

# DINOSAURS

GIANTS OF PATAGONIA

Educator's Guide

## About this Film

Thanks to the magic of the giant screen, *Dinosaurs. Giants of Patagonia* provides a unique occasion to get a true experience of the incredible size and strength of these creatures that once roamed the Earth. Creatures that are even too big for an IMAX screen !

The movie concentrates on the remarkable discoveries made in Patagonia, in the south of Argentina, by world-renowned paleontologist Rodolfo Coria. As director of a dinosaur museum in the city of Plaza Huincul, Coria was responsible for discovering some of the largest dinosaurs ever found: Argentinosaurus, a giant herbivore that could reach 100 tons and 120-feet in length, making it the biggest animal to ever walk the earth, and Giganotosaurus, a 15-meter long meat-eating predator that was even bigger than the famous T-Rex.

Deeply rooted in science, the film carries the audience through the lives of these two superb creatures. The action is intense and the landscapes, shot in some of the most stunning locations in Patagonia, are truly magnificent. They are also very close to the ones where dinosaurs actually lived.

As it shows how the dinosaur era came to an end, 65 million years ago, *Dinosaurs. Giants of Patagonia* also reveals how these animals are still with us today. Their descendants, much less fearsome, are all around us, everyday. They are birds.

## Table of Contents

The Wild World of Dinosaurs . . . . .	4
What Do You Know about Dinos? . . . . .	7
The Secrets of Patagonia . . . . .	8
Countertop Mountains . . . . .	9
How Big Were the Dinosaurs? . . . . .	10
How Do You Size Up? . . . . .	11
Earth, but not as We Know It . . . . .	12
The Strength to Shape Continents . . . . .	13
Big Time . . . . .	14
Getting the Timeline Right . . . . .	15
Dinos with more Depth . . . . .	16
Parallax at your Fingertips . . . . .	17
To Find Out More . . . . .	18

## About this Guide

The Educator's Guide provides classroom tools to complement the students' viewing experience of *Dinosaurs. Giants of Patagonia*.

It begins with an overview of the Dinosaur Age, to help students supplement their understanding of that long period in the planet's natural history. This provides context both for the film and for the classroom activities that follow.

The activities are designed to create a hands-on and interactive learning experience for the students. The topics covered and methods employed are varied to provide a broad learning platform.

A grid detailing standard topics covered by each activity is available upon request. The guide also offers ideas for further reading and viewing. Additional information is available on the film's official website, at [www.dinosaurs3dmovie.com](http://www.dinosaurs3dmovie.com).

### **DINOSAURS GIANTS OF PATAGONIA**

Produced by  
**Carl Samson**

Written and Directed by  
**Marc Fafard**

Science Advisor  
**Rodolfo Coria**

Photography  
**William Reeve, CSC**

Editing  
**René Caron**

Art Director  
**Richard Bergeron**

Sound Design  
**Pierre Rousseau**

Narrated by  
**Donald Sutherland**

### **TEACHER'S GUIDE**

Text:  
**Rémy Charest**

Design:  
**Elena Fragasso**

# The Wild World of Dinosaurs

The Age of Dinosaurs may have ended millions of years ago, but we're constantly learning new things about them. From Patagonia to Canada, from Mongolia to Madagascar, there are many stories to be told.

A movie showcasing giant dinosaurs like *Argentinosaurus* and *Gigantotitanosaurus* is obviously dealing with a big chunk of natural history. Yet *Dinosaurs: Giants of Patagonia* only tells a small part of this amazing story.

## What is the Age of Dinosaurs?

The period when these creatures, large and small, roamed every part of the Earth, lasted about 180 million years. During this huge amount of time, the large species that still fascinate us today grew to gigantic dimensions and then disappeared.

More precisely, this period called the Mesozoic era is divided into three periods:

- **The Triassic** (from 250 million years ago to 203 million years ago), when dinosaurs first appeared on Earth, alongside turtles and tortoises, snakes, lizards, crocodiles and the first mammals.
- **The Jurassic** (from 203 million years ago to 144 million years ago), when dinosaurs dominated the planet.
- **The Cretaceous** (from 144 million years ago to 65 million years ago), a period that eventually saw a certain decline of dinosaurs and, in the end, a massive extinction that put an end to their era and opened the way for the rise of mammals.



For most paleontologists, it has become clear that, in a way, dinosaurs haven't really disappeared from Earth. Biologically, birds *are* dinosaurs. The huge and sometimes scary creatures that fascinate us to this day are gone, but they live on in a beautiful way.

