

Creatures of the Dreamtime

A new exhibit digs into Australia's strange past lives

By STEFI WEISBURD

he past lives on in Australia.

The continent has been called the land of the living fossils because many of its current denizens – from platypuses and wombats to lungfish and emus – are living examples of ancient animals. The paleontologic past lives on, too, in the legends and cave paintings of Australia's aborigines, whose ancestors shared the continent for several thousand years with many animals that no longer exist anywhere.

Their legends, passed down through a 38,000-year history, tell of strange monsters that lurked in water holes at night. They speak of birds that were taller than mountains. They describe a time when deserts were verdant gardens, washed by cooling rains and protected by a lush canopy of gum trees. The exotic animals that inhabited the trees were called the Kadimakara, or animals of the Dreamtime, which is the aborigine term for the distant past.

Whether aborigine tales are “based on real tribal memory, or on stories spun from findings of bones at water holes or sticking out of creek banks, I'm not certain,” says paleontologist Patricia V. Rich of Australia's Monash University in Clayton. But within the last century scientists have come to recognize that these strange legends are based on sittings of actual animals or their remains.

Using plant and animal fossils and geologic studies, researchers have learned much about the specific animals from which aborigine stories may have sprung. The scientific understanding that has emerged and the history behind it are the focus of a new museum exhibit called “Fossils from the Australian Dreamtime: Kadimakara.” Organized by Rich, the collection of fossils and artistic reconstructions of now-extinct vertebrates offers a tantalizing view of Australia's inhabitants over the last 500 million years.

And what a bizarre crew it is: from flamingos and killer kangaroos to *Palorchestes*, a bull-sized mammal whose long snout, giraffe-like tongue and massive claws may have inspired aborigine tales of a swamp-dwelling, man-eating monster.

“This exhibit,” says Rich, “is a crusade

Aborigine stories of the bunyip, a man-eating monster, may have been inspired in part by Palorchestes, a plant-eating, bull-sized marsupial thought to have had extremely powerful forearms, massive claws and a short trunk.



of mine to make the world aware that in addition to platypuses and echidnas [spiny anteaters] and all the weird animals we have in our fauna today, we're finding that there are many more strange animals from the past that are unique to the continent.”

Besides being the stuff of legends and dreams, Australia's strange fauna are significant because they reflect the continent's unique geologic history. Australia experienced unusually long periods of isolation from other continents, as well as geologically rapid sojourns between the South Pole and the equator, which brought dramatic climate changes to the continent. Australia's unique paleontology and geology have also ensured the continent a place in a number of heated scientific controversies – from arguments over the theory of evolution to debates on the demise of the dinosaurs.

The Kadimakara show is making its North American debut April 9 through

June 26 at the Natural History Museum of Los Angeles County. The Tyrrell Museum of Paleontology in Drumheller, Alberta, has also expressed an interest in the exhibit, as have the National Museum of Natural History in Washington, D.C., and some museums in Europe and Asia.

science, and particularly paleontology, got off to a late start in Australia. For that reason, the country has had a reputation of having a rather poor fossil record. But in the last 40 years especially, scientists have made great strides in unearthing Australian fossils, which have contributed to the understanding not only of that continent's past but also of the paleontologic and climatic history of the world as a whole.

Australia is home to some of the planet's oldest rocks, as well as 3.5-billion-year-old stromatolite structures



The rhinoceros-sized Diprotodon, at left, whose fossil skull is shown above, was the world's largest known marsupial. The herbivore became extinct less than 20,000 years ago, well after humans had arrived in Australia.

closest thing in Australia's past is the carnivorous kangaroo, which may have chased its prey on the open plain but did so hopping, not running. While the marsupial lion and Tasmanian tiger were both carnivores that could charge prey, she notes, they apparently didn't have the right kind of bodies to engage in long pursuits in the open.

As a result of marsupials' preference for plants, other kinds of animals became meat-eaters. Australia's largest fossil carnivore, for example, was *Megalania prisca*, a ferocious giant lizard.

made by ancient colonies of algae, which are the oldest traces of life on earth (SN: 2/15/86, p.108). The continent boasts the largest fossil marsupial, *Diprotodon*, and a collection of the fossilized remains of animals that never appeared anywhere else on earth — including *Palorchestes*, a marsupial lion called *Thylacoleo carnifex*, a carnivorous kangaroo called *Propleopus*, an assortment of dinosaurs and a recently identified order of mammals called Thingodonta, which are entirely unlike anything found on the rest of the planet.

