O Mundo Perdido Timor-Leste Exhibition Guide

Patricia Vickers-Rich, Peter Trusler and Draga Gelt, 2014

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The exhibition on display is about Timor-Leste's very ancient past. This ancient past goes back more than 250 million years to a time when many strange animals lived in the ocean waters that lay above the sea floor. A long history of what happened and how Timor became the island we know today has been worked out over the last century by scientists called **geologists**, who have studied the rocks on this island. They have been able to read the stories preserved in these rocks from all over the island and put them into some order.

Timor has not always been an island. In fact, for much of the history that we know, it has been a seabed covered with a shallow, sunlit ocean. And Timor is really a part of the great continent of Australia. The seabed that has been Timor up until about 6-8 million years ago, was part of what geologists call the Australian Plate - a part of the Earth's outer "skin" or crust. And this outer skin of the Earth is made of many different plates which are always moving with respect to each other. So, over time Australia and Timor have moved from the south to the north – beginning about 120 million years ago. Before that they were connected to Antarctica!

250 million years ago **100 million years ago** **10,000 years ago**

X marks the spot that is Timor-Leste. These sequence maps show how Timor-Leste and Australia have moved north from a connection with Antarctica over the last 250 million years.

250 million years ago 100 million years ago 10,000 years ago. As Timor and Australia moved northwards, they traveled from the cold polar regions into the tropics. And as they moved they began to crash into Asia in the north. It was that major collision that caused seabed Timor to rise and form the island it is today – beginning about 8 million years ago. At that time the old seabeds and the animals that had lived in those ancient seas and had been buried far underground, squashed and turned into rocks, had turned into fossils. Then, with the crash of Timor and Australia into Asia these underground rocks and fossils were pushed up from below, first above the sea and then high into mountains. This is why when you travel in the mountains, around places like Ossu and Maubisse, you find the fossils of corals and sea lilies and ancient fish high up on the land. These animals lived underwater, and now their fossils are exposed in the rocks far above the present sea.

Exhibition Specimens (Bird Case): ***Deformed rock.*** Look at the rock with all the twisted lines in it. This rock formed from muds that were deposited on an ancient seabed. These muds were forced underground and turned into rock. They were laid down originally as level, horizontal layers. When Timor, Australia and Asia began to collide, these muds on the way to becoming rocks were twisted into the patterns that you see in this ancient rock. This is what happens when two big continents run into each other, and geologists can understand what has happened in the past when they look at these rocks. Specimen from east of Dili.

Rocks like these that are deformed are the "pages in the book" which reflect just how much the original sediments laid down under sea have been changed since the time they were deposited millions of years ago.

PALAEOZOIC ERA

Very Ancient Timor-Leste - the Permian Geological Period - 250 million years ago.

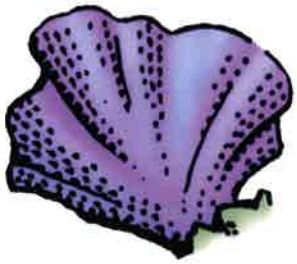
Timor's ancient history (what scientists call Timor's **geologic history**) began some 250 million years ago. Timor was completely under the sea at this time. And in this sea swam animals related to the living *Nautilus* and fish we now eat - but these fish were very ancient and primitive – different than their great, great, great "grandparents" that we fish for in the Timor Sea! In this sea, too, were other animals. Beautiful **bryozoans** looked like open nets or fans – they were tiny little animals that lived in colonies, and they sifted their food out of the ocean water. Their food was tiny, tiny little organisms that you could not see with your eyes. You needed a magnifying glass. And the bryozoans sifted them out of the ocean water like you would sift rice out of boiling water, their fans being their sieves. The bryozoan animals lived in the little cups scattered across this hard skeleton fan.

An imaginary sea floor that was Timor-Leste, more than 250 million years ago. The Boy and Crocodile legend has been used as a vehicle to tell the story of Timor-Leste's ancient history in a book, O Mundo Perdido Timor-Leste, by the President Jose Ramos-Horta and Professor Patricia Vickers-Rich, illustrated by Peter Trusler.

