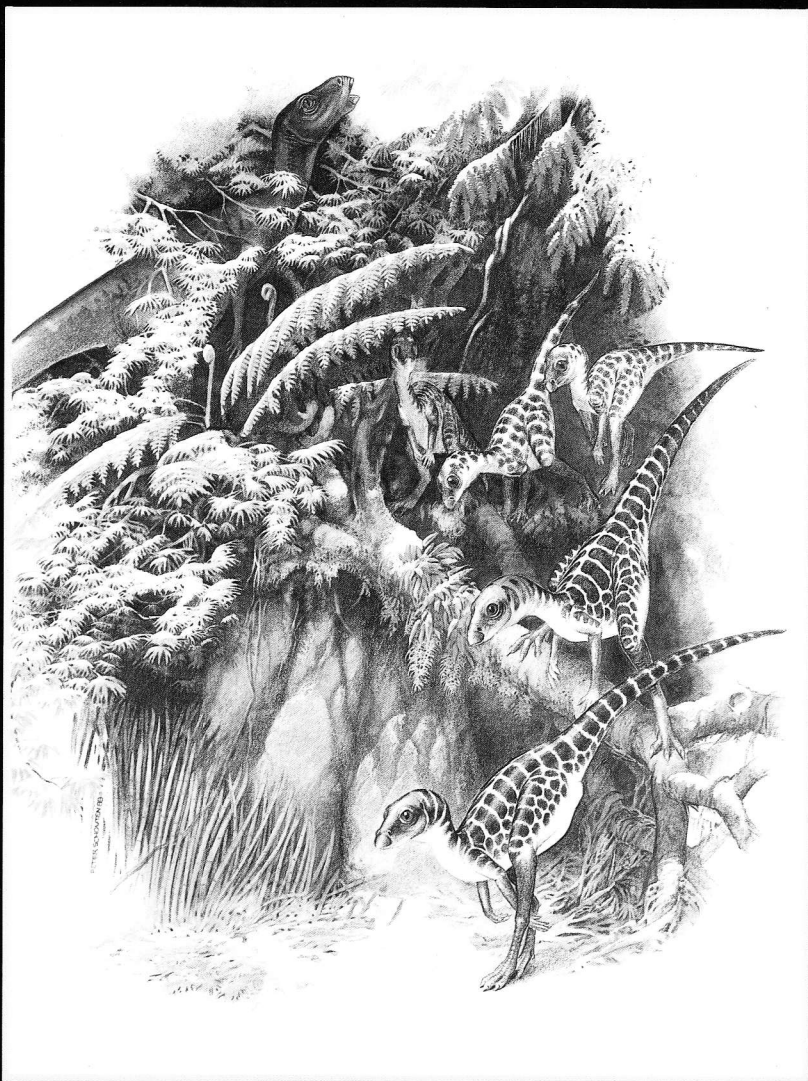


DIG AT

DINOSAUR COVE

1989



AUSTRALIAN  
DINOSAURS

# DIG AT DINOSAUR COVE, 1989

## Introduction

The 1987 excavation at the Slippery Rock site in Dinosaur Cove was the first one to utilise explosives. With this technique, tunnels were excavated above the fossiliferous layer in order not to damage any potential specimens. Once the working space was made available by this means, then the floor where the fossils were preserved was taken using mechanical methods to break up the rock.

During the previous three seasons excavating at Dinosaur Cove, only isolated bones and teeth of dinosaurs and other vertebrates had been found. In the last fortnight of the 1987 dig, the results obtained were most encouraging. The prize was a partial skeleton of a new hypsilophodontid dinosaur, Leaellynasaura amicagraphica, about 35% complete, collected in the Cross Tunnel of the Slippery Rock site. Among the other specimens found during that last fortnight was an extremely delicate partial pelvis of a different, larger hypsilophodontid.

Encouraged by the success of this technique, plans were immediately made to continue the work at Slippery Rock during the Summer of 1989. Since the underground excavations began at Dinosaur Cove in 1984, there was a dig every Summer through 1987. However, two factors dictated that there be no excavation in 1988. First, the costs and effort required to tunnel underground in the manner now adopted is so great that it is not feasible to organise a dig annually. Second, at the end of the 1987 excavation, not a single technical or popular article had appeared on the work there although four years of effort had been put into it.

As a result of this break, there was time to prepare and analyse the fossils. In the meantime, several colleagues carried out related studies. Much of this work has now been published. In addition, several popular articles are in preparation in order that the general public will have this information available to them.

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#### The Excavation of 1989

Prior to the official beginning of the 1989 dig,  
visits were made to the site by Ms. Rebecca Norton who had  
volunteered to supervise the tunnelling operation in order  
to familiarise herself with the site. Several of her  
professional colleagues also visited the site to offer  
suggestions and assistance. This was critical in  
organising much of the technical support and equipment  
needed later in the dig as well as to work out a plan for  
carrying out the operation.