## What exactly is a dinosaur?

Dinosaurs are a particular kind of a large group of animals called reptiles. Modern reptiles include crocodiles, turtles, lizards and snakes. Dinosaurs were not the first reptiles, and they were not the only ones that existed during the dinosaur age.

The first reptiles appeared during an earlier period called the carboniferous, around 350 million years ago. Marine reptiles that lived during the age of dinosaurs were not dinosaurs. They included a number of other reptiles like ichthyosaurs, plesiosaurs and several marine turtles and crocodiles. And what we generally think of as flying dinosaurs were actually a different group called pterosaurs.

Determining what distinguishes dinosaurs from other reptiles is complex. Experts look at certain bones, at the teeth, claws or horns. The socket in the hip bone where the femur (the thigh bone) connects to the hip is particularly important: dinosaur hip bones differ in a dozen ways from that of other reptiles. So finding a hip bone can be a key element in identifying a fossil from millions of years ago.

The difference in the hip bone and even more importantly, in the shape of the femur head (the top part of the thigh bone) reflects another crucial difference. Dinosaurs stood in an “upright stance”: their legs were directly under their body and the knee joint was held straight. In contrast, lizards and crocodiles have what is called a “sprawling stance”, with the legs sticking out at an angle from the body. The upper part of the leg is directed sideways, and the lower part points down.

The upright stance allowed dinosaurs to move faster and more efficiently. It is one of the reasons why they became so successful.

## Finding fossils

The scientists that study dinosaurs and all of ancient life are called paleontologists. Their science, paleontology, gains knowledge

from the study of fossils, the remains of animals and plants that have been preserved in rocks for thousands or millions of years.

To properly identify the objects and put them in context, the scientists must know as much about geology as they do about plants, animals and the way they interact in nature. To understand how things work in the past, they compare and contrast what they find with what exists today.

Dinosaurs may draw a lot of attention, but paleontologists look at many other things, often tiny and delicate. Plants, fish and insects are also studied and provide a better sense of the ancient ecosystems. In June of 2006, for instance, a scientist from the American Museum of Natural History announced that he had found a 110-million-year-old spider web in a small piece of amber, with a captured insect still caught on the silk strands. Small discoveries like that can tell us just as much about the distant past as the giant bones of an Argentinosaurus.

## A small part of life

Every year, over a dozen new species of dinosaurs are identified in different parts of the world. Strange new creatures have been found from the islands of Antarctica to the deserts of Africa, from China and Mongolia to the Badlands of Alberta and Montana. Small and big dinosaurs, some with a full cover of feathers, and others that were warm-blooded like mammals, have

Dry conditions in Patagonia reveal old ground layers and help point paleontologists to the best spots for finding fossils.



been identified over the last twenty years. At Auca Mahuevo, in Patagonia, dozens of dinosaur embryos, still inside the eggs, were so well preserved that the pattern of their skin can be clearly seen.

Still, our knowledge of the Dinosaur era remains incomplete. We know hundreds of different kinds of dinosaurs, but that is only a part of the dinosaurs that existed over 180 million years. And it is only a small part of the life that existed around them at the time.

By comparison, it is estimated that there are over 10 million species of animals, plants and other living things on the planet today. There are about 10,000 species of sponges, the most simple form of animal life, and about 25,000 species of fish. And even today, we are constantly identifying new species, even as some disappear.

In the past or present, studying life is a constant lesson in diversity. By knowing better how species adapt to different conditions, how they appear or become extinct, we gain a better understanding of how we live, and how we can protect life on Earth for the future.

The Sky High Entertainment crew traveled to Patagonia to film all locations into which the computer-generated dinosaurs come to life.



## Rodolfo Coria, Patagonian Paleontologist



In *Dinosaurs: Giants of Patagonia*, we follow one of the most renowned paleontologists in the world, Rodolfo Coria, who played a major role in the discovery of the greatest giants of the Age of dinosaurs, *Argentinosaurus* and *Giganotosaurus*. He was also the co-leader of an expedition that discovered a nesting ground of giant sauropods similar to *Argentinosaurus*, with hundreds of well-preserved eggs, one of the most amazing discoveries about the dinosaur age.

Rodolfo Coria's first contact with fossils came in 1983, when he was a volunteer at the Argentine Museum of Natural Sciences in Buenos Aires. He studied under José Bonaparte, one of the foremost authorities in South American paleontology. He became a professional paleontologist in 1989.

