky that the tree prevented erosion of C5 because it contained most of the unexposed bones found at the site. Most of the bones collected were fragmentary but were identifiable as to which group of animals they belonged. As would be expected in a fluvial environment, the majority of the bones belonged to fish and turtles, as is the case at the main Flat Rocks site. Conglomerate layers C2 to C5 appear to be quite thin, mostly less than 10 cm, but their irregular shapes make it difficult to be certain. Each layer was sampled and it was concluded that no further excavation was necessary but that the layer would be checked on a regular basis for any newly exposed bones.



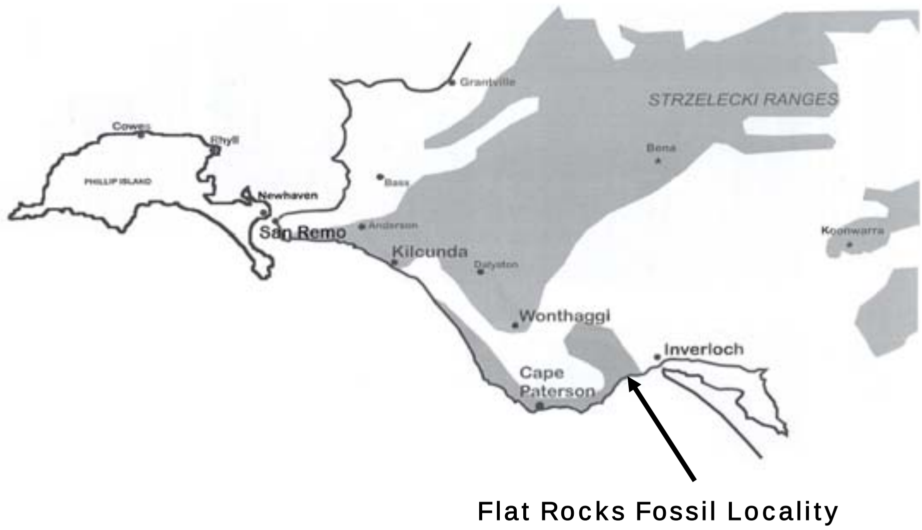
THE STRZELECKI GROUP VICTORIA

EARLY CRETACEOUS FOSSIL LOCALITIES IN THE STRZELECKI GROUP

Map Key #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Distribution of taxa recovered from the main fossil localities within the Early Cretaceous sediment of the Gippsland Basin **TAXA**	San Remo	Potters Hill	Rowell's Beach	Punch Bowl	The Arch	Blackhead	Kilcunda	Powlett River	Harmers Haven	Cape Paterson	The Oaks	Twin Reefs	Shack Bay	Eagles Nest	The Caves	Flat Rocks	Inverloch	Bena	Koonwarra
MAMMALIA:																			
Tribosphenic (Unidentified)																X			
Ausktribosphenos nyktos																X			
Ausktribosphenos sp																X			
Bishops whitmorei																X			
Monotremata (Unidentified)																X			
Teinolophos trusleri																X			
Multituberculata																			
Corriebaatar marywaltersi																X			
DINOSAURIA:																			
DINOSAUR (Unidentified)	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	
Ornithopoda (Unidentified)	X	X		X	X	X	X	X						X	X	X			
Fulgurotherium australe					X									X					
Qantassaurus intrepedus																X			
Ankylosaurs/nodosaurs					X											X	X		
Neoceratopsidae					X														
Serendipaceratops arthurcclarkei					X														
Theropoda (Unidentified)	X			X	X	X	X	X					X	X		X			
Ornithomimid	X					X										X			
Megaraptora					X									X					
Other Vertebrates:																			
Plesiosauria (aquatic reptiles)	X							X						X		X	X		
Pterosauria (flying reptiles)														X		X			
Testudines (turtles)						X		X		X				X	X	X	X	X	
Aves (birds)																X			X
Temnospondyli (amphibians)																	X		
Koolasuchus cleelandi	X	X	X	X															
Dipnoi (lungfish)	X			X			X	X					X	X		X	X		X
Neoceratodus nargun				X										X		X			
Archaeoceratodus avus														X					
Actinopterygii (ray finned fish)					X	X		X						X		X		X	X
Leptolepis koonwarri																			X
Koonwarria sp.																			X
Wadeichthys oxyops																			X
Coccolepis woodwardi																			X
Psilichthys sp.																			X
Invertebrates:																			
Freshwater molluscs:					X														
Megalovirgus flemingi					X														
Insecta (Insects)																			X
Trace Fossils:																			
Dinosaur footprints																X			
Crustacean Burrows: Parastacid											X	X		X	X	X			

THE STRZELECKI GROUP, VICTORIA

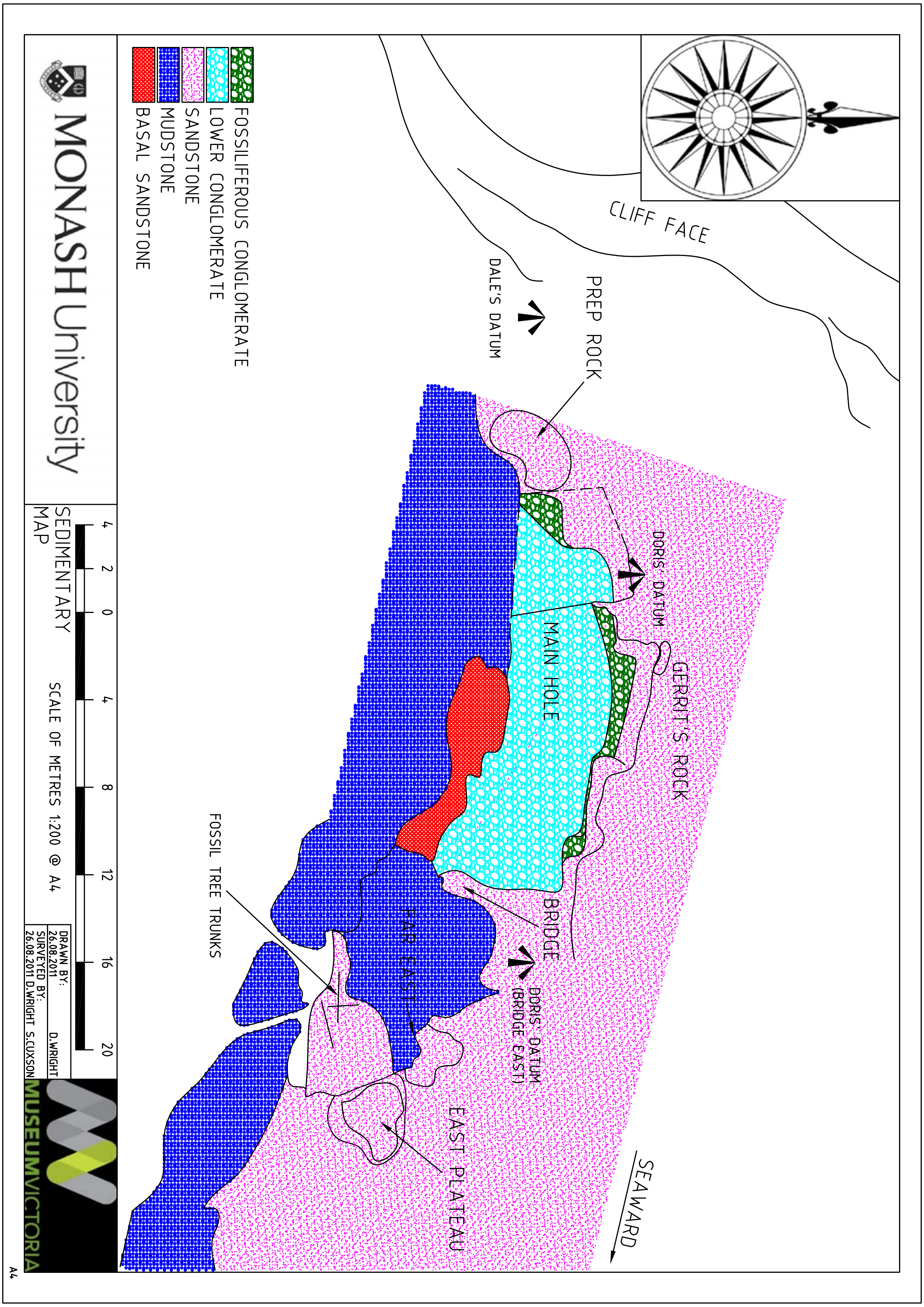
FOSSILS FROM THE FLAT ROCKS LOCALIITY IN THE STRZELECKI GROUP



Taxonmic list of Fossil Materials from the FLAT ROCKS Site reflecting the high Faunal Diversity

TAXA	Skull element	Jaw	Tooth	Vertebra	Limb	Girdle	Rib	Shell Armour	Scales	Trace
MAMMALIA:										
Tribosphenic (Unidentified)		X	X							
Ausktribosphenos nyktos		X								
Ausktribosphenos sp.		X								
Bishops whitmorei		X								
Monotremata (Unidentified)	X	X	X							
Teinolophos trusleri		X								
Multituberculata										
Corriebataar marywaltersae			X							
DINOSAURIA										
DINOSAUR (Unidentified)	X	X	X	X	X	X	X			X
Ornithopoda. (Unidentified)	X	X	X	X	X	X	X			
Qantassaurus intrepidus		X								
Ankylosauria / Nodosauridae			X				X	X		
Theropoda (Unidentified)	X		X	X	X					
Ornithomimidae				X						
Other Vertebrates:										
Plesiosauria (aquatic reptiles)			X				X			
Pterosauria (flying reptiles)					X					
Testudines (turtles)	X	X		X	X	X		X		
Aves (birds)					?	X				
Enantiorthine						X				
Dipnoi (lungfish)			X							
Neoceratodus nargun			X							
Actinopterygii (ray finned fish)										
Teleostei	X	X	X						X	
Chondrostei	X	X	X						X	
Invertebrates:										
Freshwater molluscs:										X
Megalovirgus flemingi										X
Trace Fossils:										
Dinosaur footprints										X
Crustacean Burrows: Parastacid										X

Flat Rocks Site Map



RESEARCH REPORT

BY TOM RICH

The dinosaurs of Victoria are attracting the attention of more and more overseas vertebrate palaeontologists. Three of them spent some time working on various aspects of the hard won collection of these fossils, which was compiled by hundreds of dedicated volunteers over the decades and is now housed at Museum Victoria. They were all assisted in their studies by David Pickering who arranged access to facilities both at Museum Victoria and at Monash University, as well as to the collections themselves.

Holly Woodward from Montana State University, USA, spent two months during the winter of 2010 investigating the microstructure of the Victorian dinosaurs with an emphasis on the euornithopods [= hypsilophodontids] although she did also examine some theropod fossils too.

Anusuya Chinsamy of the South African Museum, Capetown, had carried out a similar but much more limited study published in 1998. Her initial study was limited because of a lack of material at that time.

Holly supplied Anusuya with images of the thin sections of bones made one year ago. With Holly leading the project, the two worked together to produce a paper that was published in August 2011 (Woodward *et al*. 2011). With the larger sample, they were able to show that both the euornithopods and theropods had a rapid growth rate when newly hatched that tapered off as they approached adulthood at about three years of age. Perhaps one or both groups of dinosaurs hibernated but the fine structure of the bone gives no evidence one way or the other for this.

Previously, on the basis of the more limited sample then available, it was thought that the theropods hibernated and the euornithopods did not. This is a good example demonstrating that scientific hypotheses are always open to further testing.

Fernando Novas, of the Museo Argentino de Ciencias Naturales in Buenos Aires, Argentina, spent nearly a week and Roger Benson, now of University College, London, UK, three weeks reviewing the collection of theropod fossils from Victoria. At present they are writing up their interpretations of these fossils.

In the meantime, Paul Barrett of the Natural History Museum in London, along with Roger, published on a fragment of a neck vertebra of a spinosaur, the first fossil of that group reported from Australia (Barrett *et al.* 2011). This discovery is part of a rapidly emerging pattern as more of the fragmentary dinosaur specimens from Victoria are examined by world experts. The emerging pattern is that dinosaur groups previously unknown in Australia but widely known elsewhere are being found on this continent based on the collections made in Victoria. Last year, it was a tyrannosauroid that turned up, a specimen described by Roger Benson and others. At the moment, Erich Fitzgerald is leading a group that will be reporting on yet another addition to the dinosaur list from Australia based on a fossil from Victoria that, with luck, will be able to be shared in the Dinosaur Dreaming report for 2012.

Previously, Paul had published the first summary of the armoured ankylosaurs from Victoria (Barrett *et al.* 2010).

A question has been raised about the association of the various bones that together formed the basis for establishing the dinosaur *Leaellynasaura amicagraphica*. It was suggested that possibly bones of more than one individual made up the collection that was the basis for the name and even that it might be the case that different groups of dinosaurs were represented amongst that material. The fossil had been found over a period of three days in 1987 at Dinosaur Cove.

Two years later, the species was established on the basis of those fossils interpreted to have belonged to one individual. To address the issue of whether *L. amicagraphica* was actually based on a single individual, a detailed analysis of the specimens, the field records associated with them and information supplied by Nicholas van Klaveren, Natalie Schroeder and Helen Wilson (who were present when the fossils were collected) was compiled (Rich *et al.* 2010).

The comment has sometimes been made that once a fossil is published, there is no need to devote precious museum space to store it and the records associated with it. This case is an excellent example of why that is not so. There is always the chance that a fossil, even after it has been described as meticulously as possible, will have new questions asked of it that did not or even could not have occurred to the first person to study it.

Until Mike Cleeland found a nodule with numerous fossil bones in it close to the Flat Rocks locality, no partial dinosaur skeletons had been found in the Strzelecki Group. All had previously come from the 10 million year younger Otway Group. Extracting this specimen (now dubbed "Noddy" for obvious reasons) from the nodule has become a Herculean task taken on by David Pickering. The rock is even harder to deal with than the bulk of dinosaur specimens from elsewhere in Victoria. Having worked to expose the fossil from one side of the nodule, there is a plan with novelty attached to it to turn it over and expose it from the other side. The novelty will be to take images at short intervals as the nodule is slowly chipped away. If all goes well, a visual sequence will show the fossil seeming to emerge from the rock.

While much has been done with the dinosaurs in the past year, the animals that lived alongside them have not been forgotten. When not dealing with Noddy and his collection management duties, Dave Pickering has also been slowly exposing a partial skull of the temnospondyl *Koolasuchus cleelandi*. While this species was named in 1997 and is one of the best known Cretaceous tetrapods from Victoria (being represented by numerous girdle elements, limbs, and vertebrae together with lower jaws) the skull has not been previously known. So Dave's efforts will result in a significant addition to the knowledge of this species, the youngest example of a temnospondyl by at least 30 million years.

The Dinosaur Dreaming report for 2010 mentioned two upper molars of a mammal found by Alanna Maguire. While more than twenty-five lower jaws of mammals with molars have been found in the Cretaceous rocks of Victoria, Alanna's specimen was the first upper mammalian molars collected from those same deposits. Fragmentary though those worn teeth are, they have elicited an incredible amount of interest among palaeontologists. At the moment, seven people are working together to try and figure out what it is. Of the mammals currently known from the Cretaceous of Victoria, the only group to which this specimen might belong are the Ausktribosphenidae, the genera of which are *Ausktribosphenos* and *Bishops* that are currently only known from lower jaws and teeth. If these two upper molars belong to either genus, they should occlude (fit together) with one or the other of those two sets of lower molars.

The first step to be taken to work out what these two upper molars might be was made by Peter Trusler. Over a period of two months, he meticulously painted a restoration of the two teeth, mentally fitting the broken pieces together. The process of working out what this fossil is continues to this moment.

Because Alanna's specimen is so badly fractured a trial cannot be made to manually fit those teeth with the lower molars of either of the ausktribosphenids. However, as part of a larger project to document the more complete of the Cretaceous mammals from Victoria, Alanna's specimen, along with twenty-two other of the best of these fossils, was taken to the SPring 8 Synchrotron in Honshu, Japan, in July. There the specimens were scanned.

The work there was carried out by a group of four, Karen Siu from the Australian Synchrotron and Monash University, Alistair Evans and David Elliott of Monash University, and the writer. Originally given *gratis* 72 hours of machine time by the SPring 8 Synchroton, in the end we used about 86 hours. That enabled the imaging of nineteen of the specimens with us in whole or in part. These high quality scans were made for both research and archival purposes. With multiple copies of the data distributed to interested parties around the world, should the actual fossils be destroyed, scans made in this way are the best quality records of these hard won fossils that current technology is capable of creating.

By manipulating the individual elements of the scan of Alanna's specimen, Alistair Evans has been able to partially reconstruct the teeth. With the scan images available of both Alanna's specimen and ausktribosphenids, Alistair will now try to electronically fit the upper and lower molars together to see if it is plausible that her fossil is the otherwise unknown upper molars of ausktribospheids. The interest in this fossil is so great that her specimen was recently rescanned in Helsinki, Finland by Jukka Jernvall, a colleague of Alistair Evans, and will be scanned again in Bonn, Germany. Thomas Martin will use the Bonn scan to attempt a fit as well. With different workers attempting to make a fit with scans generated by different machines, different outcomes are possible. There could be a consensus one way or the other that a fit is either possible or impossible. Also, one worker may conclude that a fit is possible and another disagree. If the conclusion is that Alanna's specimen is likely to be the previously unknown upper molars of an ausktribosphenid, it will be the first advance in our knowledge of that group in almost a decade. As such, it may prove to be the decisive evidence to resolve two quite different interpretations as to just what ausktribosphenids are. The two alternatives are that ausktribosphenids are placental mammals, or represent a group much like placentals but quite unlike them and based in the Southern Hemisphere. However, should it be the case that the evidence shows that Alanna's specimen could not be an ausktribosphenid because the fit is wrong, then things will definitely get interesting because the fossil will clearly be a new group for Australia, if not for the planet.

