

***"Among Dinosaurs". From 15<sup>h</sup> July 2010 to May 2011.  
West side of the Umbracle (promenade and car park).***

This exhibition occupies 3,000 square metres. It is a fascinating journey to the past for you to discover spectacular dinosaurs from the Jurassic and Cretaceous eras. "Among Dinosaurs" creates awareness about the importance of caring for our planet. It establishes parallels between the dinosaurs that lived for almost 200 million years in harmony with nature, and mankind, who has lived approximately for barely 150,000 years on Earth and has caused a great damage to the planet.

The Umbracle is the stage where the display is to be shown until 29<sup>th</sup> May next year and where the public can discover the remote past when these amazing beings lived. It is an exhibition that stunningly recreates these animals' habitat. From the 2.5 metre stegosaur to the 27 metre long diplodocus, not forgetting a replica of a 14-metre tyrannosaurus rex, the 26 life-like robots are able to perform a great variety of movements and sounds that will surprise the visitors.

"Among Dinosaurs" can also be visited at night – until 31<sup>st</sup> August the display will be open from 10:00 a.m. until midnight. From 1<sup>st</sup> September to 12<sup>th</sup> October, the exhibition will close at 9:00 p.m. and from 13<sup>th</sup> October to 29<sup>th</sup> May at 7:00 p.m.

The City of Arts and Sciences provides a variety of disciplines with additional activities and content in each one of its buildings. In this case the visitor has the chance to gain deeper knowledge about dinosaurs by seeing the large format film "Dinosaurs Alive!" in the Hemisfèric (IMAX and full dome). This recreates these animals' lives too, with spectacular images.

Entrance tickets for the "Among Dinosaurs" exhibition cost € 6 for adults, € 4.80 for discounted tickets (children from 4 to 12 years of age, people aged over 65 and retired people), € 4 for school groups, and € 4.40 for adult groups (20 people or more).

The exhibition tour begins with information that visitors see about the origins of life, changes in the Earth's crust, geological eras and extinction. Thus, as well as discovering how the Earth's geography affects the distribution of living beings or the different theories as to the extinction of the dinosaurs, the public will glean detailed information about the different geological eras, the periods they are divided into and the forms

**"Among Dinosaurs". From 15<sup>h</sup> July 2010 to May 2011.  
West side of the Umbracle (promenade and car park).**

of life that existed in each one of them. From the pre-Cambrian and the Palaeozoic era to the Cenozoic, through the Mesozoic that includes the Jurassic period (200 to 145 million years ago) with the oldest dinosaurs such as diplodocus, and the Cretaceous period (145 to 65 million years ago) at the end of which the massive extinction of these animals occurred.

Another aspect that visitors to the exhibition will have the chance to discover is some of the theories regarding the extinction of the dinosaurs. These include global climate change and diseases caused by parasites, as well as changes in vegetation. However, the catastrophic and the gradualist theories are the ones that have attracted most attention.

The former states that a meteorite crashed into the Earth and the impact raised a great dust cloud that stopped sunlight getting through. The effect caused a drastic drop in the planet's temperature and blocked plants' ability to photosynthesise. The result was a chain reaction in which plants died, then herbivore animals, and lastly carnivores, including the dinosaurs.

A new idea based on the discovery of dinosaurs with feathers is that they were not wiped out in the so-called Cretaceous-Tertiary boundary but rather a branch of the *Compsognathidae* family evolved, giving rise to birds. This idea is backed up by studying and comparing the skeletons of reptiles, dinosaurs and birds, since it can be seen that dinosaurs and birds share a likeness of about 75 % whereas contemporary reptiles share only a 15 % similarity with dinosaurs.

The gradualist theory suggests that the extinction of the dinosaurs was progressive and had begun millions of years before the meteorite collision. Although there is proof of the impact, a reasonable model is needed to explain why many animals and plants were not exterminated by it such as turtles, crocodiles, lizards, birds, insects and numerous marine animals such as clams, snails, starfish and urchins.

The display then goes on to investigate the world of palaeontology. Visitors can discover that palaeontological excavation techniques vary according to the state of the find and the size of the fossil. Small fossils are easier to extract as bigger ones need more tools to extract them.

**"Among Dinosaurs". From 15<sup>h</sup> July 2010 to May 2011.  
West side of the Umbracle (promenade and car park).**

This area includes a recreation of one of these excavation sites where children can become palaeontologists attempting to locate fossils buried in the sand. In this part of the exhibition there are also reproductions of tyrannosaurus rex skeletons and a yangchuanosaurus.

Finally, the public come to the part where the following dinosaur species are shown:

**Tyrannosaurus rex:**

Meaning: tyrant lizard king.