Since 1996, he has been director of the Museo Carmen Funes in Plaza Huincul, in the province of Neuquen, in western Argentina, at the very heart of the rich fossil lands of Patagonia. Besides discovering at least ten new species of dinosaurs over the last 15 years, he also helped us gain a better understanding of how dinosaurs lived. In collaboration with Canadian paleontologist Philip Currie, he discovered a group of at least seven mapusaurus, a sub-species of the *giganotosaur* family. The group seemed to have died together. This showed that these giant predators lived in groups, and that they probably hunted in packs.

Dr Luis Chiappe, director of the Dinosaur Institute at the Los Angeles County Natural History Museum, calls him "the most accomplished dinosaur paleontologist of South America. His work on the giant dinosaurs from Patagonia has provided critical information for better understanding the lifestyles of these amazing animals".

# What Do You Know about Dinos?

**Are you an expert, or should you stick with toy dinosaurs? Test your knowledge about these amazing creatures and what we know about them.**

**Answers on page 18.**

## 1. How long did the Dinosaur Age last?

- a) About 100 million years
- b) About 180 million years
- c) About 250 million years
- d) You mean it's over !?!

## 2. Which is bigger : a blue whale or an Argentinosaurus?

- a) Argentinosaurus
- b) The blue whale
- c) Argentinosaurus was longer, but the blue whale is heavier
- d) The blue whale is longer, but Argentinosaurus was heavier

## 3. What type of scientist looks for dinosaurs?

- a) A biologist
- b) A geologist
- c) A paleontologist
- d) A desertologist

## 4. Dinosaurs are still present in the world today as...

- a) Action movies
- b) Museum displays
- c) Lizards and crocodiles
- d) Birds

## 5. Dinosaur remains have only been found in warm climates.

- a) True
- b) False



## 6. Argentinosaurus were...

- a) Herbivores
- b) Omnivores
- c) Carnivores
- d) They drank lots of milk to build strong bones

## 7. What color were dinosaurs?

- a) Mostly green
- b) Mostly brown
- c) They came in all kinds of colors
- d) No one really knows

## 8. Most of the large flying creatures we see in dinosaur movies are:

- a) Feathered dinosaurs
- b) Flying reptiles of the pterosaur family
- c) Sharp-toothed flying squirrels
- d) Falconosaurs

# The Secrets of Patagonia

Why are there so many big dinosaurs – and so many bones – in southern Argentina?

Over the last fifteen years, many of the most amazing dinosaur discoveries have taken place in Patagonia, a large region running from the Andes Mountains to the Atlantic Ocean, at the southern tip of South America. Several species, like *Argentinosaurus* and *Giganotosaurus*, have impressed people because of their huge size.

Why did dinosaurs get so big in Patagonia? No one is absolutely sure.

The drifting of continents may hold part of the answer. About 120 million years ago, a large continent called Gondwana broke into several parts, including South America and Africa. This probably created a change in conditions that made dinosaurs become bigger and bigger in South America.

It may simply be that the animals benefited from a warm climate in a fertile land with plenty of vegetation. Others think that the large expanses of flat land in Patagonia could have made it easier for large animals like *Argentinosaurus* to get around. Still others believe that bigger animals were better adapted to a dry climate with very cold nights: their size would have helped them maintain their body heat.

What is more certain is why so many fossils have been preserved and found in Patagonia.

Around the end of the dinosaur age, the Andes Mountains, on the west side of South

America, began to rise and take their present shape. This caused the climate to dry up more and more in Patagonia. The mountains create a barrier that stops moisture from the Pacific Ocean and limits rainfall east of the Andes. Dry conditions favor the preservation of fossils. Most dinosaur discoveries have taken place in dry regions like the Badlands of Alberta or Montana or the Gobi Desert in Mongolia.

The dry climate also increases erosion. This makes it easier to recover the fossils. As rock faces erode through wind and weather, old ground layers come back to the surface, revealing the best spots for finding fossils. This makes the paleontologists' job that much easier: they know what they are looking for before they even start to dig. And it also provides the amazing impression of walking on the very same ground as the dinosaurs.