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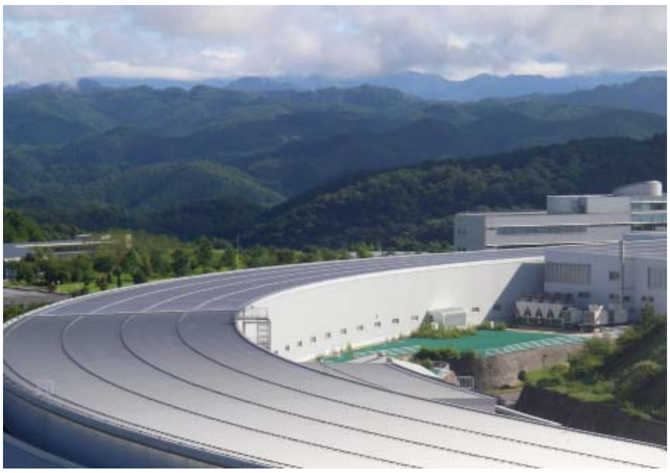

The Spring8 Synchotron in Honshu, Japan

A Concise History of the Dinosaur Dreaming Vertebrate Fossils

By Doris Seegets-Villiers

In anticipation of an in depth analysis, last year's report dealt (in theory) with the general characterisation of bone modifications and their interpretation. Following several months of frequenting the halls of the collection at the Museum, the eagle has landed and we have got results.

So, what did we find?

Flaking, for example as part of the higher stages of bone **weathering**, was not observed on a single bone. A few specimens showed Stage 3 weathering (whereby the outer bone surface has been removed leaving rough compact bone) but apart from these few examples, the highest degree of weathering was Stage 1. And even here, one had to look closely for the characteristic splitting of the outer bone. In a majority of cases the cracking could only be identified with the aid of a microscope, which is in contrast to suggestions by experts in the field who describe Stage 1 splitting as macroscopically identifiable and anything but subtle. Little to no damage indicates "short" subaerial exposure. Regrettably, we cannot be certain what time frame we are dealing with. However, as we can be quite confident that the climate was neither tropical nor subtropical, which would indicate a time frame of as little as one year (hot climates tend to accelerate the weathering process), we can assume that exposure was longer, possibly by quite a few years (of course without the knowledge of the meaning of "few").

Short transport distance of bone material is suggested by a low degree of **abrasion** and expressed by only slight polishing of bone ends and processes. Again, the problem lies in the term "short". Behrensmeyer (1982) observed that a transport distance of about 1000 metres generally incurred little abrasion, but also that several kilometres more did not necessarily increase its effect greatly. Luckily for us, some of our bones have been deposited alongside clay clasts, which have a tendency to completely disintegrate after a few kilometres of entrainment (Smith 1972). Therefore, we can assume that our bone material was transported for a lesser distance, which might be as little as a few hundred metres, but should not exceed ten kilometres.

Breakage whilst bones were still fresh is by far more common than breakage of mineralised bone and can be caused by scavenging, trampling or during transport. With only few tell-tale signs, we cannot be certain which (if any) of these parameters played the more prominent role.

Compression fractures are diverse and range from small cracks to complete "flattening" of the bone accompanied by many cracks. Interestingly enough, the directions of these compressions are very diverse. For example some tibiae are compressed laterally (Fig.1) and others posterior to anterior (Fig.2). Why this is the case is debatable but might indirectly confirm a short transport distance where individual specimens did not have sufficient time to settle into a stable position.

Fig. 1 Lateral compression of a tibia

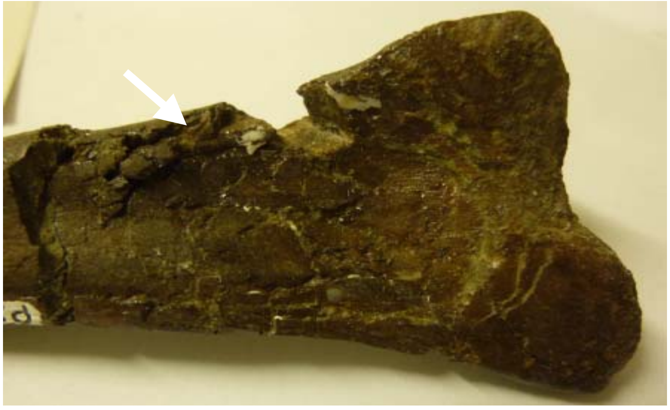

Fig. 2 Posterior-anterior compression of a tibia

Although **trampling** is often seen as a cause of fragmentation (we have plenty of fragmentation), very few specimens show the tell-tale signs of sub-parallel scratches (Fig. 3) on outer bone surfaces. Why there are so few traces is again debatable. We know that scratching is caused by pressing bone material into soft sediment as a consequence of trampling. We also know that marks will only be left if sediments are coarse (silt size and above). A lot of the sediments at the excavation site are sands and even the matrix of some of the conglomerates is formed by sand, therefore the little scratching we have observed might have occurred in those areas. We do not, however, know what sediment existed in the areas where animals died. These might have been, at least in part, fine grained clays (such as those we now find as pebbles in the conglomerates). If this is the case, it can be argued that more trampling (and therefore fracturing of the bones) occurred in the source areas of these bones, but due to the fine grained nature of the sediments no traces of the action of traversing animals were left.

Fig.3 Sub-parallel scratches on a tibia

Evidence of **predatorial behaviour** (puncture marks caused by biting and grooves as a result of scavenging, Fig. 4) is limited to ten specimens. This number might, at first glance, seem low, however examination of several dinosaur sites by Fiorillo (1991) has revealed a generally low frequency of affected bones (between 0 and 4%). This might still sound low, but then again scavenging is dependant on supply and demand. Whilst there might have been abundant supply, there may not have been much demand.

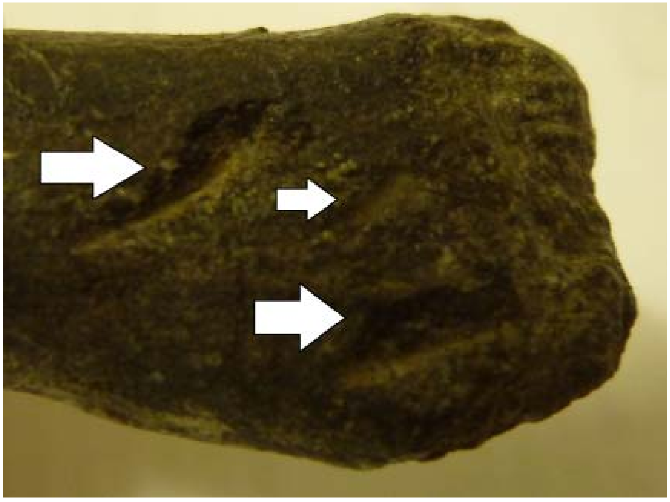

Fig. 4 Gnaw marks on a femur

To determine the degree of **sorting** of an assemblage, the ratio of limbs to vertebrae is assessed. In accordance with their hydraulic behaviour, light elements (such as vertebrae) will be carried away ahead of heavier specimens (such as limbs) in a flowing water body. If relative numbers of vertebrae and limbs are (roughly) the same, an assemblage is in situ (not moved). If, however, heavier specimens are predominant, the assemblage has been sorted. Limb bones are by far the more abundant of the two elements within the Flat Rocks collection, suggesting that the assemblage was well sorted before final deposition.

The study of bone modifications has aided in understanding the taphonomic history of the Dinosaur Dreaming assemblage. Subaerial exposure was relatively short, with most of the specimens showing minimal signs of weathering. Likewise, abrasion due to transport activity was minimal, suggesting a source relatively close by. Most bones were fractured whilst still in a fresh state - a result of trampling or even scavenging, but in the presence of only few tell-tale marks these inferred causes can only be seen as speculative. Lack of traces associated with trampling can be a consequence of sediments that were too fine-grained to leave marks. The absence of a higher number of tooth marks does not indicate the fasting associated with the final stage of a "Biggest Loser" competition in the Cretaceous world, rather might show parallels to the modern world where even today, many carcasses are not disturbed by scavenging.

Some might say that proof of predatorial behaviour makes a much more interesting story. However, we have to consider that this very behaviour is linked to a huge loss of information. Information that, in the long run (provided fossilisation does what it is supposed to do) might just add a little more towards the understanding of life and the life forms that once roamed the earth's surface.

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Otways Prospecting Trip Report

26 - 30 November 2010

By David Pickering

"The best laid schemes o' Mice an' Men,
Gang aft agley,
An' lea'e us nought but grief an' pain,
For promis'd joy!"

Robert Burns - To a Mouse

Our plan to do a ten day excavation at the Eric the Red West site came to "nought" at the last moment when, due to a bureaucratic misunderstanding, we were denied permission to extract fossils from the site. This was completely unexpected as we had been working the site since 2005 with the approval of Parks Victoria and the local Indigenous groups. Since the accommodation had been booked, the logistics put in place and the troops were raring to go, it was decided not to cancel the trip but to modify our plans from fossil extraction to fossil prospecting. The duration of the field work was reduced to four days as this was sufficient time to cover the intended length of coast, and any longer than four days walking and climbing would run the risk of a crew mutiny.

"There is a pleasure sure in being mad which none but madmen know."

John Dryden - The Spanish Friar

A crew of seventeen gathered at Bimbi Park to face the usual early summer Cape Otway weather which comprises early morning fog followed by driving rain, biting wind and cutting sand. The crew was divided into two groups, one led by David Pickering with Tim Holland as GPS navigator, the other led by Mike Cleeland with Marion Anderson as navigator. The coast line between Marengo (near Apollo Bay) and Cape Otway was divided into sections, allocated to the groups and systematically searched for any sign of fossils exposed on the eroded rock. Prospecting for fossils does not mean a casual walk along the beach. It is a slow and exacting exercise involving high levels of concentration. Prospectors scan the ground, often bent from the waist or even on hands and knees. About a dozen fossils were found and their locations recorded. A stretch of the Otways coast more than twenty kilometres long was duly prospected. Notes were taken for future work in the area.

Meanwhile, back in Melbourne, Tom Rich and Pat Vickers-Rich had been working their way through the red tape and had finally resolved the bureaucratic impasse. This enabled the crew to do a few hours of rock breaking at our usual site, culminating in John Wilkins unearthing a neat ilium (hip bone) from a small-bodied ornithopod.

Two interesting side excursions were undertaken during the field work. Tom Rich, John Wilkins and David Pickering trekked down to Milenesia Beach, west of Johanna, to check on the condition of two slab erratics (loose rocks fallen from the cliffs) covered in dinosaur trackways that had been found the previous winter by Tony Martin, Greg Denney and Tom. These are the first dinosaur trackways (as opposed to single footprints) that have been found in Victoria. The erratics were soon rediscovered and found to be in good shape. Greg Denney subsequently recovered the blocks and delivered them to the Museum.

The other excursion involved a trip down to Dinosaur Cove by Alan Tait, accompanied by Sean Wright, to sample some sediment. While Alan was taking his samples, Sean (who is an excellent prospector) spotted an erratic containing three dinosaur footprints. The second dino trackway from Victoria! This 40 kilogram rock was recovered in March 2011 by Alan, who singlehandedly carried it up the track out of Dinosaur Cove. This Herculean effort has Dinosaur Cove old-timers shaking their heads.

Mary, Wendy and Dean demonstrate their agility and bravery as they scale the ledge on a blustery day

I would like to thank Frank and Katrina from Bimbi Park (Koalas under the Gums!) who cheerfully catered to our sudden changes in accommodation needs.

Many thanks to everyone who attended for their hard work, undertaken with good humour, often under trying conditions.

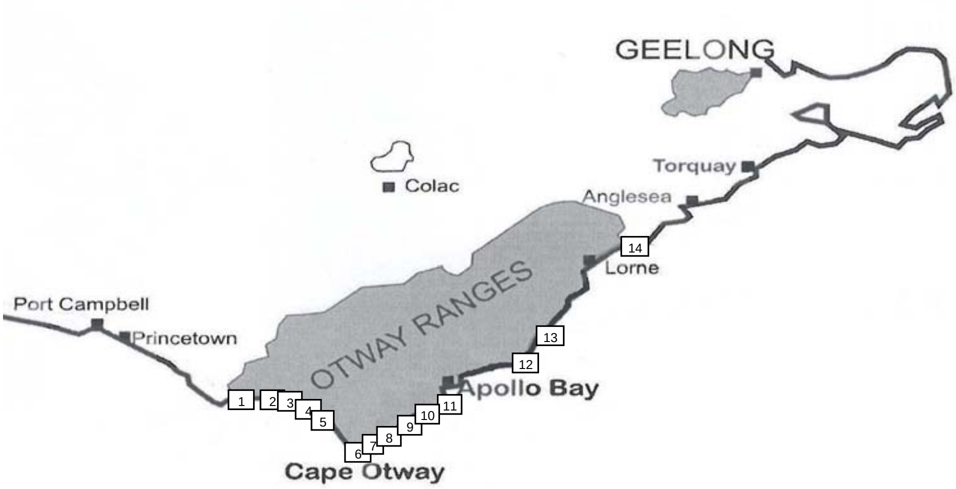
" It was fun... but I wouldn't do it again"

Mary Walters, 2011

P.S. Is there a connection between the crew walking for 4 days and the most significant thing seen being rocks with tracks of dinosaurs walking over them?

THE OTWAY GROUP, VICTORIA

EARLY CRETACEOUS FOSSIL LOCALITIES IN THE OTWAY GROUP

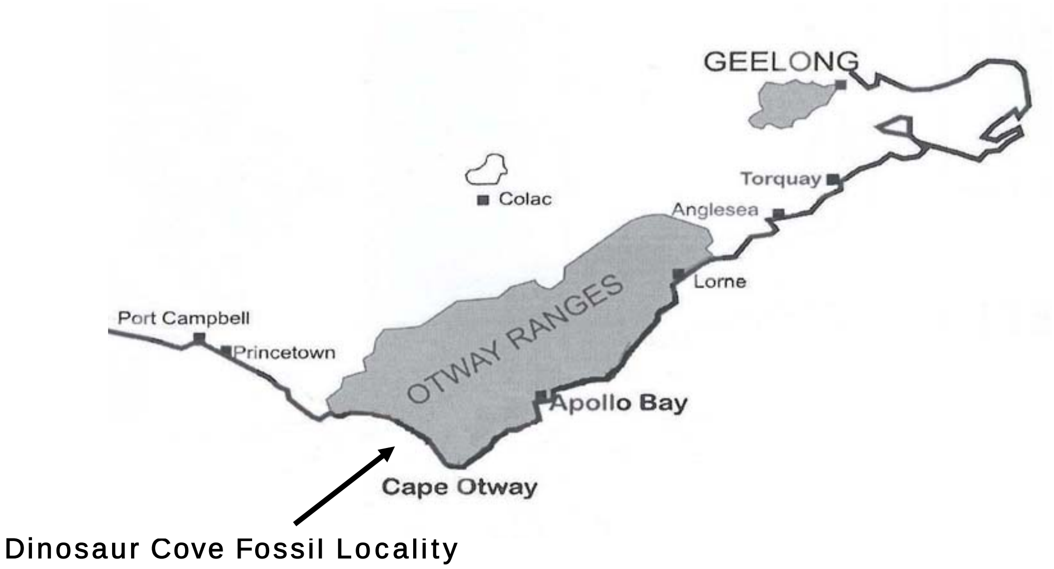


Distribution of taxa recovered from the main fossil localities within the Early Cretaceous sediments of the Otway Basin

Map Key # / TAXA	1 Ryans Den	2 Knowledge Creek	3 Milanesia Beach	4 Rotten Point	5 Dinosaur Cove	6 Eric the Red West	7 Eric the Red	8 Point Franklin	9 Point Lewis	10 Elliott River	11 Marengo	12 Skenes Creek	13 Cumberland River	14 Eastern View
MAMMALIA:														
Tribosphenic (Unidentified)						X								
Bishops sp.						X								
Monotremata (Unidentified)														
Kryoryctes cadburyi					X									
DINOSAURIA:														
DINOSAUR (Unidentified)	X			X	X	X	X	X	X	X	X			X
Ornithopoda (Unidentified)	X			X	X	X			X	X	X			
Atlascopcosaurus loadsi					X				X					
Fulgurotherium australe					X									
Leaellynasaura amicagraphica					X									
Ankylosaurs/nodosaurs					X									
Neoceratopsian					X									
Theropoda (Unidentified)					X	X		X						
Spinosaurid						X								
Oviraptosaurid					X									
Ornithomimid					X									
Neovenatoridae indet.					X									
Tyrannosauroid					X									
Other Vertebrates:														
Plesiosauria (aquatic reptiles)					X								X	
Crocodylia (crocodiles)					X									
Pterosauria (flying reptiles)					X									
Testudines (turtles)	X				X	X	X	X	X					
Otwayemys cunicularis					X X									
Dipnoi (lungfish)					X	X			X					
Neoceratodus nargun					X				X					
Actinopterygii (ray finned fish)					X	X								
Invertebrates:														
Freshwater crustacean:					X									
Palaeoechinastacus australianus					X									
Freshwater molluscs					X									
Megalovirgus flemingi					X									
Trace Fossils:														
Dinosaur footprints		X	X		X							X		
Dinosaur Burrows		X												
Crustacean Burrows: Parastacid		X			X						X	X		

THE OTWAY GROUP, VICTORIA

DINOSAUR COVE LOCALITY IN THE OTWAY GROUP



Distribution of taxa and material recovered from the Dinosaur Cove locality

TAXA	Skull element	Jaw	Tooth	Vertebra	Limb	Girdle	Rib	Shell / Armour	Scales	Trace
MAMMALIA:										
Monotremata (Unidentified)			X							
Kryoryctes cadburyi					X					
DINOSAURIA:										
DINOSAUR (Unidentified)	X	X	X	X	X	X	X			X
Ornithopoda (Unidentified)	X	X	X	X	X	X	X			
Atlascopcosaurus loadsi		X	X							
Fulgurotherium australe					X					
Leaellynasaura amicagraphica	X	X	X	X	X	X				
Ankylosaurs/nodosaurs				X				X		
Neoceratopsidae					X					
Theropoda (Unidentified)	X		X	X						
Oviraptosaurid		X		X						
Ornithomimid : *Timimus hermani*				X	X					
Neovenatoridae (Unidentified)					X					
Tyrannosauroid						X				
Other Vertebrates:										
Crocodylia (crocodiles)			X					X		
Plesiosauria (aquatic reptiles)			X							
Pterosauria (flying reptiles)			X		X	X				
Testudines (turtles)										
Otwayemys cunicularis	X	X		X	X	X		X		
Dipnoi (lungfish)			X							
Metaceratodus wollastoni			X							
Neoceratodus nargun			X							
Actinopterygii (ray finned fish)	X	X	X						X	
Invertebrates										
Freshwater crustacean:								body fossil		
Palaeoechinastacus australianus										
Freshwater molluscs:										X
Megalovirgus flemingi										X
Trace Fossils:										
Dinosaur footprints										X
Crustacean Burrows: Parastacid										X

Discovering Dinosaur Tracks from Milanesia Beach

By Tony Martin

Dinosaur tracks are hard to find. This humbling realisation struck me during the third week of a month-long field excursion in May-June 2010, while doing field work along the craggy coast of Victoria. Paleontologist Tom Rich of Museum Victoria had invited me to look for trace fossils made by dinosaurs and other Cretaceous animals that might be preserved in the rocks of Victoria. Yet as was often the case with looking for fossils of any kind, there were no guarantees of success. He and I had already searched more than a hundred kilometres of coastal cliffs and platforms east of Melbourne, and were then working our way through sites to the west.