Size: 13.5 metres long, 6 metres high.

Approximate weight: 4.9 to 6.4 tonnes.

When it lived: approximately 67 to 65 million years ago, in the Late Cretaceous.

Findings: Canada, the USA and Mexico.

Food: hadrosaurs, ceratopsids and carrion.

Palaeontologists suggest that it was not a predator and that it fed on dead animals, as hyenas and vultures do today. However, everything indicates that it did both. Its behaviour was very similar to the contemporary lion - a keen predator but an opportunist with carrion. They changed the horizontal position of their head and tail in balance with their hips. To compensate the huge weight of their head, their forelimbs became considerably smaller.

**Diplodocus (*Diplodocus carnegiei*).**

**This specimen will be located until September in the South Lake.**

Meaning: double column.

Size: 27 metres long, 3.6 metres high.

Approximate weight: 15 tonnes.

When it lived: approximately 161 to 146 million years ago, in the Late Jurassic.

Findings: the USA and Mexico.

Food: ferns, cycads and conifers.

**"Among Dinosaurs". From 15<sup>h</sup> July 2010 to May 2011.  
West side of the Umbracle (promenade and car park).**

This was the biggest dinosaur of which a full skeleton exists. In the past there was discussion as to whether it had a trunk. Recent studies show that the diplodocus probably had sharp, thin keratin spikes along its back that were very similar to those of today's iguanas.

**Stegosaurus (*Stegosaurus armatus*)**

Meaning: roof-lizard

Size: 9 metres long, 3 metres high.

Approximate weight: 2 to 3 tonnes.

When it lived: approximately 159 to 144 million years ago, in the Late Jurassic.

Findings: The USA.

Food: ferns, cycads, horsetail and conifers.

This is one of the best known dinosaurs, as dozens of almost complete specimens have been found. They had rows of plates on their back whose thinness and many veins suggest they were used to control the amount of blood flowing into them in order to change their colours for more lively ones. This may have been important in courtship or to dissuade predators. It is thought that the plates also acted as a heat regulator to cool themselves, like the ears of an elephant. The large bony quills on its approximately 1-metre long tail were its defensive weapon.

**Iguanodon: (*Iguanodon bernisartensis*)**

Meaning: iguana tooth

Size: 9 metres long, 3.5 metres high.

Approximate weight: 4 tonnes.

When it lived: approximately 161 to 100 million years ago, in the Late Cretaceous.

Findings: Spain, Belgium, Great Britain and Germany.

Food: ferns, cycads and horsetail.

This creature's hands had five digits with a spike on the thumb that it could only move sideways and was used as a defensive weapon. Its fifth digit was long and flexible to grip plants while the other fingers acted like a hoof that enabled it to walk on all fours. It had a beak or rhamphotheca with no front teeth but

**"Among Dinosaurs". From 15<sup>h</sup> July 2010 to May 2011.  
West side of the Umbracle (promenade and car park).**

with a great many molars to grind down its food. Different genera and species of iguanodonts have been found around the world.

**Velociraptor (*Velociraptor mongoliensis*)**

Meaning: rapid thief.

Size: 1.8 metres long, 0.5 metres high to the hips.

Approximate weight: 15 kilograms.

When it lived: approximately 99 to 65 million years ago, in the Late Cretaceous.

Findings: Mongolia, China and Central Asia.

Food: protoceratops, infant and ill large herbivores.

This had a flat, long, thin skull. The fact that velociraptors were covered with feathers indicates they were warm-blooded animals. They moved in herds and it is thought they used a strategy to hunt in a group.

***Apatosaurus: (Apatosaurus Ajax)***

Meaning: deceptive lizard, previously known as brontosaurus (thunder lizard)

Size: 21 metres long, 4 metres high to the hips.

Approximate weight: 25 to 30 tonnes.

When it lived: approximately 147 to 137 million years ago, in the Late Jurassic.

Findings: The USA.

Food: ferns, cycads, horsetail and conifers.

This animal had long front teeth in the shape of a chisel, and no molars. Food was ground in its stomach with the help of rocks that it swallowed – gastroliths or stomach stones. These sauropods had massive vertebrae reinforced by a great many ligaments to withstand its enormous weight. It was impossible for them to stand on their hind legs without destroying their back. The tail's position was horizontal and it probably used it as a means of tactile communication.

***Ankylosaurus: (Ankylosaurus magniventris)***

**"Among Dinosaurs". From 15<sup>h</sup> July 2010 to May 2011.  
West side of the Umbracle (promenade and car park).**

Meaning: fused lizard.

Size: 10 metres long, 3 metres high.