# Countertop Mountains

**Why is Patagonia so dry ?  
Because the mountains on  
the west coast of South  
America stop the moisture  
from the Pacific Ocean.  
Build a small mountain  
chain and see how.**

## You will need :

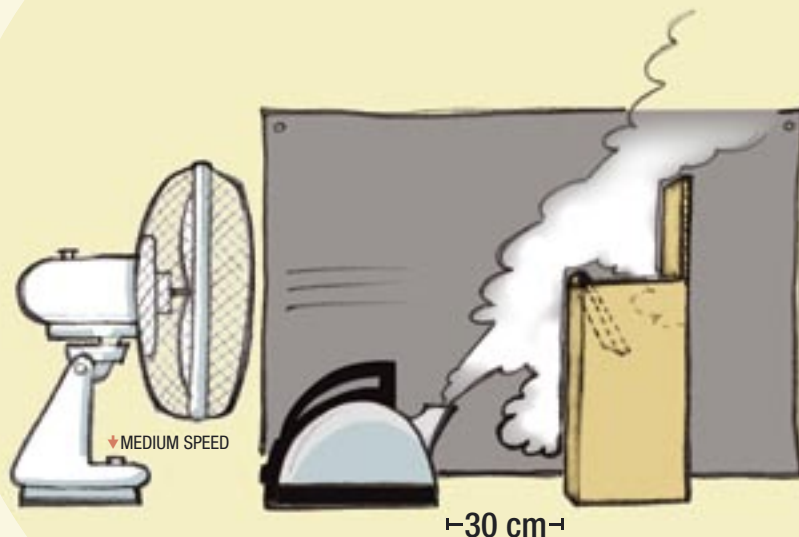
- » a fan
- » a kettle
- » a cardboard box or two large pieces of cardboard
- » a dark piece of fabric

**F**or this experiment, you will need to set up a fan, a kettle full of water and a tall cardboard box or two large pieces of cardboard on a table or counter, in that precise order. The top of the cardboard should be fairly higher than the kettle.

A thin cardboard box, like the ones used for mailing books or small parcels, or a large cereal box should do fine. Otherwise, take two pieces of cardboard and have someone hold them vertically, about a foot (30 cm) from the kettle, and a few inches apart from each other. The cardboard closer to the kettle should be a little shorter than the second one. If using a box, just cut or fold down one of the flaps.

Get the water boiling. When the steam rises, start the fan at medium speed, so that it pushes the steam towards the cardboard. Be careful not to burn yourself on the hot steam!  
A dark piece of fabric held behind the kettle and the cardboard will make it easier to see the steam move.

The steam, as it strikes the cardboard, will split up: some of it will go down along the cardboard, and most will go up and away from the table. This shows how the rain will tend to fall west of the Andes or the Rockies, as moisture from the Pacific Ocean is stopped by the mountains.





# How Big Were the Dinosaurs?

Patagonia is home to the largest dinosaurs ever discovered on Earth. Argentinosaurus, measuring over 120 feet long, standing over 40 feet high, and weighing up to 100 tons, is the biggest creature ever to have walked the Earth. It was roughly the same size as the blue whale, the largest living creature today.

The Argentinosaurus' vertebrae could be over five feet wide. Its thigh bone could reach over 6 feet long, the size of a tall adult. An animal that big - as big as 14 adult elephants - would have shaken the ground at every step it took. Yet it was a gentle plant-grazing creature.

The largest carnivores ever found, Giganotosaurus and Mapusaurus, also from Patagonia, were no wimps either. They could be over 12,5 meters long, and weigh over 8 tons - as much as four SUVs. The head of a full-grown adult was over 2 meters (6 feet) in length. Two 8-year-old children could fit inside the skull.

Scientists don't know the precise reason why dinosaurs became so big. Some think that it was simply a measure of their success at dominating the planet. Others think that size could have helped cold-blooded dinosaurs resist changes in temperature.

Not every dinosaur was a giant, however. Some were also very small, even tiny. Compsognathus (meaning «pretty jaw»), a small dinosaur found in Europe, was 1 m (3 ft) long. It weighed about 2.5 kg (about 6.5 lb), like a fair-

sized chicken. Discovered in China, the bird-like Microraptor zhaoianus, with its coat of small feathers, measured less than 2 feet (60 cm) and was even lighter than its European cousin.