And there were other animals called **crinoids, sea lilies**. Their relatives still live today on the reefs around Timor, but their fossils turned to hard stone. One place where they are very common is at the Telecom Tower near Laleia, not so far from Baucau. Their stems are made up of many segments that look like buttons with a central hole, and to that is attached a "head" called a calyx, which has arms that also, like the bryozoans, sift small animals and plants out of the seawater. There were also ancient **clams**, and **brachiopods**, which look like clams, but are different in that one shell is larger than the other, and they eat their dinner by sieving food out of the water like the **bryozoans**, not like the clam eats.

Exhibition Specimens (Bird Case): *Crinoid Stems, Crinoid Head (Calyx), Crinoid "Arms", Crinoids and Bryozoans in Rock, Brachiopod in Rock, Brachiopod Shell.* These are ancient relatives of the Sea Lilies. The rock specimen contains hundreds of the little discs that together form the stem of the sea lily. These animals are tied to the sea floor and the stem is the attachment. The stem is attached to the "head", called by geologists the calyx, and the "arms" are attached to the head. The Sea Lily eats by pulling water into its mouth by waving its arms about and setting up a current. It sieves its food out of the water. Specimens are from Laleia to the east of Dili.

Sea Lily



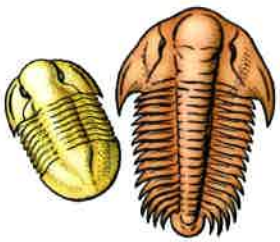
Bryozoan

Brachiopod

A very weird companion of the sea lilies, bryozoans and ancient fish were the **trilobites**. Their nearest relatives today are the crabs and shrimps, but these modern "cousins" are not very similar to these ancient ones. **Trilobites** have a head, "chest" and tail. The head has two big eye patches – but on each of these patches are hundreds of eyes, like the eye patches in flies and dragonflies. Their "chest" is divided into many parts, and their tail is a plate-like structure. **Trilobites** have dozens of legs and most of them just wandered around the seafloor gobbling up the mud and sieving the food particles out of it. Very few swam about in the sea sieving their food out of the water.

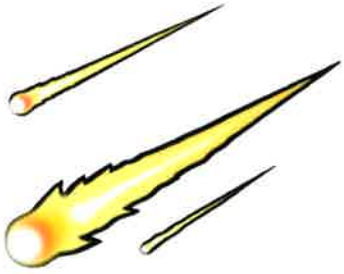
Exhibition Specimens (Traditional Person Case): *Trilobite trackways, Trilobite models, Trilobite Head.* The large slab of rock in the case is part of an ancient sea floor. Trilobites have left their "footprints" in these muds and sands, and they have been preserved. These ancient seabed muds and sands were deeply buried underground and turned into rocks. Then as Asia collided with Timor and Australia, these rocks were exposed in mountains. This particular specimen comes from the Macdonnell Ranges of the Northern Territory in Australia, but the same kinds of trilobites were living in the seas above Timor. One specimen in this case (lower right, on glass pedestal) is the head of a real trilobite, also from Australia, but its relatives were living on the seabeds of Timor and fossils have been found in Timor.

Trilobite



more *Trilobites*

Trilobites were very successful animals until around 220 million years ago when something very terrible happened. This was a time of huge **volcanic eruptions** and the Earth may have also been crashed into by a **meteorite from outer space**, which caused wildfires and filled the air with dust that cut off much of the light from the sun. Many thousands and thousands of animals and plants died out and many things, including trilobites went completely **extinct.**



meteorite

volcanic eruption

Exhibition Specimen: *Mesenosaurus Skeleton*. This little reptile is an ancestor of the dinosaurs. It lived a long way away from Timor-Leste on the land of Central Asia. It gave rise to dinosaurs, and dinosaurs lived in Australia, not so far from Timor, later in time. From small things big things grew!

Very, Very Old Rocks

Exhibition Specimen: *Archaeocyathid shells*. These animals were like corals, but they were a bit more complicated in the way they built there shells. This rock with its fossils is more than 500 million years old. Archaeocyathids lived very much like corals, building great reefs in the seas around the world. This specimen comes from Central Australia where their fossils now form large ridges. Rocks of this age are nt known in Timor. Maybe they will be found someday.

Archaeocyathid

Rock with *Archaeocyathid* fossil

MESOZOIC ERA

The Middle Age of Timor-Leste (the Jurassic and Cretaceous Geologic Periods) around 170 million to 66 million years ago.