Approximate weight: 7 to 10 tonnes.

When it lived: approximately 70 to 65 million years ago, in the Late Cretaceous.

Findings: The USA.

Food: ferns, cycads, horsetail and flowering plants.

This creature used its tail as a powerful defensive weapon, since it had a heavy mallet at the end made of bony material covered with a thick layer of scaly skin. Its armour was impenetrable, perhaps the most resistant in the history of the animal world, but it was also flexible. It was made up of thousands of bony plates (osteoderms). Most of the osteoderms were small. The biggest ones had long points on the end. Such was its armour that even its eyelids were made of these bony plates.

**Brachiosaurus (*Brachiosaurus altithorax*)**

Meaning: arm lizard.

Size: 25 metres long, 6 metres high to the hips.

Approximate weight: 35 to 70 tonnes.

When it lived: approximately 150 to 130 million years ago, in the Late Jurassic.

Findings: the USA, Tanzania, Spain and Portugal.

Food: cycads and conifers.

This animal's nose was located on the highest part of its skull to protect its nasal tissue from the thorns and branches of the plants it ate. These sauropods did not live with their body semi-submerged in marshes, as was previously thought, but were completely land-bound animals. They could not lift their neck very high, but they had great sideways flexibility which helped them eat vegetation in a wide area without having to move. Its long forelegs enabled it to reach a wide diversity of plants.

**Deinonychus: (*Deinonychus antirrhopus*)**

Meaning: terrible claw.

Size: 3 metres long, 1 metre high.

Approximate weight: 70 kilograms.

**"Among Dinosaurs". From 15<sup>h</sup> July 2010 to May 2011.  
West side of the Umbracle (promenade and car park).**

When it lived: approximately 146 to 100 million years ago, in the Early Cretaceous.

Findings: The USA.

Food: Tenontosaurus, Iguanodontia (Camptosaurus), Sauropelta, and other herbivores.

This dinosaur was related to the velociraptors. It is believed it was extremely fast, had a lively intelligence and hunted in groups. It had an enormous retractable claw of 12.5 centimetres in diameter that enabled it to practically stab its prey. Thanks to the discoveries at Liaoning, China, it is known that members of this group were covered in feathers. The last half of its tail was not flexible but acted as a stabiliser and a rudder.

***Dilophosaurus: (Dilophosaurus wetherilli)***

Meaning: two-crested lizard.

Size: 6 metres long, 3 metres high.

Approximate weight: 450 kilograms.

When it lived: approximately 200 to 190 million years ago, in the Early Jurassic.

Findings: The USA and China.

Food: prosauropods and other herbivore dinosaurs. Probably carrion too.

This was the biggest predator at the beginning of the Jurassic. It is believed it had striking colours that it used as an attraction in times of courtship.

***Gallimimus: (Gallimimus bullatus)***

Meaning: chicken mimic.

Size: 4 to 6 metres long, 3.5 metres high.

Approximate weight: 450 kilograms.

When it lived: approximately 74 to 65 million years ago, in the Late Cretaceous.

Findings: Mongolia.

Food: insects, mammals, eggs and perhaps plants, seeds and fruit.

The largest of the Ornithomimidae (bird mimics, sometimes called the ostrich dinosaur).

**"Among Dinosaurs". From 15<sup>h</sup> July 2010 to May 2011.  
West side of the Umbracle (promenade and car park).**

Its long hands enabled it to handle different objects. It had a horn-like beak like today's birds, known as a rhamphotheca, with no teeth. Its long hind legs with light, hollow bones gave it a long stride, reaching speeds of up to 60 kilometres per hour.

**Parasaurolophus: (*Parasaurolophus Walkieri*)**

Meaning: similar to crested lizard.

Size: 9 metres long, 4 metres high.

Approximate weight: 6 to 8 tonnes.

When it lived: approximately 76 to 74 million years ago, in the Late Cretaceous.

Findings: The USA and Canada.

Food: conifers and cycads.

The peculiar crest of nearly two metres in length was a sound box that amplified the sounds produced from its throat and which it transmitted towards its nose.

Some studies have reproduced the crest's inner shape and structure (four tubular chambers) and have confirmed how the sounds were created and amplified, which must have been audible from kilometres away. It belongs to the family of the hadrosaurs and moved in two ways: on all fours, which is how it walked distances, and on two legs when it needed to move a little faster.

**Pteranodon: (*Pteranodon longiceps*)**

Meaning of the name: winged and toothless.

Size: from 7 to 10 metre span.

Approximate weight: approximately 20 kilograms.

When it lived: approximately 85 to 75 million years ago, in the Late Cretaceous.