On Monday June 14 2010, Tom Rich, local guide Greg Denney (of nearby Apollo Bay) and I went to Milanesia Beach to look for fossils in that area dating back to about 105 million years ago. The landscape was certainly very different back then; it was a time when Australia was close to the South Pole, and dinosaurs walked across broad floodplains of rivers that coursed through its circumpolar valleys.

Greg had a long-standing relationship with Tom as a field assistant and friend. He had grown up in the area living next to one of the most famous dinosaur sites in Australia, Dinosaur Cove.

Milanesia Beach was a new place for me, and it might as well have been new for Tom, as he had not visited it in more than 20 years. His main reason for looking at its rocks was for fossil bones, especially those of dinosaurs or mammals.

My purpose, however, was different. I am an ichnologist, and was there to look for trace fossils - vestiges of life that would most often consist of burrows and trails made by invertebrate animals, like insects, crustaceans, or worms.

It was a fine day with no signs of the rain, gusting winds, and powerful waves that had kept us off the coastal outcrops for much of the previous week. Earlier that morning, Tom and I picked up Greg and parked our field vehicle near a trailhead, about 2 kilometres upslope from the beach. The walk down to the outcrops, punctuated by muddy, slippery patches, promised a vertically challenging slog later in the day, just when we would be most spent from our explorations below.

On Milanesia Beach, two choices faced us in our fossil explorations. Either go to the outcrop on our immediate right with only beach sand in front of it, or to a more modest outcrop on our left, with our path complicated by numerous blocks of rock that had fallen from cliff-faces above. We looked briefly at the closest part of the outcrop to the right, but these rocks seemed too coarse-grained to have many discernible trace fossils. Fine-grained sandstones or siltstones are much better for preserving identifiable invertebrate burrows or vertebrate tracks. Thus we chose to go left, a decision that was helped by high waves already lapping against the outcrop on our right.

Sure enough, within less than 10 minutes of our arriving, Greg and I started finding trace fossils – invertebrate burrows – in fine-grained sandstones and siltstones exposed in the outcrop. These burrows closely resembled trace fossils I had seen in rocks at another place - Knowledge Creek- which was just a few kilometers east of us. Knowledge Creek is the place where the only well-documented dinosaur track was discovered from the Eumeralla Formation (in 1980 and probably made by a small ornithopod dinosaur), and also home to possible dinosaur burrows. Similar sedimentary rocks and trace fossils at Knowledge Creek and Milanesia Beach implied similar environments produced these rocks. So perhaps the conditions at both places were conducive to dinosaurs walking across floodplain surfaces.

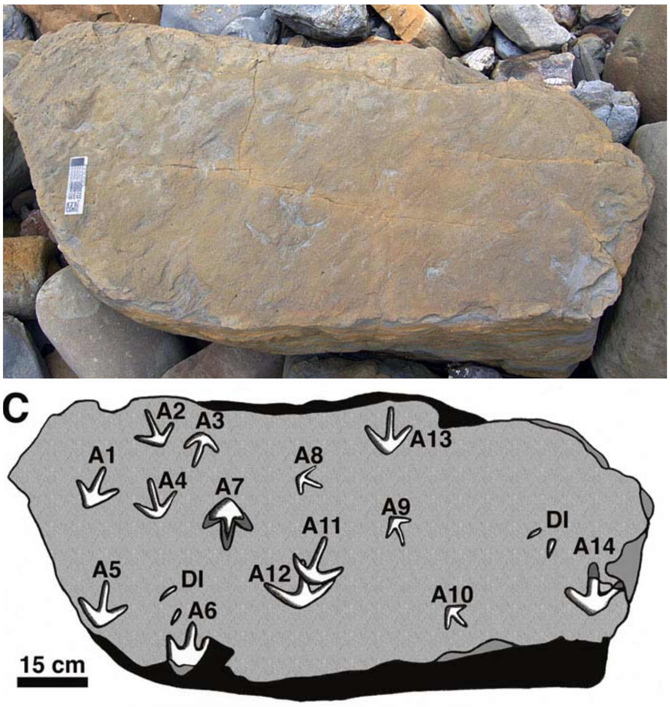
Only four definite dinosaur tracks had been identified from all of the Cretaceous of Victoria, after more than 100 years of paleontological research in those rocks. The two tracks from 105-million-year-old rocks west of Melbourne – Knowledge Creek and Skenes Creek – were attributable to small ornithopod dinosaurs. Large-sized theropods likely made the two 120-million-year old tracks in rocks to the east of Melbourne.

An abundance of dinosaur bones found during the past 30+ years in this part of Australia indicate a more diverse fauna should be there, and these dinosaurs should have been leaving tracks during the springs and summers in between harsh polar winters. Moreover, in most places where dinosaurs used to live, dinosaur tracks tend to be more abundant than their bones. Frustratingly enough, the situation in the Cretaceous rocks of Victoria was just the opposite. Paleontologists deal with gaps in the fossil record all of the time, but this was a big one for the fossil record of polar dinosaurs in Australia.

To this day, I don't know why, but one large, rectangular block of rock among dozens along the shoreline compelled me to stop and take a moment to stare at it. I looked to my left, then down at the top surface of the boulder.

There was a small, three-fold impression, looking vaguely like the middle three fingers of a human hand. It was close enough to touch, so I did. My own three middle digits molded to the indentations, confirming what my eyes had seen but not quite believed. It was a small dinosaur track.

After a quick inhalation of breath and almost trembling, I dared to look at the rest of the rock, scanning from left to right. More patterns of three came into focus, one after another, each identified faster than the previous one. Within about 5-10 seconds, I realized the bumpy surface was loaded with dinosaur tracks.



This slab of rock has at least 16 dinosaur tracks on it, although some are so shallow that you can't see them very easily, and at least two are only represented by paired clawmarks. The photos had a little bit of digital enhancement, and I later mapped track locations.

One of the footprints – a chicken-sized one, only about 7 centimetres long – was close to the edge of the slab. I shifted my focus behind the track nearest me to see if any similar preceded it. Sure enough, there was another one of the same size, aligned with the previous one. Halted briefly by disbelief, I backtracked one more time. Another track was exactly where it should be, at a distance nearly identical to the space between the other two, although slightly off the line of travel. One, two, three steps in sequence, showing a slight rightward turn. A preserved motion from more than 100 million years ago, made by a small theropod dinosaur on a river floodplain during a polar summer. It is the first known dinosaur trackway in all of southern Australia, and the first polar-dinosaur trackway from the Southern Hemisphere.

I looked more closely, and felt the rock surface to augment what my eyes told me. I began sketching what was there and marking locations of the tracks, using graph paper in my geological field notebook to make a scaled drawing that served as a "track map." Unlike taking photographs, drawing forced me to look at the rock and its fossil tracks repeatedly, carefully, and critically, a time-honored observational technique I teach to my students.

Within about 10 minutes, I found a few more tracks, subtle ones that either consisted of very faint toe impressions or were missing parts. For instance, two tracks were only evident as paired marks made by sharp claws from two toes. A quick, initial count yielded about 14 tracks, all showing three or fewer toes. The surface itself only had an area of about 0.7 square metres, so it held a lot of information in a small space. This was a busy little piece of real estate during the Early Cretaceous.

A handheld GPS unit quickly determined the latitude-longitude coordinates of where I was standing. These were saved as a waypoint but also written in my notebook, just in case the GPS unit somehow ended up in the seawater that just happened to be crashing in waves behind me.

Tom measuring the rock to calculate the mass.... "can we get this up the cliff?"

Tom and Greg soon joined me. I resumed taking measurements and writing notes, then took some photographs. Greg helped with the data collection, acting as a scribe with my field notebook as I measured lengths, widths, and depths of the footprints with digital calipers. As we did this, I could tell Tom's mind had gone somewhere other than gathering data about the dinosaur tracks. At some point, he asked to borrow my tape measure, and he immediately went about measuring the length, width, and thickness of the slab. He sat down, wrote in his notebook, and then revealed what he was thinking. "Greg, do you think we could get a front-end loader down here to take this up?"

I was surprised by Tom's question, but shouldn't have been. As an ichnologist, I've never been much of a collector. But Tom wasn't planning to let this big hunk of rock stay here on Milanesia Beach, but instead was already plotting how to get it to Museum Victoria. His scribbling consisted of back-of-the-envelope calculations of the approximate length, width, and height measurements, which yielded volume, which was then multiplied by density of the rock – sandstone interbedded with siltstone, which was about 2.7 grams per cubic centimeter, or more than 2.5 times the density of water. This yielded an estimated weight of about 700 kilograms for the rock in front of us.

Amazingly, nearly a year later in early June 2011, Tom, with the help of Pat Vickers-Rich, their daughter Leaellyn Rich, Greg Denney, David Pickering (Museum Victoria), and personnel from Parks Victoria succeeded in retrieving this block of rock with dinosaur tracks safely from the beach. It and the other block containing dinosaur tracks from the same site were then transported and deposited at Museum Victoria in Melbourne, where they are now stored for future reference and further study.

Oh, right. There was a second block of dinosaur tracks. Greg discovered that one. While I was self-satisfyingly writing field notes, he was looking at every nearby boulder. Suddenly, “This rock is the same as that one!” he shouted gleefully. As if watching a tennis match, Tom and I swiveled our heads back-and-forth between the slab with the dinosaur tracks and the one Greg was attempting to turn over. He was right: they matched perfectly, although this one was upside-down, with its uppermost surface hidden from view.

He had noticed the thickness of the first block, its thinly interbedded sandstones and siltstones, and a gray siltstone a little more than halfway down its thickness, looking much like a different ingredient in an otherwise monochrome layer cake. He then glanced around to see if any other boulders shared those traits, and matched one of them. Seeing that the gray siltstone bed was less than halfway down its thickness, he correctly surmised that it was wrong-side-up, and intuited that dinosaur tracks could be on its top surface. He was right.

So only three hours beforehand, when we first descended onto Milanesia Beach, only two confirmed dinosaur footprints had been found in the Eumeralla Formation of western Victoria. Now we had 24.

Tom quickly measured the second slab’s dimensions and figured out its weight. He reckoned it was about 400 kilograms, smaller than the first one but still too massive for any (or all) of us to haul up the trail.

I hurriedly photographed the overall surface, conscious of how our light would soon disappear, and started sketching the forms and locations of the tracks on the surface. I also noted similarities and differences between these newly found tracks and the ones found a few hours earlier. Greg again assisted me in recording measurements, as I used the digital calipers to gather data on the dinosaur tracks from this second block (number of toes, length, width, depth, and so on), and he wrote down the numbers in my field notebook as I read them aloud. Only then did I take close-up photographs of individual tracks with a photo scale next to each, documenting their dimensions and other details.

Tony studying the footprint-laden slab

We knew that some more science had to be done before we could share our finds with the rest of the world. Sure enough, exactly one year later – on June 14, 2011 – my coauthors and I - Tom Rich, Pat Vickers-Rich, Mike Hall, and Gonzalo-Vazquez Prokopec - received the good news that our scientific article had been accepted for publication in the journal *Alcheringa*.

And although these tracks were only a drop in the proverbial bucket when it comes to paleontological discoveries, they help to affirm the most important point about the fossil record: it gets better every day.

PEER-REVIEWED ARTICLE

Martin, A.J., Rich, T.H., Hall, M., Vickers-Rich, P., and Vazquez-Prokopec, G. 2011. A polar dinosaur-track assemblage from the Eumeralla Formation (Albian), Victoria, Australia. *Alcheringa: An Australasian Journal of Palaeontology*. DOI:10.1080/03115518.2011.597564

READ THE FULL STORY AT:

www.greatcretaceouswalk.blogspot.com

THE MAMMAL JAWS OF VICTORIA'S CRETACEOUS

As long-time Dinosaur Dreaming diggers can attest, the tiny fragments of Cretaceous mammals that we find are celebrated and prized. But mammal jaw finders don't always get to find out what became of their precious scrap. So here is a list of all confirmed mammal fossils identified since 1997 with Museum catalogue number, notes and taxa.

Reg #	Taxonomy	Collector	Field Number	Year	Preparator	Notes
P208090	*Ausktribosphenos nyktos*	N. Barton	#1111	1997	L.Kool	HOLOTYPE. Right. P6, M1-3
P208094	*Kryoryctes cadburyi*		Dinosaur Cove	1993	L.Kool	HOLOTYPE. Right humerus. Slippery Rock Pillar, Dinosaur Cove
P208228	*Ausktribosphenos sp.*		#329	1995	L.Kool	600my Exhibition display. Right. P6, M1-3
P208230	*Ausktribosphenos ?*			1995	L.Kool	Edentulous jaw fragment
P208231	*Teinolophos trusleri*		Mentors trip	Nov. 1993	L.Kool	HOLOTYPE. M3 or M4
P208383	*Monotremata*		Dinosaur Cove	1993	L.Kool	Premolar. Slippery Rock Pillar, Dinosaur Cove
P208482	*Ausktribosphenos nyctos*	N. Gardiner	#150	1999	L.Kool	Right. M2-3, badly crushed. Found in rock from DD1998
P208483	*Ausktribosphenidae ?*	N. Van Klaveren	#140	1999	L.Kool	Probably Left. x1 premolar & partial tooth
P208484	*Bishops whitmorei*	K. Bacheller	#450	1999	L.Kool	Right. M2
P208526	*Teinolophos trusleri*			1994	L.Kool	Right. Edentulous
P208580		A. Maguire	#200	2000	L.Kool	Jaw fragment. (unprepared)
P208582	*Ausktribosphenidae*	L. Irvine	#500	2000	L.Kool	Right. M3
P209975	*Bishops whitmorei*	R. Close ?	#387	2000	L.Kool	Right. Roots M1, worn M2. OK M3
P210030	*Teinolophos trusleri*			2000	L.Kool	Right. Edentulous
P210070	*Bishops whitmorei*		Rookies day	03.12.2000	L.Kool	Right. Badly broken M1, M2 and x6 Premolars
P210075	*Bishops whitmorei*		Rookies day	03.12.2000	L.Kool	HOLOTYPE. 600my Exhibition display. Left. P2-6, M1-3. (P1 lost since initial preparation)
P210086	*Ausktribosphenidae ?*	J. Wilkins	#250	2001	L.Kool	Right. Root fragment
P210087	*Ausktribosphenos sp.*	G. Kool	#620	2001	L.Kool	Right. Rear half M1, M2-3
P212785		M. Anderson	Rookies day	03.12.2000	L.Kool	Fragment only
P212810	*Bishops whitmorei*		#300	2002	L.Kool	Left. M2-3
P212811	*Teinolophos trusleri*	D. Sanderson	#187	2002	L.Kool	Right. Edentulous
P212925	*Mammalia ?*		#222	1996	D.Pickering	Edentulous
P212933	*Teinolophos trusleri*		#179	2001	L.Kool	Left. Edentulous. (Plus associated molar: since lost)
P212940	*Ausktribosphenos nyctos*	W. White	#171	2003	D.Pickering	Left. M1, M2-3
P212950	*Bishops whitmorei*	C. Ennis	#292	2003	L.Kool	Left. P6, M1-3
P216575	*Teinolophos trusleri*	N. Gardiner	#180	2004	D.Pickering	Left. x2 molars. Probably M2-3
P216576		A. Musser	#500	2004	L.Kool	Isolated tooth
P216578	*Bishops whitmorei*	A. Leorke	#600	2004	D.Pickering	Left. M1-3
P216579	*Teinolophos trusleri*	N. Van Klaveren	#635	2004	L.Kool	
P216580	*Bishops whitmorei*	G. Kool	#800	2004	D.Pickering	Right. P6, M1-3
P216590	*Teinolophos trusleri*	J. Wilkins	#447	2004	D.Pickering	Posterior part of right edentulous jaw
P216610	*Teinolophos trusleri*		#557	2004	L.Kool	Left. Edentulous
P216655	*Corriebataar marywaltersae*	M. Walters	#142	2004	L.Kool	HOLOTYPE. Multituberculata. Left. P4
P216670	*Ausktribosphenos nyctos*		#184	1999	L.Kool	Left. M2-3
P216680	*Teinolophos trusleri*	R. Long	#132	2004	L.Kool	Right. Fragment
P216720	*Teinolophos trusleri*		#648	2002	L.Kool	Right. Edentulous
P216750	*Teinolophos trusleri*	R. Long	#162	2005	D.Pickering	Right. Edentulous
P221043	*Bishops whitmorei*	A. Leorke	#100	2005	D.Pickering	Right. M1-2?
P221044	*Ausktribosphenidae*	C. Ennis	#300	2005	D.Pickering	Left. M2
P221045	*Teinolophos trusleri*	J. Wilkins	#395	2005	D.Pickering	Right. Edentulous
P221046		H. Wilson	#480	2005	L.Kool	Isolated tooth
P221150	*Teinolophos trusleri*	J. Swinkels	#340	2006	D.Pickering	600my Exhibition display. Right. x2 molars. Probably M2-3
P221156	*Ausktribosphenidae*	N. Van Klaveren	#360	2006	D.Pickering	Right. M2 (requires preparation to confirm)
P221157	*Bishops whitmorei*	M. Walters	#585	2006	D.Pickering	Right. Edentulous with alveolae for P6, M1-3
P221158	*Ausktribosphenos ?*	R. Close	#200	2006	D.Pickering	Right. P5-6, half M plus M2-3
P228432	*Ausktribosphenidae*		scrap rock	2009	L.Kool	Right. Molar talonid
P228848	*Bishops sp.*	M. Walters	ETRW, Otways	10.12.2006	D.Pickering	Left. P6, M1, partial M2
P229037	*Teinolophos trusleri*	M. Cleeland	#91	2008	D.Pickering	Right. Edentulous with alveolae for x4 molars and ultimate premolar
P229194	*Mammalia*	N. Barton	#770	07.03.2007	D.Pickering	Isolated upper Premolar
P229408	*Teinolophos trusleri*	M. Walters	#300	14.02.2008	D.Pickering	Left. Ultimate premolar, M1-4
P229409	*Ausktribosphenidae*	N. Evered	#180	07.02.2007	D.Pickering	Possibly *Bishops whitmorei*. Left. P5-6, M1-3
P229410	*Teinolophos trusleri*	C. Ennis	#90	2008	D.Pickering	Right. ?M1 plus M3
P229649	*Bishops whitmorei*	J. Tumney	#330	2009	D.Pickering	Right. P2-3,5-6, M1-3
P231328	*Mammalia*	A. Maguire	ETRW, Otways	29.11.2009	D.Pickering	Maxilla fragment with x2 molars