After so many things died out, many new animals appeared to take their place or even to do different things. This was the time that dinosaurs of all kinds developed on the lands, and reptiles did many different things in the seas, including the seas above Timor-Leste. There were dolphin-like reptiles called **ichthyosaurs**, and very strange reptiles called **plesiosaurs**, - both of which liked to eat fish and shellfish. Particularly delicious shellfish were the **ammonites,** ancient relatives of the living *Nautilus, squid, and octopus*, which live today in the seas around Timor. **Ammonites** themselves were fierce carnivores - they ate other animals smaller than themselves. Like the **octopus, ammonites** probably also squirted ink when they were disturbed.

Ammonite

cuttlefish

Exhibition Specimens (Human Figure Case): *Ammonite Fossil Shells; Modern Nautilus Shell.* The fossil shells of the ammonites are from the area to the east of Dili, near Manatuto. These fossil animals lived in the seas that covered Timor-Leste more than 150 million years ago. They are related to the living Nautilus, whose shell is also in the display case with them, collected in the waters north of Timor-Leste recently.

The Mesozoic Era was the time of the dinosaurs. Dinosaurs lived on the lands to the south of Timor-Leste as well as to the north in Asia. In fact, dinosaurs lived all over the world at this time between around 170 million years ago and up until 66 million years ago when another disaster occurred on Earth. A giant meteor (a shooting star) from outer space hit the Earth and volcanoes in India were blowing ash into the air changing the climate fast and destructively.

Several dinosaurs are represented in the ***0 Mundo Perdido Timor-Leste Exhibition***- but all of these are from outside of Timor. Why? Timor was still under water. There are plenty of sea-loving animals known from Timor-Leste, but no dinosaurs. But dinosaurs were living nearby - in Australia, which was above sea level in many places. In Australia there were big carnivores, like the big theropod *Tarbosaurus bataar* on display at the President's Office in Dilli.

There were also many small meat-eating dinosaurs, like the *Velociraptor* - which may have hunted in packs. They were very dangerous. There were also many plant-eaters- like the *Probactrosaurus* and the little *Leaellynasaura*. These plant-eaters had to be careful for the big carnivores were looking at them hungrily for their meals! Some plant-eaters were fast and just ran away. Others had armor, like the ankylosaurs, which had bones in their skin and a huge bone at the end of their tails which they would have used to bash the ankles of the carnivores, when they tried to eat them!

Timimus* and *Leaellynasaura

Exhibition Specimen: *Giant Carnivorous Dinosaur Claw.* This claw is from a very big and fierce dinosaur that lived more than 70 million years ago. These sorts of dinosaurs lived to the south of Timor on the land of Australia. Timor was still under sea. This is a cast of the real bone of this dinosaur. The cast was made from a specimen that came from Mongolia. The material from Australia is fragmentary, but is from a dinosaur much the same that lived in Australia.

Exhibition Specimens: *Probactrosaurus*, which was a plant-eater, also about 70 million years old. In this same case is part of a skeleton of a tiny plant-eating dinosaur from Australia, named after a school girl who hunted fossils with her parents from a very young age. This dinosaur is ***Leaellynasaura,*** and she lived about 110 million years ago. The part of the skeleton that is in the case is the hind leg, the tail and the pelvis. The rest of her skeleton was never found. This dinosaur is in the painting of all the dinosaurs in this case - she is on the far left side of this painting. The little model is what a baby of this dinosaur would have looked like, hatching out of its egg.

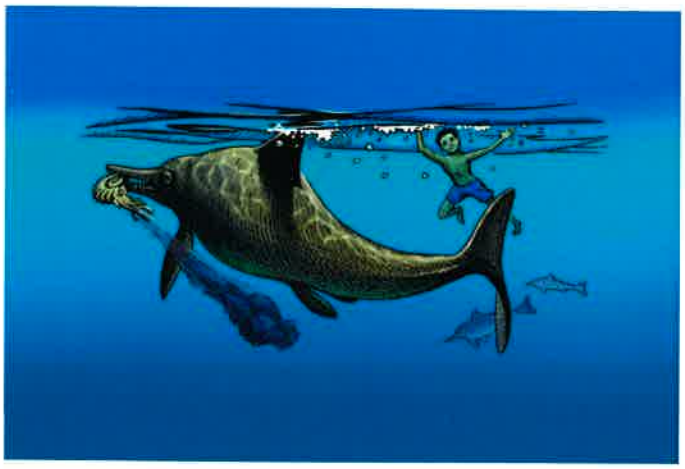
The arm bone (an ulna) of another plant eater is ***Serendipaceratops***, a frilled dinosaur, also from Australia.