The main reason for Australia's unique fossil repertoire is the continent's unusually long period of isolation. For the last 50 million years or so, Australia has been a loner land mass, devoid of any links with other continents. This isolation is providing modern scientists with a remarkable opportunity to study an unparalleled experiment in mammalian evolution: Biologists can compare the development of marsupials "down under" with that of their counterparts in the rest of the world — where they have had to compete with the now-dominant placental mammals, such as lions and deer. (Marsupials incubate their young in an external pouch rather than in a placenta.)

Not surprisingly, scientists have found that Australia's marsupials, protected for millions of years from placental immigrants, have moved into certain ecological niches typically held by placental animals. Kangaroos, for instance, occupy the grazing and browsing niches that animals such as antelopes and deer hold

elsewhere.

But there are some niches that marsupials — even without competitive pressure from placentals — have been more reluctant to take than their placental cousins. Their inability to run fast in long pursuits of prey on the open plain seems to have prevented most marsupials from moving into the kind of carnivore niche that is typically occupied elsewhere by animals like cheetahs, says Rich. The



Flamingos once shared what is now Australian desert with dolphins, primitive platypuses, gigantic lungfish and a diverse array of marsupials.

With its unusual fauna and geologic history, Australia has influenced scientific thinking for more than a century. Fossils from Australia's Wellington Caves, for instance, threw a wrench into 19th-century creationist arguments that certain animals were tailor-made by God for specific climes. This line of reasoning predicted that Australian fossils would resemble animals found in other environments with similar climates.

But the Wellington Caves remains had another story to tell. Not only were they entirely different from the lions and elephants and other animals living in similar climates elsewhere, but they looked suspiciously like the fauna living in Australia today. This led to the proposed Law of Succession, which suggested that fossil animals in a specific area are succeeded by other, closely related animals regardless of environmental conditions. The Wellington Caves fossils "would not worry creationists today," says Rich, "but at that stage they did have an important, supportive impact on evolutionary thinking."

Australia's fauna have also supported the theory of plate tectonics, in which continents and ocean crust are embedded in about a dozen plates that slowly move about the earth's surface. The continents, driven by the creation of new plate material at oceanic volcanic ridges and the sinking of plate edges elsewhere, have each been on a kind of geologic walkabout over the planet's surface — occasionally colliding to form supercon-

tinents such as Pangea and then breaking apart to go their separate ways.

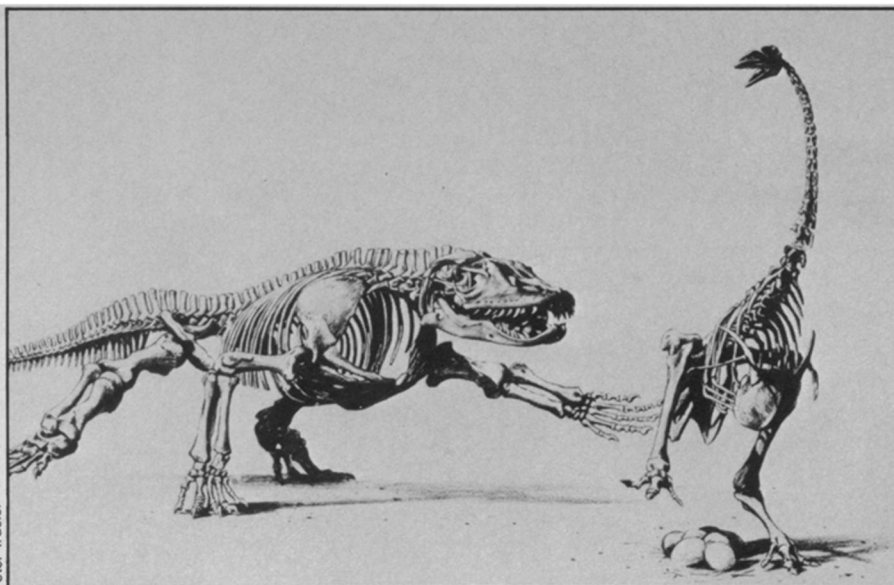
Slightly less than 500 million years ago, when the first known vertebrates inhabited Australia, says Rich, the continent straddled the equator, had close links to Asia and was part of Gondwana (a supercontinent that also incorporated South America, southern Europe, Africa, the Near East, India, New Zealand and Antarctica). Two hundred million years later, Australia was moving southward with Antarctica, which had ties to South America and other continents. Then, about 100 million years ago, Australia's link with Antarctica began to dissolve and Australia started to move north toward Asia.