Eric The Red West - Otways Dig Report

26 March - 2 April 2011

The excavation crews hard at work

By David Pickering

Following the discovery of a mammalian maxillary fragment containing two upper molars by Alanna Maguire in November 2009 at Eric The Red West (ETRW), Dr. Tom Rich was understandably anxious to maximise quarrying at the site. His suggestion to supplement the, by now customary, November/ December dig with a second summer effort in late March/early April 2011 was fortuitous after the imposed embargo on fossil extraction at the site during the pre Christmas event (see article page 18).

Dave inspects a possible fossil that Mary has found

Although the dig was scheduled to occur less than a month after the conclusion of Dinosaur Dreaming 2011, twenty workers were mustered for the eight days of field work. Of this group nine were only available for the first weekend due to work commitments and unfortunately this included most of the Otways heavy excavation crew. This necessitated that the excavation crew concentrate on supplying enough bulk rock in 1.5 days to sustain the dig's needs for the remaining 6 days. The quota was met by working two teams which sampled a variety of places along the shore platform and stacked the rock above the high tide line. During this process no bones were observed on the cleaved surfaces. Of course fossils may be found when these large blocks are broken down but it is a nice morale booster to find a big bone in the split.

With only a few hours remaining before the departure of the "wrecking crew", I conferred with Alan Tait and we decided to sample a section of the shore platform from the extreme east end. This area has been previously ignored since it is covered in weed which obscures the rock surface. The first piece of rock we removed contained a 20cm long dinosaur limb element. This was followed in quick succession by a vertebra and several other unidentified bones. Erich Fitzgerald, Dean Wright and Travis Park started work to our right and immediately hit pay dirt with a complete ornithopod vertebra and other bone fragments. Some of the blocks contained at least three fossils. A high concentration by ETRW standards! Lack of time curtailed this mini "bone rush" but we had lifted sufficient bulk rock to enable the rock breakers to (hopefully) find the mammal-sized treasures contained inside.

Travis wields the sledgehammer in the eternal quest for fossils

For the remainder of the dig, in the absence of the usual "bosses", the baton was passed to Mary Walters who ably guided the dig with the support of Mike Cleeland, Lisa Nink and visiting English palaeontologist Roger Benson.

The preparation of fossils from the dig is still proceeding (we could still pull a mammal out of this, Tom!) but a number of specimens have already been registered into the Museum Victoria palaeontology collection. One of these is a nice theropod tooth which was found by Cate Cousland (with Sharyn's barracking) – only the fourth theropod tooth found in the Otways and also the first from ETRW. Sorry Tom but theropods are still prized by the crew!

Disappointingly, but understandably, the rest of Alanna's mammal skull has not turned up but the site information gained from this dig will assist us during our next major effort in March/April 2012.

Sorry Pip but beach callisthenics are banned under the Museum OH&S dignity regulations.

The diggers limber up with some stretches

Sedimentological Bits and Pieces

By Alan Tait

Back in November 2010 during the Cape Otway trip, I didn't finish mapping the Eric the Red West site because we were prospecting elsewhere, and again in March 2011, I didn't finish mapping the Eric the Red West site because we discovered bones at the eastern end of the site and I was having too much fun removing rock for the breakers. However, I helped Lesley map the sediments at the Swim O'clock Rock dig site and I managed to recover footprints, discovered by Sean Wright, from Dinosaur Cove in March 2011.

Also, in December 2010, I visited the Flat Rocks dig site to discuss the contested permafrost features in the nearby cliff with Pat Rich, Andrew Constantine, Mike Hall, and Tom Rich. We also looked at similar features at several other locations along the coast towards Inverloch. We appear to agree that the features resulted from liquefaction and/or fluidisation of the sand under the clay, allowing the clay to sink in lobes and the sand to rise between the lobes. We differ on the cause of the liquefaction/fluidisation. The features at any one horizon appear to me to have formed in one event, such as an earthquake, and thus have a different method of formation from permafrost features which are caused by repeated freezing and thawing. I intend to study the features in more detail and also investigate the literature on permafrost features for comparison.

On the same day, we also visited Kilcunda where Andrew Constantine agreed that the sandstone dykes are injectites and not sand-filled ice wedges. I commented in the 2010 Dinosaur Dreaming report that I believe the so-called permafrost features at Kilcunda are related to the injectites and potentially caused by the same earthquake. I have not had time this year to follow this up with detailed mapping but hopefully next year I will.

Injectites are present at Eric the Red West, Kilcunda, and at three locations along the Inverloch coast that I know of (so far). At one of the locations, the injectites intrude a thick claystone that appears to be an abandoned channel because it contains none of the soil horizons which are common in the overbank sediments between the main river channel sandstones along the Inverloch coast. This potential abandoned channel and another without injectites require detailed mapping, which I hope to be able to do this year with the assistance of two of Mike Hall's PhD students from Monash who are working on the structure and sediments of parts of the coastal area. The abandoned channels could contain bones, possibly even articulated ones, and their dimensions will help in reconstructing the size of the river system that deposited the sediments.

I look forward to the coming year's investigations and excavations along the Inverloch coast and at Eric the Red West.

Top: Sean Wright captures Alan on film moments before he finds the footprint rock. Bottom: Alan examines the shore platform.

Some Observations on Sedimentary Structures in Coastal Outcrops - Inverloch to Kilcunda

By Andrew Constantine

First, some definitions.

Gelisols are soils that form in very cold climates where permafrost occurs within 2 metres of the ground surface. They currently cover approximately 9% of the Earth's present day land surface and are best developed in high latitude (greater than 55°) northern hemisphere periglacial environments with Mean Average Annual Temperatures (MAATs) of less than +3°C such as those found in Siberia, Canada and Alaska. Structurally, gelisols are characterised by an A horizon resting directly on permafrost – the B horizon is absent. The A horizon typically consists of a distinctive upper organic-rich dark brown to black layer underlain by a less organic mineral layer. The upper organic rich layer can range from in thickness from several centimetres to about 50 centimetres.

Cryoturbations are soft-sediment deformation structures that form in response to the freezing and thawing of geliosols during the annual winter – summer cycle. The vertical interval affected by this process of repeated freezing and thawing is known as the "Active Layer." In the northern hemisphere, the Active Layer ranges in thickness from about 0.15 metres in regions of thick continuous permafrost near the North Pole, to about 12 metres at the southern edge of the discontinuous permafrost zone.

Gelisols are divided into three classes called **Histels**, **Turbels** and **Orthtels** based on the depth of the cryoturbation and the intensity of the deformation. Histels are soils where the upper layer contains large concentrations of organic matter (greater than 80%) down to a depth of about 50 centimetres. Cryoturbation in these soils is limited to less than one third of the active layer. They are primarily found in zones of continuous or widespread permafrost. Turbels are gelisols where cryoturbations span more than one third of the active layer. The intensity of the deformation is also much higher and they primarily occur in the zone of continuous permafrost. Orthels are gelisols that exhibit little or no cryoturbation. Cryoturbation, when present, is restricted to a relatively short interval less than one third the thickness of the active layer. Gelisols of this type are primarily found in zones of discontinuous permafrost and alpine areas.

Cryoturbation structures

Dozens of papers and several books have been published on modern and Pleistocene cryoturbation structures – so the data is out there on these sorts of structure. These studies have clearly shown there is considerable variation in the morphology of cryoturbations. The best classification I've come across so far is *Vandenberghe (1988)* who divides cryoturbations into six types numbered 1 to 6:

Type 1 are cryoturbations with small folds having short-amplitudes and long-wavelengths.

Type 2 are multiple symmetrical ball-and-pillow like involutions with amplitudes of up to 2 metres, which bottom out at a common depth. These are further divided into two subtypes, 2A and 2B, based on whether the convolutions are shaped like tear-drops (Type 2A) or diapirs (Type 2B).

Type 3 structures are similar in shape to Type 2, but are smaller (less than 60 centimetres in depth).

Type 4 structures are solitary or single convolutions, similar in morphology to the Type 2 and 3 structures.

Type 5 structures are vertical dyke-like “cracks” where sediment has been injected vertically up the cracks. In plan view the cracks can either be solitary linear features or form polygonal nets. Type 5 structures are similar in morphology to ”ice wedges”, but in the case of the latter, the sediment fill is from the top, not the bottom.

Type 6 are horizons where the original horizontal bedding has been intensely deformed both laterally and vertically.

Three mechanisms are thought to be responsible for the formation of cryoturbation structures:

- **They are load structures that form in response to density inversion** during the thawing of the active layer. This thawing causes the sediment at the base of the active to become highly water saturated and liquefied, causing it to rise upwards and the overlying denser sediment to sink downwards. This process is thought to be responsible for the Type 2, 3 and 4 structures.
- **They form in response to the liquefaction of near-surface sediments** due to the generation of high pore pressures at the commencement of the annual freezing cycle. Some workers believe the deformation is associated with high pore pressures generated in the unfrozen soil between the descending freezing front and top of the permafrost. Others believe the deformation is linked to the lateral movement of groundwater through the active layer between the descending freeze front and the top of the permafrost.
- **The rate of frost penetration and ice formation in soils is grain-size related**. Water in fine-grained sediments freezes at a lower temperature than water in coarse-grained sediments, which generates differential pore pressures causing sediment deformation.

The presence of cryoturbation structures in modern and Pleistocene sediments is a well-documented fact. Cryoturbations today are only found in periglacial environments with MAATs of less than +3°C, and they are morphologically very distinctive, especially the Type 2, 3 and 4 variety, so there is no reason why they should not also occur in the fossil record if the required paleoenvironmental and paleoclimatic conditions were conducive to the formation of these types of structures.

What was the latitudinal positions and the climatic conditions of the Inverloch-Kilcunda regions in the Early Cretaceous?

In the case of the structures that I have interpreted in the past as cryoturbations at Flat Rocks and Kilcunda – what are the facts about the palaeolatitudinal position of these sites during the Aptian-Albian and what was the climate like at the time? Everybody acknowledges Victoria was situated at a high-palaeolatitude in the past. Just how “high” is open to debate. Most estimates are based on plate reconstructions, which place Victoria somewhere between 65°S and 75°S. Mart Idnurm, who collected a few paleomag samples from an Early Albian site in the Otways, suggested it was closer to 80°S. The work carried out by Mick Whitelaw and me, which is based on more than 240 paleomag plugs collected from 25 age-controlled sites in the Otways and Strzelecki spanning the entire Aptian – Albian, yielded a paleolatitude of 69°S. This paleolatitude, however, is a Late Cretaceous (95 Ma) overprint, and not the paleolatitude where the sediments were originally deposited. Nevertheless, this provides a minimum estimate of latitude because Australia has been gradually moving northwards since 140 Ma.

So, we know Victoria must have been at a palaeolatitude on at least 69°S during the Aptian-Albian, or possibly higher (75° to 80°). Cryoturbations today are closely associated with the continuous and discontinuous permafrost zones. In the northern hemisphere today, the zone of continuous permafrost extends as far south as

55°N, while the zone of discontinuous permafrost extends as far south as 51°N. So, Victoria was clearly situated at a paleolatitude well within the known present-day latitudinal range of permafrost, and even though global climate was somewhat different than now, the continuous dark of Winter at these latitudes was still a significant factor controlling minimum temperatures annually in these truly polar regions.

The next question is what the MAAT was like in Victoria back in the Aptian – Albian? This is a not a simple question, because the Aptian – Albian spans about 25 million years of time, and the sediments deposited during this period in the Strzeleckis and Otways are in excess of 3000 metres thick. Several studies have attempted to address this issue using palaeobotanic and isotopic methods to estimate MAAT, but the results do not support each other. Paleobotanists suggest that the MAAT was in the order of +7°C to +10°C, whereas the geochemists think it was more like -2°C. There are numerous problems inherent with both techniques. Some are related to the methods and assumptions behind the techniques, and others are primarily related to the number of sites sampled. In both cases, the work was carried out on samples collected from a handful of sites, which is hardly representative for a 3000 metres plus thick pile of sediment spanning 25 million years of time. However, the isotopic MAAT (-2°C) was based on concretions collected from the Dinosaur Cove fossil site.

While it is easier to imagine dinosaurs surviving in an environment with a MAAT of +7°C to +10°C, the possibility they could have lived in an environment with a MAAT of -2°C cannot be discounted. In an attempt to resolve the issue, I organized collection of approx 170 concretions from 14 different sites in the Otways and Strzeleckis spanning the Aptian – Albian to see if there was any change in MAAT with time. The results of that study yielded MAATs of between -7 °C and +4°C, with the coldest MAATs obtained from sites of Aptian age (-7°C to -2°C). When the sites were plotted in stratigraphic order, the MAATs show a gradual warming trend from the base of the Aptian (approximately -7°C) up to the mid-Albian (approximately -2 °C), with a sharp rise in the late Albian (+2°C to +4°C). Just how reliable these isotope-derived MAATs are for concretions formed in freshwater environs is open to debate, but the Aptian temperatures are certainly consistent with the temperatures under which cryoturbations are reported to form at in modern periglacial environments, where MAAT's range from -6°C to +3°C.

Cryoturbation Structures in the Inverloch-Kilcunda Sediments?

In terms of the sedimentology of the Flat Rocks, Petrel Rocks and Kilcunda sites, I would like to make the following points taking into consideration the observations of the modern world noted above.

FLAT ROCKS

In this case, while I do not dispute that morphologically similar structures can form as the result of density inversion associated with the rapid loading of denser sediment onto a less dense sediment (i.e. sand deposited rapidly by turbidites onto muddy substrate either in a deepwater marine or deepwater lacustrine environment), the structures that can be observed in the cliff face at Flat Rocks are clearly associated with a paleosol horizon, not a turbidite. I have observed numerous turbidites in the past with ball-and-pillow structures, and in all cases you see sand sinking into mud, not mud sinking into sand like you see at Flat Rocks.

I suggest that the sedimentary structures seen at Flat Rocks are related to the freezing and thawing of the upper 50 cm or so of a paleosol layer at that location, with the ground surface at the time defined by the thin coal band immediately above the involutions. Morphologically they display all the features associated with the Type 2A involutions described above. I have interpreted the involutions as having formed by the melting of ice in the sand below the shale, causing the sand to liquefy and be displaced upwards as the overlying denser shale gradually sank downwards. As can be clearly observed, many of the tear-drop shaped shale bodies had very flat bases that bottom out in the middle of the sand layer, suggesting to me that they could not sink any further and could only expand laterally. This can be clearly observed in modern cryoturbations where the drops hit a hard, impenetrable layer, that is the top of a still frozen permafrost layer. The pattern at Flat Rocks is typical of cryoturbation structures in the modern world. My question to those who question these structures as being cryoturbations is how do you explain such flat bottoms in the middle of an undifferentiated sand unit?

PETREL ROCKS

North of Flat Rocks are several more horizons which also contain structures that I likewise interpret as Type 2A cryoturbations. As with the Flat Rocks site, all of the horizons are characterised by a thin coal band below which tear-drop shaped blobs of carbonaceous mud can be seen sinking into the underlying paler, less-organic mud. However, at these sites there is no sand layer below the shale. The depth of penetration is also less, but again they all appear to stop at the same depth (approximately 15 – 20 centimetres below the coal band) although you don't see the flattened bases to the tear-drops like you see at Flat Rocks. This may be related to the type of paleosol layer they occur in (possibly a Histel).