Findings: The USA and England.

Food: fish.

The Pteranodon was not a dinosaur but a flying reptile of great wing span that was characteristic for having a large crest on its skull, which probably aided it in balancing the size of its long beak. Its eating habits were carnivorous and it fed on fish. It combined flight with movement on all fours.

**"Among Dinosaurs". From 15<sup>h</sup> July 2010 to May 2011.  
West side of the Umbracle (promenade and car park).**

### **Spinosaurus (*Spinosaurus aegyptiacus*)**

Meaning: Spine lizard

Size: 14 to 18 metres long, 5 metres high to its head.

Approximate weight: 7 to 9 tonnes.

When it lived: approximately 95 to 93 million years ago, in the Mid-Cretaceous.

Findings: Egypt, Morocco, Niger, Algeria and Tunisia.

Food: carnivore

This creature's main characteristic was a large sail on its back made of extensions of the vertebrae of up to 2 metres in height. This large sail is the subject of discussion amongst palaeontologists. It is believed it may have been used as a heat regulator or else probably to intimidate other dinosaurs. Other scientists suggest that this sail may also have been used in courtship. This dinosaur is considered to be one of the biggest theropods (carnivorous biped dinosaurs) found until now.

### **Pachycephalosaur: (*Pachycephalosaur wyomingensis*)**

Meaning of the name: thick-headed lizard.

Size: 4 to 7 metres long, 3.5 metres high.

Approximate weight: 3 tonnes.

When it lived: approximately 74 to 65 million years ago, in the Late Cretaceous.

Findings: The USA.

Food: conifers, ferns, cycads, horsetail and flowering plants.

Some areas of this animal's brain were over 20 centimetres thick. For a long time it was thought that it used its head to fight among its own kind, as happens today with bighorn sheep. Other palaeontologists claim that its neck bones could not have withstood a direct strike and that they fought sideways.

### **Amargasaurus: (*Amargasaurus sp.*)**

Meaning: La Amarga lizard

Size: 10 metres long, 4 metres high.

**"Among Dinosaurs". From 15<sup>h</sup> July 2010 to May 2011.  
West side of the Umbracle (promenade and car park).**

Approximate weight: 8 tonnes.

When it lived: approximately 130 million years ago, in the Early Cretaceous.

Findings: Argentina.

Food: ferns, cycads, horsetail and flowering plants.

The Amargasaurus was a sauropod that was characteristic for having a series of spikes on its back that were higher than the height of its neck and became lower towards the hips. Its name comes from the site where it was found, La Amarga creek in the province of Neuquén, Argentina. There are many theories as to the purpose of these spikes, among which the following stand out: defence, reproductive behaviour and heat regulation. Nevertheless, nobody is sure about this.

**Hadrosaur (Hadrosaurus foulkii):**

Meaning: Robust lizard.

Size: 10 metres long, 4 metres high.

Approximate weight: 4 to 7 tonnes.

When it lived: approximately 80 to 74 million years ago, in the Late Cretaceous.

Findings: The USA.

Food: conifers and cycads.

At first it was thought that the hadrosaur was an amphibious animal that lived in and around bodies of water. However, on analysing fossilised vegetation associated with this species it has been discovered that it inhabited lowlands where conifers, willows and oak predominated. The hadrosaur's main characteristic was its large beak.

**Triceratops: (Triceratops horridus)**

Meaning: face with three horns.

Size: 9 metres long, 3 metres high.

Approximate weight: 2 to 8 tonnes.

When it lived: approximately 70 to 65 million years ago, in the Late Cretaceous.

Findings: The USA and Canada.

Food: cycads, horsetail and flowering plants.

**"Among Dinosaurs". From 15<sup>h</sup> July 2010 to May 2011.  
West side of the Umbracle (promenade and car park).**

This creature belonged to the ceratopsid group. Its horns were effective defensive weapons.

The males probably fought to choose the leader of the herd. They pushed and shoved with their horns interlocked to show their strength, as antelope, deer and rams do today. Wounds have been found in the frills and skulls found, so it has been deduced that the head and horns were designed to enable them to interlock when fighting each other.

**Allosaurus: (*Allosaurus fragilis*)**

Meaning: different lizard.

Size: 10.5 metres long, 4 metres high.

Approximate weight: 3 tonnes.

When it lived: approximately 150 to 144 million years ago, in the Late Jurassic.

Findings: The USA.

Food: sauropods, stegosaurus and small ornithopods such as Hypsilophodon.

Its articulated jaws could move laterally, giving them a larger bite as serpents have today. Large cavities reduced the weight of its jaws, which were equipped with 5 to 10 centimetre long saw-like teeth.