Left to right: *theropod* - like *Tarbosaurus* and sauropods.
Flying reptiles (*pterosaus*) in the sky.

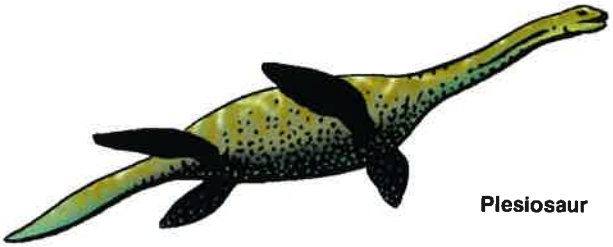
Exhibition Specimens: *Sauropod Eggs*. These are casts of real eggs that were laid by a very large, four-footed plant eater. Its reconstruction picture is on the pillar behind the case. These were very large dinosaurs and probably as adults were able to survive attacks by many of the big carnivorous dinosaurs. You are most welcome to touch these.

Exhibition Specimens (Hut Case): *Fossil Fish, Fossil Plants, Fossil Skin of Dinosaur.* In this case the large orange rock has both fossil plants that dinosaurs would have eaten when they were alive and fossil fish that lived in the lakes and rivers that were around when the dinosaurs lived. Also in this case is a cast of the skin of one of the armoured dinosaurs called an **ankylosaur.** These fossils and casts come from Australia, which lay to the SE of Timor and which was land at this time. Timor was still under the sea. The blue arrows point to several fish skeletons that lie amongst much plant material.

Exhibition Specimens (Person Case): *Ammonites and Nautilus*. The *Nautilus*, whose shell is in this case, still lives in the seas around Timor. Its ancient relatives were the ammonites, and three of these ancient animals are also in this case. The ammonites swam in the seas that covered Timor when dinosaurs roamed the lands of Australia. Both them and most of the dinosaurs died out, became extinct around 65 million years ago.



Ichthyosaur* eating an *ammonite
(from ***O Mundo Perdido Timor-Leste***, an imaginary story)



Plesiosaur

CENOZOIC ERA

The Youngest Age of Timor-Leste - from 66 million years ago to today.

Timor-Leste has many fossils that are this age, and even some plant fossils from the land when Timor emerged as an island some 6 to 8 million years ago. Off to the south, Australia was a big continent and during this time both it and Timor were moving north at the speed of about 6 to 12 centimeters a year eventually crashing into Asia.