KILCUNDA

The Kilcunda site has several horizons that I also interpret as cryoturbated. The best horizon is the one at the base of the cliff which crops out over a distance of about 25 metres. This horizon is also associated with a paleosol, but unlike the Flat Rocks and Petrel Rocks sites, you can see a lateral change in the morphology of the cryoturbation structures from classic Type 2B at the western end of the outcrop to Type 6 (intensely-deformed "marble cake" appearance) at the eastern end. The horizon also has a distinctive hummocky appearance, with the wavelength of the paleosol surface decreasing from west to east. I interpret this horizon again as having formed in a similar manner to the one at Flat Rock, with the sand toward the base of the palesol liquefying and forcing itself upwards.

In the "2009 Dinosaur Dreaming Field Report" Alan Tait interprets this horizon as having formed in response to either earthquake activity or, jokingly, a "herd of dinosaurs passing by." If this horizon did form in response to earthquake activity, why don't you see more of these all through the sedimentary sequence? In such an active area as an opening rift basin, there well could have been numerous quakes, not just one offs. All of the horizons I've interpreted as cryoturbated are directly associated with paleosols which have common characteristics identical in morphology to those associated with modern and Pleistocene cryoturbations.

I also noted in the "2009 Dinosaur Dreaming Field Report" that I was quoted (on page 24, paragraph 3 in the 2009 Dino Dreaming Report, supposedly from my thesis) as having interpreted the large sand dykes at Kilcunda as ice wedges. This is quite incorrect as I make no reference to those dykes at Kilcunda in my thesis. The "dykes" I referred to are located further east of the sand dykes noted by Tait (2009) and are considerably thinner, with photos presented in my thesis.

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The cliffs at Flat Rocks

Theropods

By Roger Benson

This year, in March and April, I visited Museum Victoria to work on identifying theropod dinosaur bones with Tom Rich. During my visit I made it out to the Strzeleckis for a few days with Mike and Pip Cleeland, and to the Otways for a week. It was great to meet everyone, and I am happy to be writing this article. It was a fantastic time and everyone was extremely friendly and welcoming. The second rock I smashed open on the first day contained several bones. Despite what I'd heard about the difficulty of finding dinosaurs Down-Under, I began to think, "well this is easy"! My next bone came seven days later on the final afternoon of the final day in the field…

There is a zen-like mentality adopted by people breaking huge rocks into sugar-cubes for days at a time. It reaches the point where finding anything at all comes as a huge shock. There is an intermediate stage where you optimistically believe that almost any speckle in the stone might just be that lottery-winning mammal jaw, but that exciting period soon passes. It has taken amazing dedication on the part of many people, and belief in the value of understanding the evolution of the Australian fauna (or perhaps just a love of dinosaurs) to accumulate the hundreds of specimens in the Museum. It is easy to be dismissive about the material — most of it consists of fairly small, isolated bones. But actually, this represents a substantial portion of our knowledge of Australian dinosaurs. There are now several more impressive specimens from Queensland. However, these haven't yet come close to matching the diversity of fauna in the Victorian collection, not only of dinosaurs, but also of mammals and other taxa. I spent much of the last seven years working with fragmentary material from the UK and China. Consequently, I believe strongly in the scientific value of these kinds of collections.

So, what do the Victorian theropods tell us? At least thirty-seven specimens in Museum Victoria belong to theropod dinosaurs. These are the group of mainly predatory dinosaurs that gave rise to birds, and so survive to the present day at a higher species richness (about 10,000 bird species) than do mammals (about 5000 mammal species). Among this material, at least seven different theropod groups are represented: tyrannosauroids, spinosaurids ('crocodile-snouted' dinosaurs), allosauroids, basal coelurosaurs, ornithomimids ('ostrich dinosaurs'), ceratosaurs, and paravians (birds and their very closest relatives, including *Troodon* and *Velociraptor*). In fact though, the paravian material seems to represent at least three different species, so we might estimate a minimum of nine theropod species in the Victorian fauna. This sounds like a lot, but actually it is comparable to other well-sampled global faunas. If you like, we can be more conservative in making this estimate. In that case I'd observe that five very distinct dorsal (torso) vertebrae are present, suggesting that at least five taxa are present. However, I'm confident about the estimate of nine taxa because different theropod groups have very distinct anatomical details. By the deposition of the Strzelecki and Otway deposits in Victoria about 110 million years ago, these groups had been around for at least 50 million years each, equivalent to most of the time span since the extinction of non-avian dinosaurs. Thus, they had plenty of time to accumulate differences. That said, there are many bones that are indeterminate within Theropoda. So we can honestly say that some things can be identified, whereas others cannot.

There are interesting patterns of abundance. Most of the large theropod bones represent allosauroids, including an enormous collection of teeth from Flat Rocks, and a claw similar in size to that of the 8.5 metre long British spinosaurid *Baryonyx*. This suggests that an abundant, large allosauroid was present in the fauna. However, most of the other bones represent medium- or small-sized theropods (the smallest is a tiny dorsal vertebra belonging to an adult paravian about 1 metre long), and these are highly-diverse. This is similar to the pattern in modern faunas, in which small animals are much more diverse than large animals (there are only a few kinds of elephant, compared to more than 2000 rodent species). Among the small-bodied theropods, ceratosaurs, ornithomimids, and several distinct paravians, some species are each represented by only a single bone. This high count of singleton occurrences suggests that Victorian theropods are incompletely-sampled — if we had nearly exhausted the potential for discovery then most taxa should have been discovered multiple times, but this is not the case. Bearing this in mind, it is likely that future field seasons will continue to yield new kinds of dinosaur.

Roger and Sharyn examine a fossil at Eric the Red West

Previous work on the Victorian fauna has recognised dinosaur groups that are unknown from the other southern continents, or are otherwise very rare. These include tyrannosauroids, ornithomimids and ceratopsian ornithischians. Some dinosaur palaeontologists have criticised these claims, both within Australia, and further afield. However, since I visited, I have become confident that these claims regarding the theropods are basically accurate (note: I'm biased because I originated some of these claims). But even if you reject them, there's a pervasive pattern that is much harder to reject. Other 'Gondwanan' (southern continent) dinosaur fauna contain abundant ceratosaurs at small and medium body sizes, representing a primitive but long-lived theropod radiation. This is certainly not the case in Victoria. The rule in Victoria is high abundance of coelurosaurs (the group including tyrannosauroids, ornithomimids, paravians and other somewhat bird-like theropods). This is really similar to the pattern in Laurasian (northern continent) faunas. Furthermore, it is true regardless of whether you believe some of the more sensational specific claims (of mine). Another strange property of the Victorian fauna is the complete absence of sauropod dinosaurs. These titanic, long-necked herbivores include animals like *Diplodocus*, and the Queensland genera *Diamantinasaurus* and *Wintonotitan*. This absence is also strikingly different to other Gondwanan dinosaur faunas (including that from Queensland), in which sauropods seem abundant. Instead, Victorian dinosaur herbivores comprised a high diversity of ornithischian dinosaurs such as 'hypsilophodontids', ankylosaurs, and possible ceratopsians. This is qualitatively like Laurasian fauna.

Many people will find this surprising. Intensive exploration of Cretacous rocks in South America and Africa has turned up classically 'Gondwanan' dinosaur faunas time and time again. This has led to a strong consensus that some dinosaur groups just never made it down south, and others didn't venture up north. I always found this difficult to swallow. During the Jurassic, when most dinosaur groups appeared, the continents were assembled into a single landmass, the supercontinent Pangaea. Although the Cretaceous world was highly fragmented, there was nothing to stop tyrannosauroids, ornithomimids, or many types of ornithischians, from making it down to Oz early in their history. That doesn't mean that branching of the dinosaur evolutionary tree won't eventually reveal the fingerprints of continental isolation, but it suggests that more intensive sampling of the fossil record in time and space will be required, and that the patterns will be found **within** the groups we currently recognise, not **between** them.

Roger and Dave discuss the finer points of theropod anatomy (or some similar topic no doubt!)

This leaves one question — if continental isolation doesn't provide a convincing answer, why do different regions like Africa, South America, Australia and the northern continents have distinctive faunas at all? I believe that climatic zonation provides the answer. Recent studies have revealed surprising hetrogenetiy in the distribution of Triassic herbivores and Cretaceous crocodyliforms that can only be explained by the presence of low-latitude arid belts spanning most of Cretaceous Africa and South America (inferred from many other lines of evidence). Thus, it may not be surprising that similar dinosaur groups flourished in Australia, and especially in high-latitude Victoria, to those from the climatically-similar Laurasia.

Before I visited, I expected to find something closer to a classic 'Gondwanan' fauna. I am pleased to have been wrong because this story seems much more interesting. Continued exploration will test these ideas further. In particular, I'd be delighted if someone reading this found a complete theropod skeleton over the next few years. That's fanciful (but possible…). However, even if it never comes true, Victoria continues to provide unique data on cold temperate southern dinosaur faunas that are of global interest for their pivotal role in structuring our understanding of dinosaurian biogeography, and the influences of continental fragmentation and climatic zonation in determining the distribution of animals.

Before I finish, I'd like to say that this work would not have been possible without kind support from the Cambridge Philosophical Society and Museum Victoria. However, even more crucial was the hospitality of Tom and Pat Rich, Mike and Pip Cleeland, and Wendy White, who provided me with places to stay, and the assistance and banter of Dave Pickering. Mary Walters took command of the Otways dig weekdays and Leslie Kool kindly had me over for tea. Many people, including my hosts, and Lisa Nink and Alanna Maguire, kept me entertained in various respectable ways while Tim Holland and Erich Fitzgerald made certain that I never ran short of caffeine. I could continue listing people, but I must leave space to finally thank the dinosaurs. Without them, we couldn't have had such a great time.

Roger takes emptying his matrix residue in the ocean very seriously

Diggers' House Report

By Wendy White

Goodbye Inverloch. Hello Cape Paterson!

After the 2010 dig, we learnt that the Lavington St house would be unavailable for the 2011 Flat Rocks field season. We'd been expecting this for a few years, but seemed to get a reprieve each time. Finally, this year, our time ran out.

Having determined in June that we were actually going to have a 2011 Flat Rocks dig, Lesley spearheaded the search for our new home, and we started early.

In July, a couple of us joined Lesley down in Gippsland and inspected places in Inverloch and Harmers Haven, but none of those places looked like they'd survive a grubby dig crew in steel caps traipsing mud through the house and all wanting to shower. Some didn't have town water or sewerage, and at least one was simply too clean and beautiful for us to consider. And of course we needed to stick to our budget…

Norman had been talking for a couple of years about a friend of his who rented a place in Cape Paterson, and this looked really close to perfect. Four bedrooms, town water, and a backyard almost as big as Lavington Street. And it was a gloriously rough "beach shack" rather than a mansion. It had bare concrete floors downstairs, so-kitch-its-cool-again'70s linoleum in the bathrooms, mismatched sofas in the lounge room, lots of weatherboard outside and lots of plasterboard inside. It was a place where we could feel at home.

We had a couple of different logistical challenges than we'd faced at Lavington Street. For example, it's a two storey house with a narrow windy staircase. The kitchen is upstairs and heaps smaller than Lavington Street, with less storage and a cute little fridge. The kitchen is open plan to the living room so that carpet comes close in to the kitchen. There were bunk beds in the shared bedrooms and not much storage. The place had no shed and not much storage downstairs.

And I think this last one relates more to changing technology rather than a specific change to the house, but this year we seemed more challenged than ever to find enough power points for 20 mobile phones!

But it was a great house that we could afford and that met all of our needs and a whole lot of our desires. We were excited and ready to give it a red hot go.

Lesley's article explains our big idea this year - "reprocessing" the backlog from her shed. We thought we'd combine core crew reprocessing training with a dry run of the Cape Paterson house. So, we invited about a dozen of the experienced volunteers to an October weekend living in the new house and reprocessing rock at the Kools'.

We started Friday night with take-away Fish and Chips from the Cape Paterson café and general store. We sat at the dining room table, which sat a cosy six. We wouldn't be playing *Chase the Ace* on this table - but the table on the upstairs outside verandah might work... The fridge is not very big – but John's got one he's going to bring. We plan tables and urns downstairs, and count plates and glasses and teaspoons. John and I negotiate bedroom allocation. We don't break anything important. Phew! We have a house.

Planning done, we're for the main event.

A three week dig, staffed only with experienced crew. Easy, right?

Well, kind of.

A few core crew arrived on the Friday night and started to set up. John set up his spare fridge. We hid the huge teddy bear from the girls room, and packed away everything associated with the fireplace (with twenty people jostling around the house it's better not to have dangerous burning surfaces around). We decided to leave the rest of the work until morning when the crew arrives (perhaps decided is too strong a word here – the process was more about gradually drifting towards the open bottle of red than an organized evaluation of remaining work).

The view from the balcony.... the rock breaking stations nearly set up

Then the crew arrived. We sat down for the Saturday night briefing.

So the problem with having an all-experienced crew was that everyone knew what the bad jobs were and did not immediately volunteer. Anyone want to be Tea Wallah? Anyone? The most beloved person on the dig? Anyone? Big thanks to those who (after only a little prodding) answered the call.

And whilst I'm issuing random thanks, we were a little short of what Nicole quaintly likes to call "young muscle" – so a super special thanks to the people who carried load after load of heavy stuff up and down the stairs.

The diggers hard at work breaking rock in the backyard

With a smaller crew there were less cooks – so when our master chefs rose to the challenge of feeding us more than once in their allotted week it was really really appreciated.

With an experienced crew, lots of people arrived carrying goodies, some home-made, some from our favourite bakery in Tooradin. And there were plenty of Norman bikkies, of course.

My personal contribution this year was to bring dozens of Chinese food containers for refrigerator storage and lunches. Alanna and I over-ordered diligently all year from our favourite take-away to make sure we would have as many as possible. Sadly(!), we did not salvage any as we packed up, and have had to start the eating and collection process all over again for 2012.

It took a while to come to terms with the whole upstairs/downstairs thing. By sometime in the second week we were all set up downstairs with coffee, tea, lunch things, a table with chairs, our beer supply, snacks and everything else we needed to spend all day and most of the evening down there. I think that next year we will be able to do this more easily and faster so the first week crew need not feel so divided.

We used the first aid kit more than usual this year. We even bandaged a couple of passers-by. We had two hand injuries – one sweeping at site, one washing dishes at the house. I bet the boys told their friends it was whilst wielding the rock saw or at least a large sledgehammer! Our excavation manager John had to take his bandaged hand home and missed the last two weeks of the dig. Dave took over excavation planning, and our last-minute-substitute equipment managers rose to the challenge (we even started calling Paul Smith "John Paul"). Our pumps behaved themselves admirably. The O-ring I have been carrying to every dig for years was not needed (in fact it has never been needed and may actually be John's idea of a practical joke – but I will never be able to get that confirmation so it stays in my backpack year after year).

There are a couple of things we'll try to sort out for next year:

- We'd love to move the washing up to somewhere less crowded and more social (maybe outside)
- We'll set up downstairs earlier
- We'll start saving up quizzes to do whilst rock-breaking during the year (and yes, we say that every year and don't)
- We'll think about getting a big fridge from somewhere…

We are expecting to take new volunteers again for the 2012 dig season now that the new house has been exercised with crew who already know what we are trying to achieve.

Once again a big thanks to all the crew who stepped up this year - you are a big reason that all of this can happen.

An Addition to the Dinosaur Dreaming Family…

Many of the old-time Dinosaur Dreaming crew will tell you that we feel in many ways like a family. We are pleased to note a new addition to that family. Luca Robert was born on August 26th to long-time dig volunteer Jillian Garvey (zooarchaeologist and the only person ever to store a road kill snake in the dig freezer) and her partner Anthony Dall'osta (also a dig volunteer but not as frequently as Jillian!). We all agree that Luca is very cute.