In late December, 1988, one caravan was moved on site.  
It had been stored outside at Beech Forest for three  
successive Winters. Thus it was not too surprising that

because of the serious rust damage which consequently had occurred, one of the wheel rims collapsed. No damage was done to the caravan but there were long range consequences owing to this incident. The decision was made that a shed had to be found to house the caravan or it would not survive another Winter.

Mr. John Herman, who in the past had carried out much of the engineering needed to keep the excavation going, offered to organise the materials to build a shed of sufficient size to store two caravans as well as much of the equipment the excavation at Dinosaur Cove now requires. With this promise of support, the decision was made to go ahead and build a shed 5 x 10 x 2.5 metres high during the course of the 1989 excavation if land could be found for it. David and Winsome Denney who had permitted the fieldparty to camp on their property each summer there has been an excavation at Dinosaur Cove, graciously consented to allow this permanent structure to be built on their land.

With the help of many of those who had volunteered to dig dinosaurs and found themselves instead involved in building this structure, the shed was completed without interfering with the work of tunnelling and excavating the fossils in Dinosaur Cove which was going on simultaneously. The site was surveyed and the stumps put in by members of the 21st Construction Squadron of the Australian Army, based at Puckapunyal, Victoria. Most of the frame for the walls and roof was put up by students from Lewis & Clark College, Oregon, U.S.A. Much of the rest of the work was done by Graeme King, Thomas Whitelaw, Gordon Spark, and Chris Marek.

Setting up the camp and flying fox between the cliff top and the shore platform were quickly achieved as there were no major innovations in these areas. Considerable time was devoted to improving the footpath descending into Dinosaur Cove. A major improvement on site was the construction of scaffolding to provide a horizontal platform well above the highest seas where equipment could be safely stored and was less likely to be lost than when kept among the boulders next to the Slippery Rock site as in the past. Mr. Graeme O'Brien was instrumental in the completion of both of these tasks.

The excavations for the powder magazines which were dug in 1987 had withstood two years of weathering so well that other than mowing the grass around them to reduce the fire hazard, little needed to be done to them before they could be utilised again. ICI again supplied the explosives as they had in 1987. In all, half a tonne was used, about 250 kgm of power gel and the balance, AN60 which was found to be the more appropriate explosive for the circumstances at the Slippery Rock site.

Two different systems were constructed to supply water at sufficient pressure for the rock drills. The first was

a tank about two metres above the level of the tunnels where the excavations were carried out. Although this was thought to be far in excess of sufficient pressure, apparently because of the amount of clay in the rock being drilled, it was not adequate to keep the opening for the exit of the water from the drill steel clear. The second system was a tank located at the top of the cliff that gave a head in excess of 80 metres. This was quite adequate and had the advantage that freshwater rather than seawater could be utilised. The tank used was an above ground swimming pool supplied by David and Winsome Denney. The tank was recharged by the Otway CFA on a weekly basis.

The initial objective was to extend the East and West Tunnels of the Slippery Rock site inward to a point about 10 metres beyond the Cross Tunnel and at that point drive a second cross tunnel linking the two up in order to see whether the fossiliferous layer continued that far underground. In addition, in order to try and pick up the fossiliferous rock to the east of the East Tunnel, another objective was to drive in that direction, beginning near the middle of the East Tunnel.

By the latter part of February, the East and West Tunnels had been driven as far as intended. Great difficulties were encountered in drive eastward out of the East Tunnel because the ground was unexpectedly more difficult than anticipated. It was found to be highly fractured and therefore further excavation in that direction seemed imprudent.

At this stage, no fossils had been recovered from the Slippery Rock site. Therefore, the decision was made to discontinue further exploration tunnelling in 1989 and devote the month remaining to widening the existing Cross Tunnel. Twice the tunnel was widened about 1.3 metres on its north side so that its current width is 4.0 metres. In doing this, a sufficient area of fossiliferous rock was exposed to produce all but a few hundred of the 1300 fossils collected in 1989.

To insure the stability of the tunnels, wire mesh was placed on the roof and walls and W-straps on the roof using split sets. In addition wooden supports were placed at the western and eastern walls of the Cross Tunnel as well as a series of props being placed in the central area of that chamber. To prevent people from entering the tunnels prior to the next excavation, wire mesh was placed over both entrances to the excavation. At the opening of the West Tunnel, this served a dual purpose in that it prevented previously excavated rock from being washed back into the tunnels by the sea.

The balance of the fossils collected in 1989 came from a northward extension of the fossiliferous unit at Dinosaur Cove East. This excavation was carried out on the shore platform in the open.

Mr. Rob Anderson drilled four cores in order to provide information to guide future excavations. The first demonstrated that the fossiliferous unit at Dinosaur Cove East continues at least 5 metres further north on the shore platform than has yet been excavated. The remaining cores were at the northern ends of the East and West Tunnels. In none of those cases could unequivocal fossiliferous rock be identified.