This game of continental bumper cars is reflected in Australia's fossil record in many ways. For example, freshwater fish that lived about 370 million years ago in Australia are very similar to fish living in China at that time — suggesting that the two land masses were close enough for the fish to travel between them. By noting that the southern beech tree, certain mammal-like reptiles known as Diconodonts and other Australian flora and fauna are found only on Gondwana continents, scientists have determined that these continents were once linked. The development of Australian animals and plants not seen elsewhere signals that there were times when Australia had lost ties to other continents.

"Geologists can tell tectonically when continents broke apart or came together by looking at volcanics and rift valleys and the like," says Rich. "But the final clincher that really ties down precisely when and where continents broke apart is when the fauna and flora stop being alike."

Australian paleontologists are also jumping into current-day controversies concerning how the dinosaurs lived and died. Australia is one of the few places in the world where remains of dinosaurs that once lived at polar latitudes have been found (SN: 3/19/88, p.184). In particular, Rich, her husband Thomas H. Rich at the Museum of Victoria in Melbourne, and their co-workers have discovered a chicken-sized dinosaur with unusually large eyes and optic lobes of the brain, suggesting that this animal may have been equipped to survive the polar winter's long period of darkness rather than simply migrate away from it.

This and other discoveries of polar dinosaurs are likely to fuel the debates of whether the dinosaurs were warm- or cold-blooded and whether an asteroid impact killed them off by creating an atmospheric canopy of dust that brought on a period of darkness and cold. "I don't think the [fossil] material disproves the idea that an asteroid could have had some effect," says Patricia Rich. "But I think it constrains the theory by saying that if our tiny dinosaurs were indeed permanent polar residents, darkness had to last



Peter Trusler



Edmund Gill



Frank Coifa

The aborigine carving of the footprints of a giant bird, shown on the lower left, may have been prompted by the now extinct *Genyornis*, which in the drawing above is defending its eggs against a *Megalania prosca*, a gargantuan lizard known as the "great ripper," which was Australia's largest predator. At left, a skull of the 25-foot-long *Megalania* sits next to the skull of its smaller living relative, a goanna or monitor lizard.

longer than the five or six months of winter [that the dinosaurs were able to deal with]. It also gives us more insight into how flexible the dinosaurs may have been."

Australian paleontology continues to blossom. In the last few years, paleontologists have uncovered an unusually rich and well-preserved collection of fossils of snakes, bats, marsupials and other animals from the last 15 million years, which promises to greatly enhance understanding of several members of Australia's fauna. At another site, researchers have discovered the oldest known monotreme in 110-million-year-old rocks (monotremes, the earliest mammals, lay eggs and display both reptilian and mammalian characteristics). According to the paleontologists who unearthed *Steropodon galmani*, this primitive, toothed platypus offers some hints about the early relationships between monotremes and other mammals. The finding shows that monotreme dental patterns, like those seen in the mod-

ern platypus, haven't changed much in 110 million years. The Riches and their colleagues have also recently found the possible remains of a labyrinthodont, a crocodile-like amphibian, that are about 30 million years younger than fossils of the same animal group previously discovered elsewhere in the world. This is one of many examples of species that survived longer in Australia than anywhere else in the world, she says.

But there is still much to do. For instance, paleontologists, longing to fill what has come to be called "the ghastly blank," are hunting for marsupial fossils from about 30 million to 100 million years ago. There's no record of marsupials from this period yet, says Rich, but "we know there must be something out there."

Writing in *Kadimakara: Extinct vertebrates of Australia* (Pioneer Design Studio, 1985, Lilydale, Australia; Australian Book Source, Davis, Calif.), upon which much of the exhibit is based, Patricia Rich concludes: "So much is yet to be understood about the origin and evolution of vertebrates on this continent, the reason why Australia has served as a refuge at the end of the world for numerous groups of backboneed animals, the effects of changing latitude and climate on the fauna of a continent that has moved a drastic 20 to 25 degrees in latitude during the last 40 million years — and is still moving. So much is yet to be discovered, which is what makes the search for more Kadimakara a fascinating endeavor!" □