Gillian holding brand new little Luca

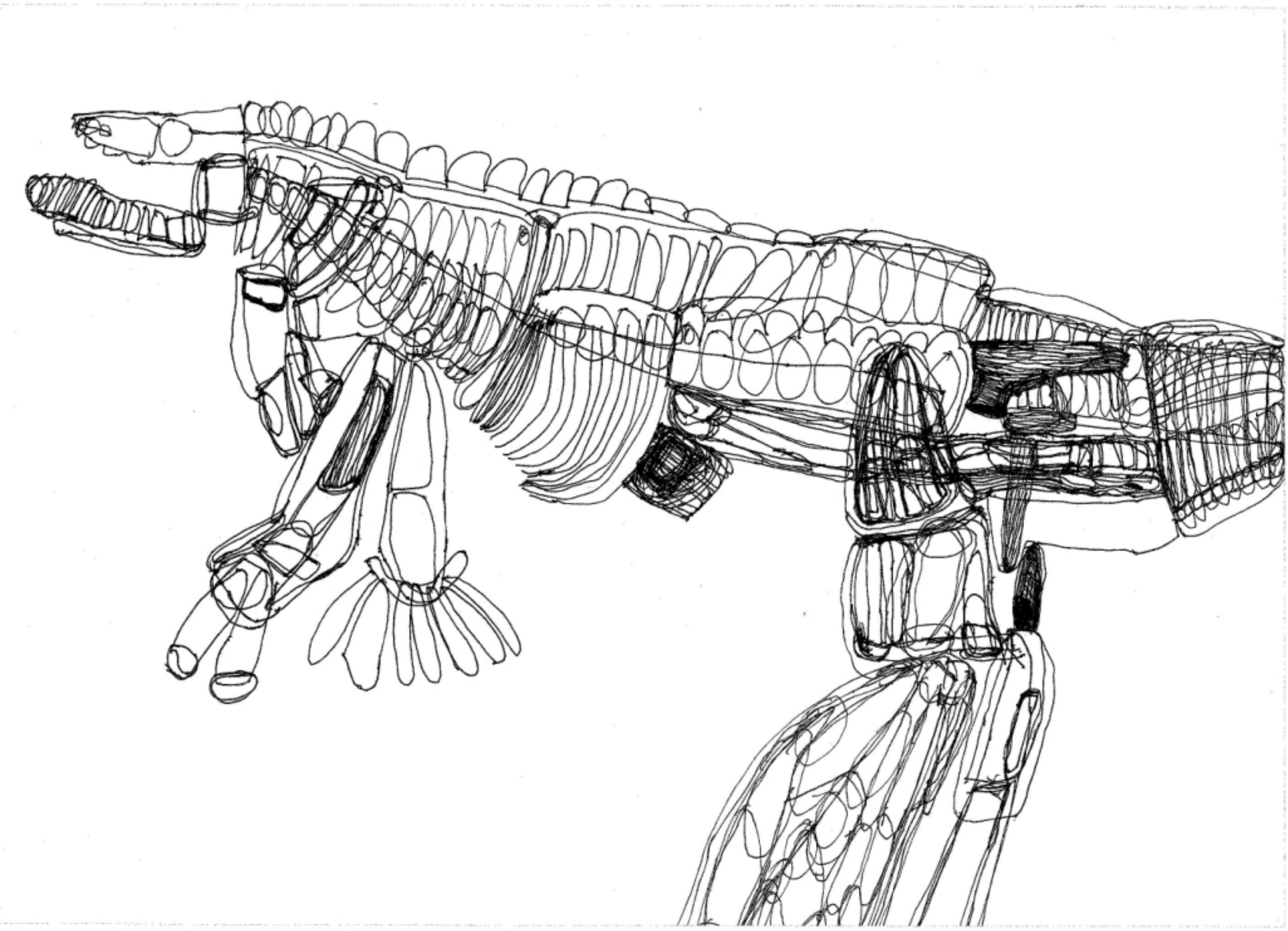
Rendered Bones

Artist with a disability Joceline Lee this year undertook an artist residency at Melbourne Museum's Palaeontology Collection, supported by Rob Delves, a practicing visual artist and sculptor who works with Joceline at Art Access Victoria's weekly art program Art Day South.

Joceline, who was awarded a JUMP mentorship in 2010 as part of the Australia Council's inaugural national mentoring program for young and emerging artists, used her time at Melbourne Museum to prepare works for an exhibition 'Rendered Bones', part of the 2011 Melbourne Fringe Festival.

Joceline's work explores animal bones, skeletal figures and anatomical studies; working mostly in ink on paper, she re-imagines these structures, in bold and subtle detail.

For more details see **http://artsaccess.com.au/2011/08/museum-residency/**



"Tarbosaurus bataar" (part of a tryptych) by Joceline Lee

The 20th Anniversary of the Discovery of the Flat Rocks Site

By Lesley Kool

March 10 2011 marked the 20th anniversary of the discovery of the Flat Rocks site, near Inverloch. Little did I realise, twenty years ago, that the discovery of this site would touch the lives of so many people and change the face of Australian palaeontology. Since the first annual dig in 1994, more than 340 volunteers have worked at the Flat Rocks site and thousands of fossilised bones and teeth from a diverse group of animals have been recovered.

Looking for fossil bones along the Bass Coast of Victoria started for me shortly after I took part in Victoria's first dinosaur dig in 1984. As a "Friend of the Museum" I was invited by Dr. Tom Rich, Curator of Vertebrate Palaeonotology at Museum Victoria, to join other "friends" on the first dinosaur dig to Dinosaur Cove in the Otways. Naturally it was an offer I could not refuse. I experienced the most exciting two weeks of my life and it left me wanting more. So I volunteered to work in Tom's department as a preparator and that is where I came across fossil bones collected by Tim Flannery and John Long, which had been found at Eagle's Nest, near Inverloch.

I managed to coerce my husband Gerry to take a drive down to the Bass Coast, where I, just like William Ferguson nearly a hundred years earlier, found my first dinosaur bone at Eagle's Nest. Over the next few years I persuaded friends and family to join me in regular prospecting trips, with various amounts of luck finding the occasional bone. It was not until 1989, when Mike Cleeland introduced himself to us during our annual field trip to Dinosaur Cove, that the prospecting really took off. Mike is a local geologist who lives on Phillip Island, which is part of the Bass Coast and is famous for its Little Penguins. He grew up wandering along the Bass Coast and knew that dinosaur bones had been found along that coast, but had never found one. He came prospecting with us in the Otways and as soon as he realised what the bones looked like in the rock there was no stopping him. Within a few weeks of returning to the Bass Coast Mike had found more bones than I had found in five years. Over the following years he discovered the giant *Koolasuchus cleelandi* jaws, the *Serendipaceratops arthurcclarkei* ulna and a giant claw from a large theropod dinosaur, to name just a few.

We organised regular prospecting trips between us, including a weekend of excavating on 9 and 10 March 1991. Saturday 9 March was designated an excavating day at Rowells Beach near San Remo, where Mike had previously found the giant amphibian Koolasuchus cleelandi's jaws and a number of other bones. Unfortunately the weather was atrocious and we were forced off the beach by horizontal rain and fierce winds.

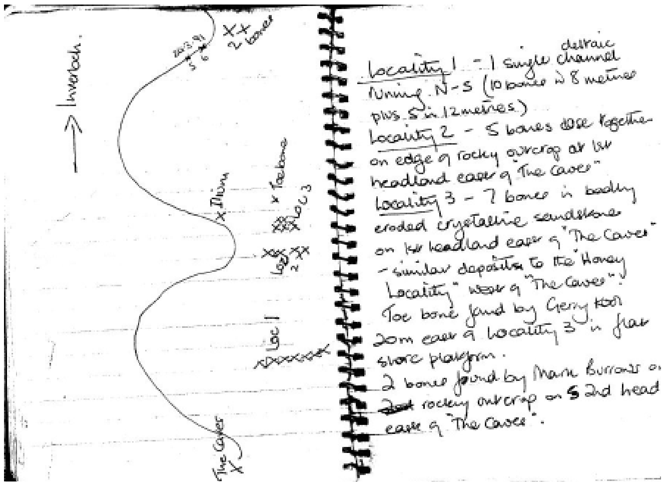
That evening, at Mike's home on Phillip Island, we discussed our plans for the following day. In January 1991 I had taken a group of visitors to The Caves to look for fossils. Originally we were supposed to go to Eagle's Nest, but being school holidays the Eagle's Nest car park was completely full, so we chose The Caves car park as an alternative. I was hopeful of finding bones in this area as I had found a small ornithopod femur (thigh bone) there two years earlier and had not been back since then. We found four bones that day, including an odd bone that we thought may be part of a jaw. So when we were discussing where to go after our failure at Rowell's Beach, I suggested we return to The Caves to see if we could find any more exposed bones.

Sunday 10 March was a much better day than the previous day. I remember that it wasn't very warm, but at least it was not raining. When we arrived at The Caves we were delighted to see that the stormy weather of the previous day had worked in our favour by scouring most of the sand off the rocky shore platform. Normally the sand covers most of the rocks from the mid to high tide mark, making prospecting difficult to say the least. So it was a pleasant surprise to see the shore platform so well exposed.

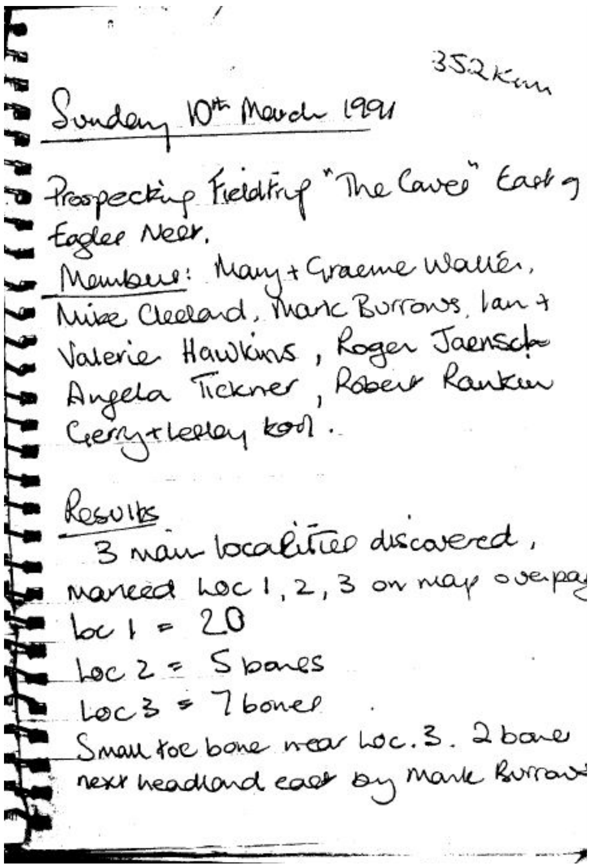
There were eleven of us in the prospecting group that day, including Mike Cleeland, my husband Gerry and Mary Walters, a founding member of the Dinosaur Dreaming team. We started at the base of the stairs leading down to the beach from The Caves car park, and headed north along the beach. We spread out so that we could cover as much of the platform as possible. It wasn't long before we came across a four metre wide conglomerate layer only a couple of hundred metres from the stairs.

Victoria's exposed Cretaceous rocks consist mainly of alternating layers of mudstone and sandstone, with occasional layers of conglomerate (debris layers made up of mud, sand, plant material and bones) formed when swollen rivers, flowing across the vast valley that existed between Australia and Antarctica, broke their banks. It was in one of these conglomerate layers that we found 20 fossil bones, exposed on the surface, within a few metres of one another. This discovery was unprecedented, as in previous years only isolated bones had been discovered along both the Bass coast and Otway coast. Never had one fossil layer yielded that many bones on the surface.

Most of the bones were fairly small and incomplete, but some were identifiable as turtle, fish and dinosaur. It was an exciting moment to see so many bones so close together. What was even more exciting was the prospect of what could be still buried below the surface. The conglomerate looked quite extensive, stretching from mid-tide



level, up the beach and into the cliff. It was difficult to estimate its depth as all the rock layers are tilted and dipping down below the surface of the shore platform. But we were hopeful that the fossil layer was going to prove productive and extensive enough for at least a few years excavating.



Excerpts from the field notebook used 20 years ago

That was 20 years ago and the results of 18 years of excavating have more than fulfilled our wildest dreams. Thousands of fossil bones and teeth have been recovered, reflecting a wide variety of fauna. At least seven different types of dinosaurs are represented, as well as three groups of mammals. Other animals have also been identified from this site, including birds, pterosaurs, plesiosaurs, primitive turtles, ray finned fish and lungfish, making it the most diverse Cretaceous fossil locality in Australia.

One of the highlights of the last twenty years at Flat Rocks is when the first mammal jaw was found in 1997, a day I will never forget. I can still picture the look on Tom Rich's face when he looked up from the microscope after realising what he had seen – the fulfilment of a 27 year old dream to discover a mammal new to science – *Ausktribosphenos nyktos*. This discovery was closely followed by the oldest and smallest monotreme in the world – *Teinolophos trusleri*. Then, there was the first evidence of multituberculate mammals in Australia – a single tooth, found by Mary Walters in 2004 – *Corriebataar marywaltersae*.

The Flat Rocks site also produced the first named dinosaur from the Bass Coast – *Qantassaurus intrepidus*, based on a beautifully preserved lower jaw found by the "intrepid" Nicole Evered in 1996. Many hundreds of dinosaur bones have been collected from the site over the last 20 years, mostly belonging to small ornithopod dinosaurs, but more than 140 isolated theropod teeth, representing at least three different types, have also been discovered - more than any other site in Australia.

In 2010, Bass Coast's first articulated dinosaur was discovered. Although it was not found at the Flat Rocks site, it was discovered less than a kilometre away and during the 2010 annual dig, so it deserves a special mention.

During the 2011 field season a fossil close to my heart was found – the first complete turtle skull from the Flat Rocks site. Fossil turtle bones have been found along the Bass Coast since Tim Flannery and John Long first visited the area in the last 1970s. Fragments of turtle shell and isolated limbs have been found at most of the 17 fossil localities, but it took 20 years of digging at Flat Rocks to find this almost perfect specimen.

The site is getting harder to excavate because the fossil layer is much deeper than when we first started our annual digs in 1994, but the layer is just as rich as it was 20 years ago, living up to its potential. We plan to continue excavating for as long as we can or until we run out of fossil layer, which seems unlikely. We are looking into more efficient ways to remove the water and sand, which covers the site every day at high tide, thereby giving us more time to excavate and greater exposure to the fossil layer.

In the meantime we are looking for new fossil localities along the Bass Coast and inland where the Strzelecki Group is exposed, but we haven't found anything to match the Flat Rocks site yet……

Tom inspecting the site in 1992

Prospecting Report

By Mike Cleeland

After returning in November 2010 from an extended honeymoon/prospecting trip in Europe and the UK, several local field trips have yielded interesting results.

Following the discovery of "Noddy" at Inverloch a decision was made to prospect an extensive area in the hope of finding similar material preserved in nodules.

During the November 2010 dig at Eric the Red West in the Otways, the entire coast from Cape Otway to Marengo was searched for these nodules and although a small number of isolated bones and numerous likely looking concretions were found, many containing plant material, no more Noddies were brought to light.

Further ground was searched for several hundred metres either side of the dig site at Inverloch during dig season, as well as an area of the Kilcunda foreshore, without success.

In the Strzeleckis a search was conducted of known sites between the Punchbowl and Kilcunda which resulted in the recovery of four isolated bones, including one possible orbital fragment. These were removed in the company of visiting postdoctoral fellow Roger Benson from Cambridge whose distinguished contribution to the field trip included not only carrying the rocksaw along the arduous path, but actually running with it for the last hundred metres back up to the carpark in an effort to end the demanding assignment sooner.

The surprise performer this season was the "Old Faithful" Honey Locality, several hundred metres north of The Caves at Inverloch. This locality has been producing since the mid 1990s and although it features particularly hard, erosion resistant rock, some fourteen bones were collected during the dig season in February.

Further success was met with at Eagles Nest in March with the discovery of "Son of Noddy", a rare example of another bone preserved in a nodule. This specimen is the tibia mentioned in Lesley's field report.

Prospecting of other regular sites at Black Head and The Arch during the year produced no further results.

A significant storm erosion event during July exposed considerable new rock particularly around Cape Paterson and Harmers Haven. While it was not possible to cover all available ground before the cycle turned and redeposited the sediment, one new bone was found from a hitherto unknown layer west of Cape Paterson.

Inland prospecting this season included searching a road cutting exposed by new roadworks about a kilometre west of Anderson and although little prospective rock was encountered and no bones were seen, enough coal was recovered from a prominent newly exposed seam to keep the home fires burning during the winter.

Mike and Pip scour the coastline for surface fossils

Friends' Day
13th February 2011

By Gerry Kool

Once again we would like to recognise the importance of the Friends of Dinosaur Dreaming, who year after year continue to support the dig and the associated research.

Without this support each annual dig would be more difficult to run as the subscriptions help to cover such things as house rental, food and many other items.

The Friends' day this year on Sunday 13 February coincided with some beautiful weather. As usual, a great number of Friends turned up to get a better insight of the workings of the dig and take advantage of a chance to chat with some of the crew.

David Pickering brought along a selection of fossils from Museum Victoria, found at the site in previous years and these were on show together with some of the more interesting finds from this year.

Nicole welcomes visitors at the registration table on Friends' Day

Other crew members assisted in taking small groups on tours of the site in general, covering the geology of the area and the actual workings of the site, affectionately known as 'The Hole'.

Mike and Pip Cleeland kept the children amused with a special kind of magic, as only they can - Mike with his 'erratic' fossil hunts and Pip with her artistic endeavours.

Rohan explains the finer points of fossil-hunting to interested Friends of Dinosaur Dreaming

It was great to see one of our earliest and staunchest Friends, Rob Glenie (who of course, together with John Long and Tim Flannery, kick-started fossil hunting in this area in the 1970s).

Priscilla Gaff from Museum Victoria was also present on the day compiling a short documentary, which can be viewed on the Museum's web site: www.museumvictoria.com.au/about/mv-blog/feb-2011/dinosaur-dreaming/

Small changes were apparent this year in our organisation of the event with our intrepid administration/publicity lady, Nicole Evered, being restricted to the car park for the day.

Parking of course was a whole adventure in itself as days like this make us aware that the small car park, which is usually adequate, cannot handle such an influx. However, we coped and a successful and enjoyable day was had by all.

The Dino Dreaming Blog

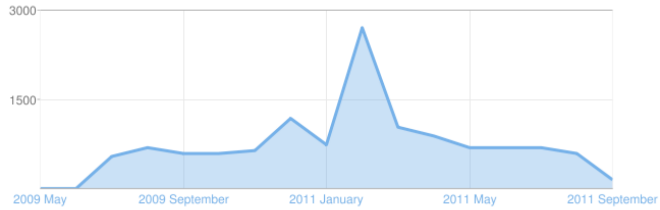
By Wendy White

As most of you are aware, the Dinosaur Dreaming team runs a blog to keep you updated during the year:

www.dinodreaming.blogspot.com

Some of the statistics around the blog are interesting.

We have had more than 12,500 page hits in total.



Number of hits on the dino dreaming blog

Top links:

- More than 1,400 Google searches have found our site.
- More than 700 times people have clicked through from the Monash University site (dinosaurdreaming.monash.edu).
- More than 150 times people have clicked through from facebook links.