For more than a fortnight, Mr. Peter Menzel, a photographer from the National Geographic Society, was on site to collect background material for an article on dinosaurs being planned by that organisation.

#### Future Plans: 1990 & 1991

When the excavations in the Cross Tunnel were completed, the fossiliferous rock along its north side was restricted to only about 2 metres of the 9 metres exposed. In going the last 1.3 metres northward, this exposure had been reduced to that figure from 6 metres. On the otherhand, the 2 metres remaining appears as rich or richer in fossils as the rock immediately southward. The ramifications of this observation are significant for the future work at the Slippery Rock site.

If the deposit is pinching out, then clearly it is imperative to plan the future operation to remove the last bit of this rock without committing one's self to a major excavation northward. In that case, to finish at Slippery Rock would require one final three month excavation to remove the last of the fossiliferous rock on the north side of the Cross Tunnel and to excavate The Pillar.

However, the current indicators which have been determined by the work of the Monash University sedimentologist Andrew Constantine indicates that the current was flowing northward; i.e. in the same direction as the fossiliferous deposit appears to be narrowing down. Unless the stream channel deposit was subsequently destroyed by a later episode of erosion, the channel has to continue somewhere. In otherwords, unless cut out by subsequent erosion, the course of the fossiliferous channel will be cut by either the East or West Tunnel or a cross tunnel driven between.

If the channel does continue northward, it would be best for the present to not carryout further excavations within the existing Cross Tunnel nor to dig out The Pillar. This is because to do so will require great expense and effort in order to make such an operation safe.

Therefore, before such a major excavation at Slippery Rock can be planned, there is a need to determine if and where the fossiliferous layer is cut by the East or West Tunnels or one between their northern ends, a Second Cross Tunnel. To do this requires that the Second Cross Tunnel be excavated and the floors of it and the East and West

Tunnels be taken up. Such a restricted operation can be done in about 5 weeks with a crew of half a dozen experienced volunteers. It would not be necessary to set up the flying fox nor the scaffolding as is mandatory during a full-scale operation as was carried out in 1989. This work will be carried out in 1990.

Once a decision is made on the basis of the 1990 results whether deeper tunnelling is warranted and if so, where, a detailed plan will then be drawn up to carry out the work of the 1991 season. If deeper tunnelling is not thought worthwhile, to finish the work at Slippery Rock will still require a three month season.

Whether deeper tunnelling or closing down the Slippery Rock site is the agenda for the 1991 excavation, a two metre wide wall will be built in the Cross Tunnel along the north side of the pillar to support the roof. In addition, the tunnel on the west side of The Pillar will also be filled in for this same purpose. When the site is ultimately be closed down in the course of the current research project, be that in 1991 or perhaps decades hence, at that time the entire entrance will be sealed by a two metre wide wall supporting the roof. This will stabilise the site and permit access to it in centuries to come if future palaeontologists should desire to reopen the locality by tunnelling through this wall. Thus far, no other southeastern Australian site than Slippery Rock yields articulated dinosaur remains. If the site should retain this unique distinction in the future, then it is likely that future workers will consider its further development worthwhile even if the present ones abandon it.

#### Preliminary Scientific Results

To date, most of the 1300 numbered specimens collected during the 1989 excavations remain unprepared. Completion of this task will require two or more years. As the material was collected, several clusters of bones were noted. Upon preparation of the second of these, it has been found to be at least one and possibly two hind limbs of a small dinosaur. This is only the second instance of articulated dinosaur remains from Dinosaur Cove and one of less than ten known from the continent. With preparation of the bone clusters as yet untouched, more articulated remains are likely to be forthcoming from the 1989 excavation efforts.

Of particular interest in the hindlimb found is that the animal from which it came suffered a severely fractured tibia during its lifetime. It managed to survive long enough after this event for the bone to knit together. Within the breaks are deposits of secondary bone and surrounding the shaft are lumps of additional bone. The hindlimb most likely is that of a kangaroo-like bipedal hypsilophodontid dinosaur. For a modern kangaroo to have suffered such a severe break and lived long enough in the wild for the bone to heal as much as this tibia did is

improbable. Thus, this pathological specimen should provide some insights into the constraints on the mode of locomotion of these dinosaurs that would be unavailable if only normal bones were available.

#### Assistance

In addition to those named above, numerous other people and organisations contributed to the success of the 1989 excavation at Dinosaur Cove. Without their combined efforts, this fascinating chapter of Australia's prehistory would remain undeciphered.

If anyone group of supporters can be considered the lynchpin of the entire operation, it is the volunteers who carried out the day-to-day tasks on site relating to the actual excavation of the fossils.

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Excavation at Slippery Rock site, Dinosaur Cove as at 27/3/1989