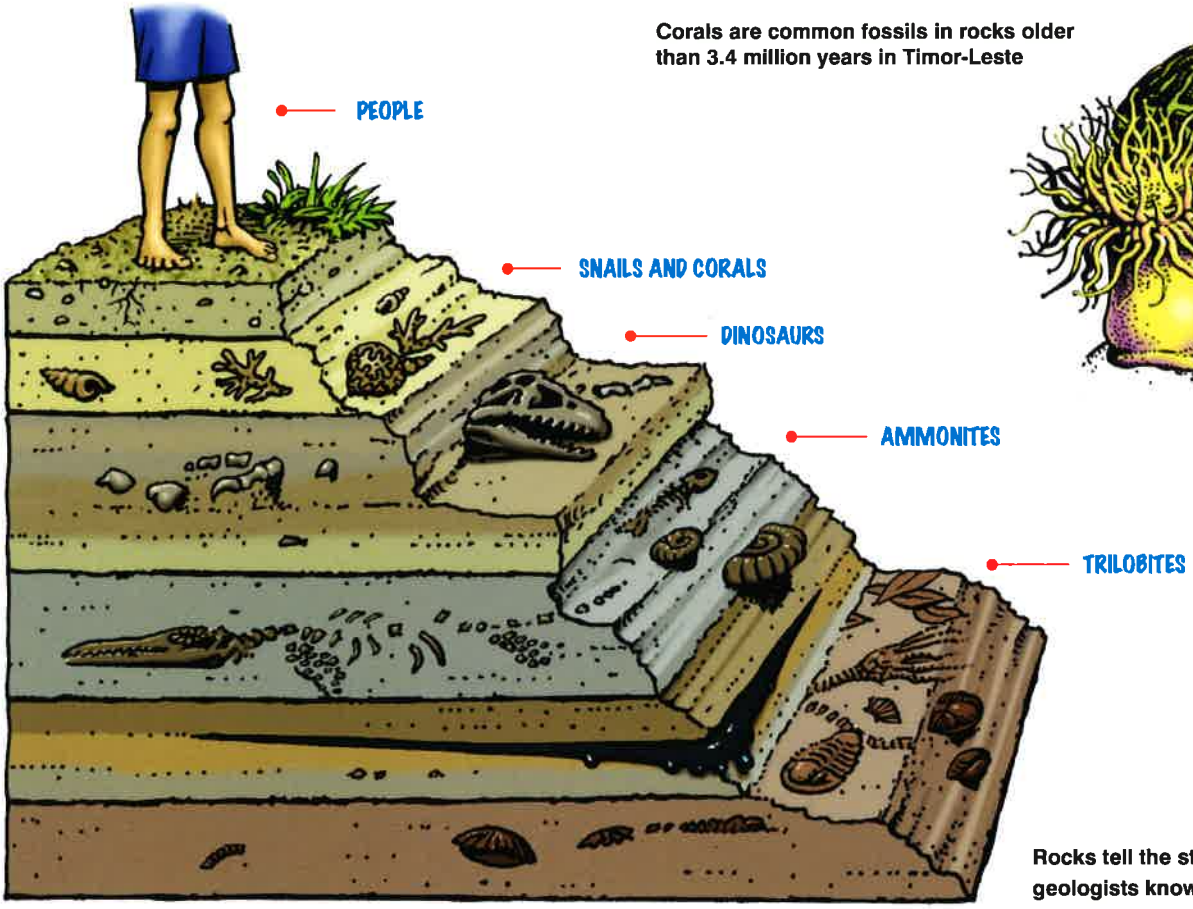
Exhibition Specimens (Crocodile Case): *Crocodile Poo, Crocodile Skull, Crocodile Armor Plate, Crocodile lower and upper jaw fragments*. Crocodiles have a very long history in the world, and lived in Australia long before 100 million years ago. The fossils in this case are from different parts of the world, but crocodiles were certainly in Australia for a very long time and must have swum in the seas around Timor just as long. Not only do we know about the skeletons and skins of ancient crocodiles, but we also know their poo - and when that is studied, we can figure out what they ate - and it included many things, mainly fish in the poo in this case!

Exhibition Specimens (Sword Case): *Horned Turtle, Tasmanian Tiger, Plant Leaves, Corals and marine snails.* The animals and plants in younger rocks in Timor become much more familiar. In this case are the fossils of the very recently extinct **Tasmanian Tiger** (and a cute stuffed toy and picture) - a pouched marsupial, relative of the Kangaroo. The **Tasmanian Tiger** lived in Australia and never seems to have made it to Timor. In Timor, great reefs formed in shallow, beautiful seas, and the fossils of the corals and sea snails that lived on these reefs are in this case.

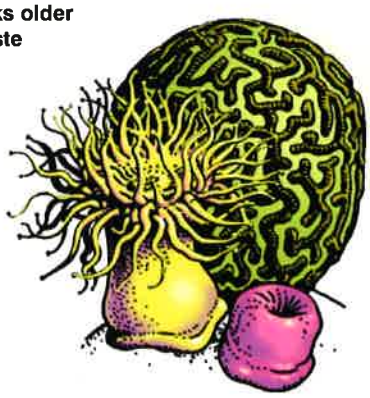
Left to right: giant bird related to geese (dromornithid), giant goanna (*Megalania*), giant marsupial (*Diprotodon*), marsupial lion (*Thylacoleo*), giant kangaroo (*Procoptodon*) and Tasmanian Tiger (*Thylacinus*) - all now extinct. Artist Peter Trusler, courtesy of Australia Post.

Also in this case is the weird **Horned Turtle** that lived on the land on an island off the east coast of Australia - Lord Howe Island. As we continue to explore Timor, one day we may find some animal just as strange!

The plant leaves in the case come from near Ossu and were growing on land that proves that Timor finally was above sea-level 3.4 million years ago.



Corals are common fossils in rocks older than 3.4 million years in Timor-Leste



Rocks tell the stories of past times and geologists know how to 'read' them

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new artwork