Top countries:

- More than 7,500 hits from Australia
- More than 1,800 hits from the United States
- More than 250 hits from Germany
- More than 200 hits from India
- More than 140 each from France, Russia, Sweden, the Netherlands and Iran

The top pages of all time:

- The launch of the Bass Coast Booklet (3 November 2010) with more than 250 page hits.
- Photos of Mary Walters and Alan Tait talking sedimentary layers (23 February 2010) with more than 100 hits.
- Dave's toy jackhammer (4 March 2008) with more than 80 hits
- Our new Dino footprints (11 June 2011) with more than 50 hits.

Our most successful month was February 2011 with more than 2,700 page views. This is not surprising as that was when the Flat Rocks dig was held!

Dealing with Dutchery - an Adventure in Mapping

By Dean Wright

The warm breeze hit the back of my neck. Its fine hairs grew erect in contradiction to the climate. Something was amiss. Being a surveyor I like things to be in order. Everything has its place, and that place can be coordinated on three planes from any given point. If you have more than one point, then fine, give me a datum. David Pickering approached me and addressed me soberly.

“Hey Dean, you’re a surveyor, how would you like to map the hole?” he casually said, quickly and briefly, not fully understanding the magnitude or crux of the question.

I sat baffled. Usually I work within the strict confines of the surveyors code: *Exigo, vel abeo* (Latin: exact, or die), with machines precise to the millimeter and 5 seconds of arc.

I chanced a look around to see if there was an automatic level or a theodolite standing abandoned on the beach. David promptly handed me the previous year's map and with one glance I knew I was in trouble. There in the performa in bold letters was the next problem. "Previous Version: N van Klaveren".

Picture in your mind a desert plateau. You stand at the top of this plateau. There is dry sand in all directions and the sun is beating down on you. You have no water, there is no way down, and no one can hear you scream.

You have just taken a trip to the inner workings of the mind of Nicholas van Klaveren, a.k.a. The Dutchman. Like The Dutchman's mind, the map was a mixture of both beauty and doom. The grids were evenly spaced, yet they were arbitrary. The North arrow, also arbitrary, was plain and dull and showed no artistic expression. The legend was thorough, yet blocky and hard to distinguish. The scale bar had no ratio. The lines were thick and messy. I could go on. There was nothing fundamentally wrong with the map. It functioned. Yet I knew that it could not be accurate, and I liked to be accurate. Dave had spoken though - the map needed to be updated and I would have to cope with what I had to work from. The tide was coming in.

I was given a sidekick, another David. He was sharp and educated and seemed happy to help. I wondered if he would be happy if I told him we were dealing with Dutchery. The beautiful Doris had established a control point to make measurements; I would use this as my datum. Armed with only a compass and six metre measuring tape, my assistant David and I set out. Using a geological compass, which had intervals between degrees of ten (not the traditional sexagesimal), I took a rough bearing. We measured a straight line of known bearing and distance. It was my plan to measure the distance from twenty centimeter intervals at ninety degrees to the edge of the hole. That way I could calculate coordinates from the datum. All was proceeding as planned. The Italian in the hole made some brief comment that his stratagraphical columns of the sedimentary layers of the hole were the real map, but I let it slide. He was Italian after all.

Thanks to the help of David we finished quickly. I turned to him and said, "Bedankt voor de hulp." He replied "Geen probleem." It was as I feared. We'd been Dutchified. "Mijn god, ik ben een arrogante klootzak" I exclaimed. Quickly I tapped the top of my head to see if a bald spot had begun to appear. I advised David to do the same. I pulled out a single hair and, to my relief, it had not taken on a ginger colour. This would pass. We had only visited Holland, we did not live there. The map would have to be destroyed, I could not risk this happening again. It would be replaced with a new one. I had a mission.

Dean mans the theodolite

The Dutchman's "Wright" of reply….

His comments on surveying methods and inaccuracies are quite relevant - it is boring and in black and white because the dig report used to be only that - black and white (not boring). I used a Sunto sighting compass, which was accurate to 16 minutes of arc or 1/6 of a degree or within 3 centimetres at a distance of 10 metres. No scale was added to the maps as they were arbitrarily resized which would have made the scale inaccurate (or just plain wrong). Also the legend and title text suffered badly from resizing to an A4 format size.

Finding a Tooth

By Cate Cousland

Illustrated by Sharyn Madder

Well here we were again at Cape Otway just past the rusty anchor of Eric the Red.

The visit on Wednesday had been a pleasure. Warm sun, soft breeze, waves lapping gently to shore. Mary with a small group of diggers worked diligently on a huge pile of waiting rock, Mike led the new Health and Safety exercises on the beach, while Pip went on an accidental tour before arriving with a late lunch. Roger the young English palaeontologist mused on the art of rock breaking while fielding improbable questions about dragons and giant trees.

But now it was the weekend.

The air had acquired a biting chill as rolling clouds and passing squalls hid the sun and occasional gusts of wind sandblasted our faces. Saturday we were joined by two filmmakers who valiantly battled the elements to keep up with Tom as his splendid chequered headscarf flapped wildly in the wind. Some courageous diggers braved the rock table oblivious to the cold water lapping their feet, while others huddled close to the hillside deluding themselves that it was slightly better. Even the H&S exercises couldn't work off the chill as the wind crept into every nook and cranny.

And all for little return..... finds were few and far between.

Sunday came. Some headed off, while the stalwart remainder tapped away, ever hopeful of finding the holy grail. By the arvo it was getting hard, relieved only by a few nice finds by Lisa. The relentless cold seeped into bones and muscles. I kept staring intently as endless streams of rock broke beneath my hammer. Was I actually seeing what was there? Were whole skeletons passing before my eyes and I just couldn't see them?

Then BINGO! Something looking like a nice bit of bone! Tentatively over to Wendy, and yes, it was a 'beautiful' vertebra. Suddenly the lethargy left, the shoulder felt good again and the remaining rock took on a decidedly animistic quality.

A few minutes later, another break (YEAH!) and a lovely mass of fine bone appeared. 'Just fish' said Wendy dismissively. But a really nice old fish, I thought, feeling chuffed.

Soon it would be time to go; just a few more knocks. Another break, YOU BEAUTY! A small object popped out of a clean cut through the rock. It looked like a tooth!! And sure enough it was. A theropod tooth, sitting in my hand, seeing the light of day for the first time in around 100 million years. My dream find!

Sharyn and I celebrated with a gin & tonic at the Apollo Bay pub, looking a bit wild with our old raincoats, windswept hair, weather worn faces, work boots and dirty fingernails. It was good to relax and ponder the trials and tribulations of dinosaur digging in the Otways.

Now to find a mammal........

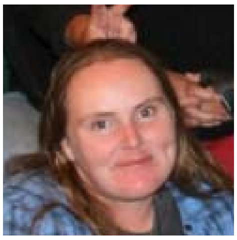
FASHIONS IN THE FIELD...

BY WENDY WHITE - FASHIONISTA

We encourage our diggers to express themselves in any way that does not interfere with the serous work of extracting and preserving fossils. Some diggers bake slices and biscuits. Some diggers make chair sculptures or write blog postings. Some diggers create wonderful outfits down at site. Some diggers just start running out of clean clothes half way through the dig and wear what they have. Some diggers forget how cold it can get and create fashion out of anything warm that they brought or can borrow.

(L-R from the top). December in the Otways: A whole day of steady downpour creates an interesting look for Dean, Tim, Mary and Dave; Dean makes sure he doesn't get lost and John experiments with alternative headwear; Mary colour coordinates whilst Tim and Dave favour the rugged explorer look. Flat Rocks: Darren's "Stand back I'm going to do Science" T-shirt and laptop on the beach intrigue Dave. Sunglasses resting on the rim of a black cap are very popular this year; Norman wears a bright yellow pullover and a much-used white hat. Alan, being Scottish, favours a plaid shirt and his trademark yellow hat; Wendy T fashions a scarf out of spare socks creating a Tim Burtonesque masterpiece; Jillian loves her purple gloves; Peggy's outfit is inspired by the beachside location.

(L-R from the top). Flat Rocks: Mary examines a rock in elbow length white gloves borrowed from Pip; Dean loves Trilobites – pictured here with wide-brimmed blue hat and hammer; Danielle fashions a cape out of a raincoat and accessorizes with a blue plastic mug; Mike wears shorts with contrasting pockets and hides behind a lilac umbrella; Pip goes 'boho' in a soft hat and matching hammer; Doris jazzes up a plain Dino Dreaming T-shirt with a truly spectacular black and white hat and pink mug; Kat teams a pink geometric pompom hat with pink striped fingerless gloves and a brown striped scarf; Otways in March: Tom takes inspiration from an earlier Saudi Arabia trip; Cate coordinates a patchwork hoodie with red gloves; Peggy in red raincoat and puffy khaki cap; Rohan in a striped beanie, jacket borrowed from work, and the ultimate fashion accessory – a fossil find.



Behind the scenes in the palaeo lab

By Lisa Nink

Many of you have visited or volunteered on the annual Dinosaur Dreaming dig at Inverloch and watched as the fossils that are found are carefully wrapped, labeled and packed to be taken back to Melbourne Museum. But what happens next? Back at the Melbourne Museum Palaeontology Laboratory a dedicated team of volunteers work with Museum staff to prepare the 120 million year old fossils from Victoria's coast and other fossils from around Australia for research or display.

We first unwrap the fossils from the Flat Rocks site at Inverloch and the Eric the Red West site in the Otways, and make any initial repairs to the fossils with various adhesives. We then stabilize the fossil bone with an acrylic resin dissolved in acetone that penetrates the porous bones, and use a compressive air driven air scribe tool to remove bits of matrix (the rock encasing a fossil). The more delicate task of removing matrix from close to the fossil itself is done by using a sharpened tungsten carbide rod held in a chuck to gently etch it away grain by grain. It may take a volunteer eight hours of work to remove a dinosaur toe bone or small limb bone, while the more delicate job of preparing a mammal jaw will take a professional like David Pickering, Vertebrate Palaeontology Collection Manager at Melbourne Museum many days.

Volunteers also assist with the preparation of 380 million year old armoured placoderm fish from the Gogo Formation in the Kimberley region of Western Australia. The preservation of these fish is such that the delicate fossil remains retain their three-dimensional structure, but they are encased in hard limestone nodules. These fossils are gradually removed from the hard limestone matrix using a delicate technique called acid preparation.

Lisa preparing Devonian fish in the lab

First we apply the acrylic resin solution to any exposed bone to stabilise and strengthen it. Then we apply a thin layer of Mowital (a polyvinyl resin dissolved in ethanol). The Mowital is impervious to acid and so protects the fragile bone while allowing the acid to eat away the surrounding limestone. We then leave the fossils in a bath of 10% acetic acid solution (acetic acid is the acid found in vinegar but we use a much more concentrated version) for a couple of days after which we remove them from their acid bath and leave them to soak under a gently running tap for a few hours to neutralise any remaining acid. Finally we leave the fossils to dry and then remove any excess Mowital glue using ethanol and a brush. We then repeat the whole process again and again, each acid dip gradually revealing a little more of the fish's skeleton.

It may take more than 20 dips in acid but eventually the whole fossil is revealed, often with spectacular results. The acid etching process can be used to prepare anything from tiny little microfossils less than a millimetre long to the skull of a *Diprotodon*. We are currently using the same acid preparation process in the lab to prepare parts of a 25 million year old whale skull from the Victorian coast.

Melbourne Museum palaeontology volunteers don't only help with fossil preparation. We also assist with writing labels for fossil specimens and storage cabinets, moving and sorting the fossils in the collections, barcoding specimens so their location in the collection can be found more easily, assisting with repairs to equipment such as the pumps and generators used on the dig and conducting administrative duties.

A collection of fossil specimens out and ready to be looked at

Volunteering in the palaeontology lab at Melbourne Museum is a privilege and I feel very lucky to be a part of a team of staff and volunteers who are so passionate about palaeontology. One of the best things about volunteering in the lab is that you see what goes on behind the scenes and have the opportunity to work with and learn from professional palaeontologists and preparators. It is a wonderful feeling knowing that you are making a contribution to palaeontology and there is always the chance that the fossil you are preparing may reveal something new about the fossil record of Australia.

Some of the palaeo lab vollies - Lisa Nink, Paul Chedgey, Troy Radford, Geoff Thomas

Dermal Ossicle

By Peggy Cole

The Dermal Ossicle

Is a very fine fossicle.

So please don't tossicle

You'll make Lesley crossicle.

Exploring Explore-a-saurus

By Tim Holland

Well, we've all heard the phrase "you can never have too much of a good thing" right? It's often used as damage control when saddled with an overabundance of something that usually good or at least benign, but let's face it, somewhat annoying when presented en masse. A little bit like being stuck in Tamworth during the Country Music Festival. There's only so much fiddling a man can take!

A very similar prospect faced an intrepid team of managers, designers, artists, contractors and the occasional palaeontologist (interchanging between Dave and myself) at Scienceworks - tasked with providing a new animatronic dinosaur exhibition by June this year. The problem was though, the public was very much in danger of being 'dinosaured' out, with two rival dino shows raking in squillions over the previous few months – including a global stadium sensation boasting high-tech robots with more chips than a stool sample from the Gobbledok.

So, what did we do in face of dinosaur overexposure? We created a new, fresh angle that had been overlooked by the others – **how do we know what we know about dinosaurs?** It seemed to fit in well with Sciencework's manifesto of promoting education too. Thus, work on the aptly-named *Explore-a-saurus* began with gusto.

One of the first jobs I undertook on site was to note down any possible changes to our animatronics dinosaurs, which had last been in Melbourne about decade ago, but had since been residing interstate. It's not surprising that 10 years of non-stop roaring, rearing and stomping required more than just a quick patch up and splash of paint. Much of the information about dinosaurs had also changed since the animatronics had been made, to the extent where body parts had to be ripped off and replaced with more correct anatomy. One such modification involved switching the thumbs of an animatronic *Muttaburrasaurus*. When it was first described by Alan Bartholomai and Ralph Molnar in 1981, this Australian dinosaur was believed to be related to the iconic Northern Hemisphere form *Iguanodon*, based on superficial similarities. This resulted in the unknown parts of the *Muttaburrasaurus* skeleton being reconstructed with elements from *Iguanodon*, including the presence of a large, sharp thumb spike, possibly used for defence. Fast forward to today, and *Muttaburrasaurus* is thought to be more closely related to smaller ornithopods, similar to *Qantassaurus* or *Leaellynasaura*, and likely had a smaller thumb with a more rounded claw. Thus, the hand of animatronic *Muttaburrasaurus* in *Explore-a-saurus* underwent a bit of a manicure. Although it doesn't look as intimidating now, it's a lot more accurate.

It was also decided that the animatronics were to get new colour schemes. For the most part, the colours in dinosaur reconstructions are well-informed speculation. However, a recent discovery regarding duck-billed dinosaurs from North America ensured at least one of our models – an animatronic *Maiasaura*, would not be painted garishly like a 1980s Moomba float. Its colouration was inspired by the mummified specimen of a related form, known as *Edmontosaurus*.

The specimen, known as 'Dakota' was preserved with skin impressions covering most of the body. Interestingly, the scale impressions covering the forelimbs and the tail varied in density and size, which sometimes reflects a change in colour in modern reptiles. Thus, it is thought the *Edmontosaurus* was coloured uniformly along most of its body, but had banding adorning the front limbs and tail. Along with adopting this shading scheme for *Maiasaura*, the other animatronics in *Explore-a-saurus* were painted a variety of different colours, including tiger-like stripes on the *Tyrannosaurus* for camouflage, and bright eye-like spots on the frill of *Triceratops* for display.

The old muttaburrasaurus (top) got brand new thumbs (bottom)

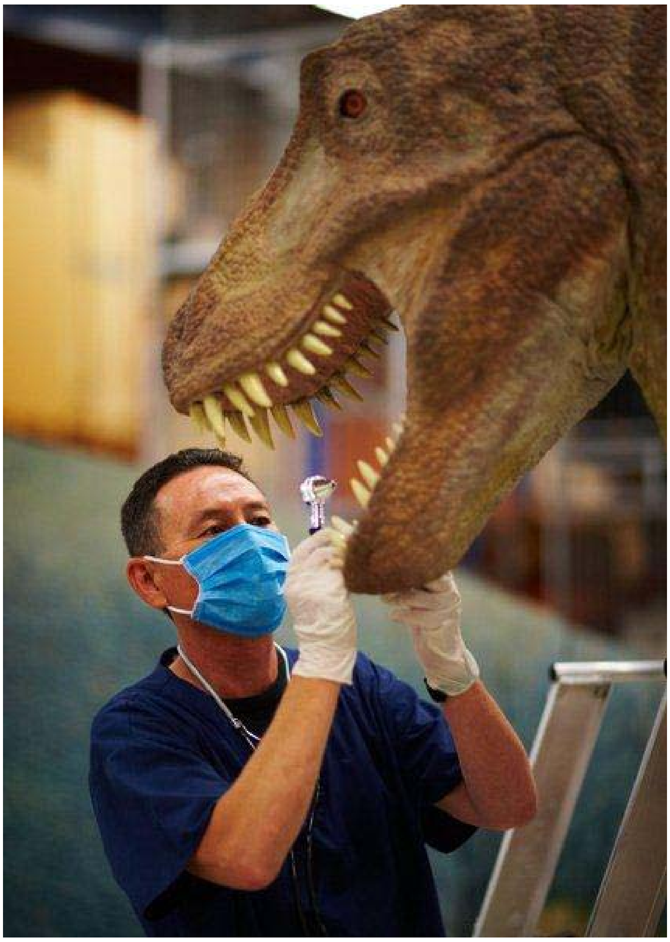
The triceratops with its brightly coloured frill is ready to go on display

But renovating robotic dinosaurs wasn't the only work to be done in Explore-a-saurus. The team also developed more than ten novel interactive exhibits, including a spinning wheel displaying insects trapped in amber, pencil rubbings made from fossil plant impressions, and duelling 'dino-vision' simulations, comparing the visual fields of carnivorous and herbivorous dinosaurs. For me though, two displays stood out from the rest. The noisiest of the pair, named Toneasaurus, involved visitors rearranging plumbers pipes to recreate the sounds of duck-billed dinosaurs. This activity was based on research involving CT-scans of crested hadrosaurs, such as *Parasaurolophus*, which found a complex series of internal passageways within the skull. These canals vary in length and shape across different genders, ages and species and were probably used to make deep noises for communication, a little bit like blowing air through a tuba.

Tim and his plumbers pipes

The other choice interactive exhibit, which unfortunately didn't have a snazzy title involving a dinosaur related prefix or suffix, involved stepping inside the jaws of a *Tyrannosaurus* skull and pressing against two panels positioned on either side. A gauge in front of the 'struggling victim' would measure the force exerted, and thus determine whether the relevant guest would be chomped in such a scenario. With a bite force of 31,000 Newtons for *T. rex* (that's three times that of an American alligator), the prognoses for most people would not seem crash hot. This was indeed the case during a recent commercial shoot, whereupon I was asked to get inside the jaws and "give it all I got". Being the method actor that I am, I probably overdid it whilst contorting my face to feign great terror and pain. The result was unexpected - on the last take I burst the blood vessels inside my left nostril, sending showers of blood down the back of my throat and out my nose! There was so much claret you would've thought I really had been bitten in half! Not sure, but think I may have even gotten blood on the camera. By the start of the next scene, I was almost gargling the stuff, and we had to stop the shoot altogether. Didn't stop gushing for three days either, but luckily enough avoided getting my nose cauterised for my troubles.

Tim tells us all about Sauropods



Dave the dino dentist gives the T-rex a scale and clean

Crouching dino hidden Tim... or not so hidden as his safety vest warns passers-by of a Sauropod in the area

Nasal injuries aside, *Explore-a-saurus* is a great exhibition and one that I'm happy to have my name attached to. Looking around the exhibition, you can't help but get caught up in the excitement of kids and adults alike, having fun and learning something new. I have seen many awestruck families travel around *Explore-a-saurus* to the point of exhaustion. It just goes to show - although it may get tiring to walk with dinosaurs, it never gets boring to learn about them.

Explore-a-saurus runs at Scienceworks until April 2012. For ticket information and opening times, please visit:

http://museumvictoria.com.au/scienceworks/whatson/current-exhibitions/exploreasaurus/

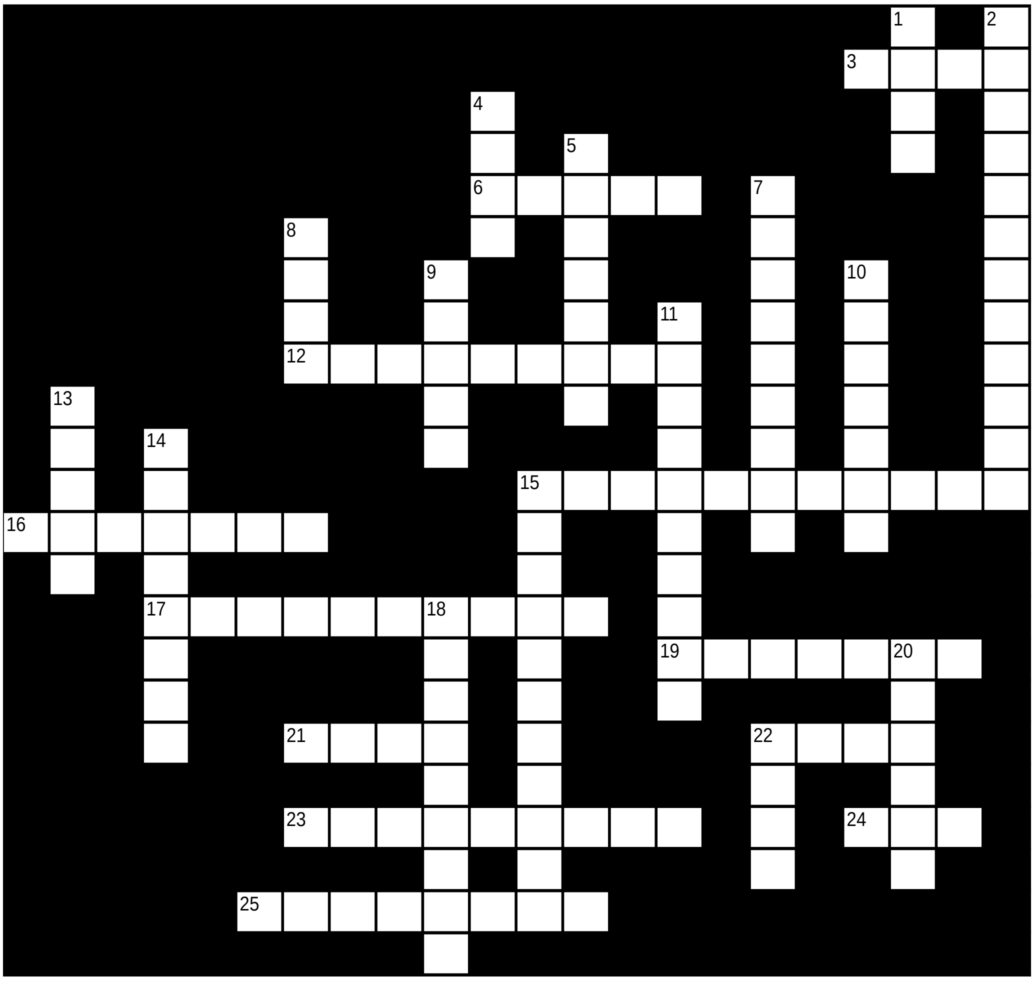
Cryptic Crossword

BY ROHAN LONG

Cryptic crosswords are often used to pass the time in evenings at the dig house. This year one of our diggers - Rohan Long - was a contestant on the TV game show *Letters and Numbers* and got to meet the real David Astle (DA). Inspired by this, he created the first Dinosaur Dreaming cryptic crossword. Enjoy!

Across

3. Disable amicable rock group. (4)
6. Birdlike behaviour observed in parts of Victoria via New South Wales. (5)
12. Unorthodox work on a rat (with missing tail) from old fossil site. (9)
15. Reprogrammed iPhone tools pinpoint Cretaceous layer. (11)
16. Strange, strange gemstones. (7)
17. For recreational time, mix last bit of oil in weird, cosmic wok. (4,1'5)
19. Injured, sore man at Temnospondyl haunt. (3,4)
21. Boron, oxygen and neon combine to form organic compound. (4)
22. Primarily lends enlargement, never short-sightedness. (4)
23. Dresses around first light at popular platform. (4,5)
24. Seabird within a UK town? (3)
25. Rebuke for Monash ID violation. (8)



Down

1. A wealthy paleontologist?! (4)
2. Spilt quarts diffuse through foreign saunas for 14-down. (12)
4. Cynic, lawyer and a bit of a sharp character. (4)
5. Aussie battlers; they can sometimes be happy. (7)
7. A husband or wife is often sought on the dig. (5,4)
8. Fanciful bird called for slab ingredient. (4)
9. 14-down found in schism in Miocene sequence. (5)
10. Men of God reminiscent of primitive mammal? (7)
11. Scientist parked cabs around moon phase before last orbit. (10)
13. What, in Latin Speech, is a cape? (5)
14. Storm is around Dorothy, perhaps. (8)
15. "Stab Jessica Parker" discussion ends for 14-down. (11)
18. Citrus pip found in carbonate rock. (9)
20. Employ mother around natural history collections. (6)
22. A distant paleontologist? (4)

Answers on page 61

Ode to the Bumbiter

By Mike Cleeland

Illustrated by Pip Cleeland

I've got this old white 1992 4WD Landcruiser
An old faithful 6 cylinder tray ute, a real bruiser
She's a fair dinkum low down dirty fighter
and we call her the The Bumbiter

So named cos she shakes you off the Richter scale
if you drive her too fast
And the bumping and bouncing up and down
leaves bruises all over your arse
She's a real derrière delighter
is the Bumbiter

She's probably done up around three quarters of a
million miles by now
I've lost count, cos the odometers busted but I'm
gonna try to fix it somehow
I'll take off me hat to any blighter
who can outlast the Bumbiter

These days the bodywork is probably a bit past its best
Wouldn't really want to see her dragged in for a
roadworthy test
So now and then we splash on some paint to make
her look a bit whiter
the new look Bumbiter

She usually takes about ten minutes to warm up
Coughs and bangs and splutters like she's brewing
a storm up
Probably needs some new plugs to ignite her
does the Bumbiter

She runs on dual fuel, both petrol and LPG
Fill up both tanks and she'll go from Bandiwollop
to Bungaree
She'll go all day, then do an overnighter
will the Bumbiter

We'd use her for weed spraying, with a 500 litre
tank on the back
She's covered most of Gippsland, knew her way up
and down just about every
farm track
Then in summer she'd double as a firefighter
the all purpose Bumbiter

We used her for ferrying gear on the Dinosaur Dig
We needed something to get along the dirt tracks,
a real old bush pig
She'll carry any load, just rope it down tighter
on the Bumbiter

I've gotta say the deep throbbing engine note of
the Bumbiter is the envy of all me pals
And o'course a good 4WD is essential if you wanna
impress the gals
You shoulda seen my fiancee's eyes light up when
first I did invite her
into the Bumbiter

And now that she's me wife I often take her out on
Sunday drives
(The missus I mean here, not the Bumbiter, snakes
alive!)
That shaky old ute has really become an important
part of our lives
It's something that can always be relied on to
excite her
is a ride in the Bumbiter

She'll probably still do another coupla footy seasons
I'd like to keep her going a bit longer, for any
number of reasons
All in all it'd be fair to say the future's never looked
brighter
for the Bumbiter

"Visually and Mentally captivating, rode like a vibrating butt clamp and had the turning circle of an Apatosaur"

- John W.

"I didn't go anywhere near Mike's beast of a truck. Sharyn made a barely audible offer to have a go if we really got stuck… but Alan fortunately returned to relieve us all from really having to face the task."

- Cate C

"Sorry, I have no idea what a Bum-biter is."

- Norman G

" I really don't know what the fuss about driving the bumbiter is. As long as you leave a bit early, don't take her over 80, take your phone, someone else, have an RACV membership, dismiss the grinding, and ignore the truck sitting right behind you, it's FINE... "

- Wendy T

My Reluctant Life at the Dig

By Plastique Bucquette

The indignity. The humiliation. The wasted dreams and potential.

Me – a food grade bucket destined for yummy pastry fillings, finding myself carrying seawater, rocks and (oh my goodness) rusty chisels.

How dare they!

I was a bit worried when sent to an Ivanhoe bakery. After all, it's not quite Paris, is it? But I carried my pastry filling with care and pride, clean and hygienic. And the pastries and croissants and tarts I helped create! Gorgeous.

As my contents started depleting and I neared emptiness, I wondered what would happen next. What would the bakers refill me with? Yeast? Dough? More fruit? Jam? Try nothing at all. Imagine my surprise and horror when I was tossed out the back into the dumpster. I lay there, trying to come to terms with my fate. It may not have been dignified, but the end would be quick – crushed and in landfill with less than a week of suffering. I could cope with that…

But then, a strange man on a bicycle pulled up next to the dumpster and started rooting through it, mumbling to himself in perfectly grammatical English. He yanked me from my moroseful rest and cackled.

Off on the bicycle. Not the most glamorous of rides (at least the delivery truck had been a Mercedes), but perhaps I would be filled with something worthy like blackberry jam.

Nope. Dropped at a neighbours'. A crazy foreigner in a bright yellow hat and an as yet undiscovered penchant for wild sledgehammer swings. Bundled off to South Gippsland. Delivered to a strange bunch of people in ugly dirty Dubbin-smelly steel cap boots and somewhat in need of more frequent bathing.

This is where the chisels came in. Painted QANTAS red, kind of rusty, and a little burred. Dumped in without so much of a by-your-leave. And they scratched. Destroying my beautiful white food-grade finish with their horrible scratchy mushroom tops. Then (and I can hardly bring myself to talk about this; one is, after all, a Lady), hoisted into a trailer that has no doubt seen many many better days. From the trailer to a canvas backpack, lugged down to site by some young whippersnapper. Tipped out of the backpack onto the sand. Which was terrible, but not the worst. After the chisels were mercifully removed, a bossy loud Paddington Bear lookalike ordered more of the grey-shirted Neanderthals (who called themselves "dig crew" as though that was some raison d'etre) to use me as part of a "bucket brigade" to remove seawater from a huge hole in the shore platform. Seawater! Horrible smelly seawater full of rotting seaweed.

What other odious demeaning tasks did they make me do?

I helped rescue little fish from that hole in the shore platform as it was pumped out. Horrible wriggly tickly little critters that one would normally cross the road to avoid.

They filled me with rock (how could I ever tell my friends?) and hid me behind a rock at the base of the cliff. And filled me with rock they'd bandaged (apparently it had fossils on the surface but it just looked like rock to me), wrote the date with a big sloppy red pen and carried me up the hill.

They filled me with rubble (they called it designer Cretaceous gravel but I know better) in the back yard.

One day, a gastrolith-inventing self-proclaimed bushman/shearer sprayed rock dust all over me! The next, a colourfully dressed matriarch who should have been very much old enough to have learnt some manners poured hundreds of shoulder bones into my refined personage, to be sorted through and cackled over later at her leisure.

At one point, down on the beach on a horrible chilly dawn, I was actually tipped upside down and sat upon. And not by one of those skinny little Germans either – by some bumbling country lad golf pro wannabe. Not fun indeed.

And the things that were spilt on me – cups of tea, vanilla slices, red wine, superglue, more cups of tea, muscat, crumbs of something hideous called a "Norman Bikkie", beer, sunscreen and so, so, so much rock dust.

And the final straw? I am writing this from the back of a shed in Wonthaggi. Wonthaggi! None of my friends would be seen dead in Wonthaggi.

And I'm still dirty.

CRYPTIC CROSSWORD ANSWERS:
Across: 3. Mica; 6. Avian; 12. Koonwarra; 15. Teinolophus; 16. Garnets; 17. Swim O'clock; 19. San Remo; 21. Bone; 22. Lens; 23. Flat Rocks; 24. Auk; 25. Admonish

Down: 1. Rich; 2. Qantassaurus; 4. Claw; 5. Diggers 7. Other Half; 8. Rock; 9. Minmi; 10. Bishops; 11. Taxonomist; 13. Otway; 14. Dinosaur; 15. Triceratops; 18. Limestone; 20. Museum; 22. Long

Otways Prospecting Field Crew

26 - 30 November 2010

Marion Anderson
Mike Cleeland
Pip Cleeland
Tim Holland
Les Kriesfeld
Rohan Long
Travis Park
David Pickering
Tom Rich
Alan Tait
Gabi Turcu
Pat Vickers-Rich
Mary Walters
Wendy White
John Wilkins
Dean Wright
Sean Wright

Flat Rocks Dig Field Crew

5 - 26 February 2011

Hala Assouad
Darren Bellingham
Tamara Camilleri
Paul Chedgey
Win Chedgey
Mike Cleeland
Pip Cleeland
Peggy Cole
Tim Couch
Cate Cousland
Kim Davis
David Elliott
Alan Evered
Nicole Evered
Norman Gardiner
Jillian Garvey
Mike Greenwood
Darren Hastie
Fotini Karakitsos
Gerrit Kool
Lesley Kool
Miklos Lipcsey
Rohan Long
Penny Loughran
Sharyn Madder
Alanna Maguire
Lisa Nink
Anne-Marie O'Brien
Travis Park
David Pickering
Katerina Rajchl
Doris Seegets-Villiers
Danielle Shean
Chris Sinclair
Paul Smith
Andrew Stocker
John Swinkels
Alan Tait
Jacqui Tumney
Gabi Turcu
Wendy Turner
Jesse Vitacca
Mary Walters
Astrid Werner
Wendy White
John Wilkins
Corrie Williams
Dean Wright

Otways Dig Field Crew

26 March - 2 April 2011

Roger Benson
Mike Cleeland
Pip Cleeland
Peggy Cole
Cate Cousland
Erich Fitzgerald
Helen Hughes
Miklos Lipscsey
Rohan Long
Sharyn Madder
Alanna Maguire
Lisa Nink
Travis Park
David Pickering
Tom Rich
Pat Vickers-Rich
Alan Tait
Mary Walters
Wendy White
Dean Wright

FIELD CREW PHOTOS...

FLAT ROCKS WEEK 1 CREW

L-R back row:
John Swinkels
Norman Gardiner
Mary Walters
John Wikins
Middle row:
Dean Wright
Wendy White
Alanna Maguire
Tamara Camilleri
Kim Davis
Front row:
Nicole Evered
Travis Park
Katerina Rajchl
Darren Hastie
Lesley Kool

FLAT ROCKS WEEK 2 CREW

L-R back row:
David Pickering
Peggy Cole
Wendy White
Paul Smith
Chris Sinclair
Gabi Turcu
Paul Chedgey
Sharyn Madder
Dean Wright
Middle row:
Lesley Kool
Nicole Evered
Win Chedgey
Mary Walters
Astrid Werner
Front row:
Lisa Nink
Jesse Vitacca
Alan Evered

Flat Rocks Week 3 Crew

L-R back row:
David Pickering
Rohan Long
Hala Assoud
Darren Bellingham
Danielle Shean
Andrew Stocker
Corrie Williams
Alan Tait
Front row:
Mary Walters
Jillian Garvey
Jacqui Tumney
Lesley Kool
Norman Gardiner
Wendy Turner

Otways March Dig Crew

L-R back row:
David Pickering
Peggy Cole
Dean Wright
Mary Walters
Roger Benson
Alanna Maguire
Travis Park
Front row:
Tom Rich
Erich Fitzgerald
Alan Tait