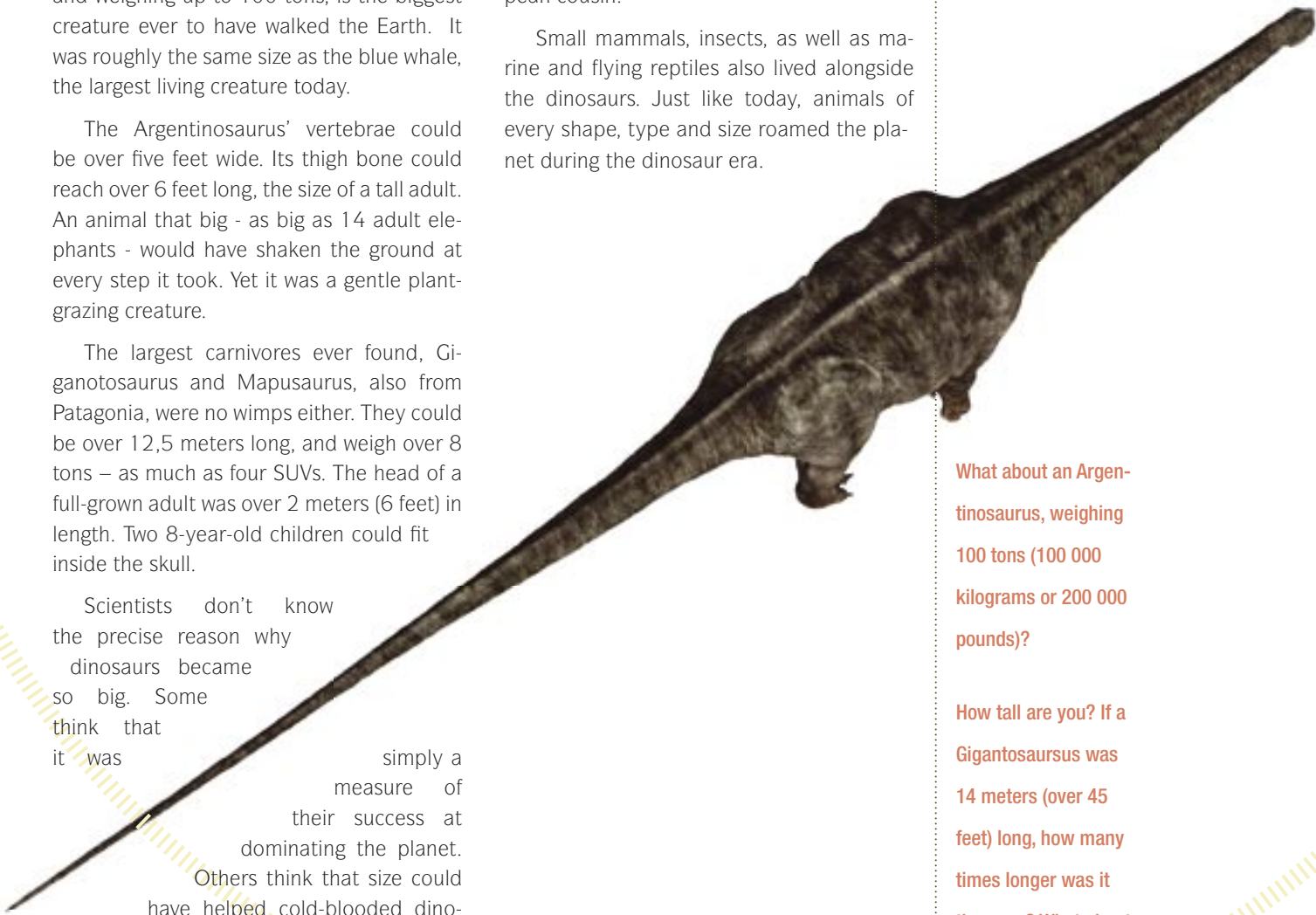
Small mammals, insects, as well as marine and flying reptiles also lived alongside the dinosaurs. Just like today, animals of every shape, type and size roamed the planet during the dinosaur era.

## How Many of You

How much do you weigh? If a Giganotosaurus weighed 8 tons (8 000 kilograms or 16 000 pounds), how many times heavier was it than you?

What about an Argentinosaurus, weighing 100 tons (100 000 kilograms or 200 000 pounds)?

How tall are you? If a Gigantosaurus was 14 meters (over 45 feet) long, how many times longer was it than you? What about a 40-meter (125-foot) long Argentinosaurus?



# How Do You Size up?

**To get a sense of just how big the dinosaurs were, draw a life-size silhouette on the schoolyard ground. If your schoolyard is big enough...**

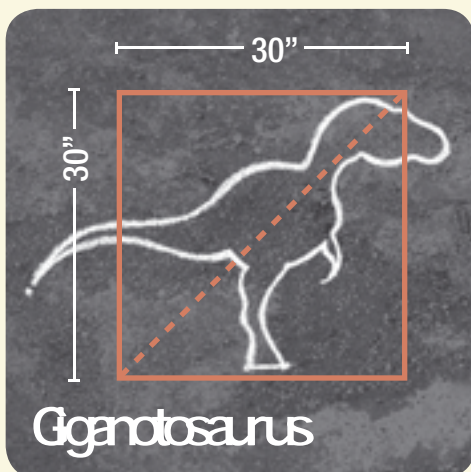
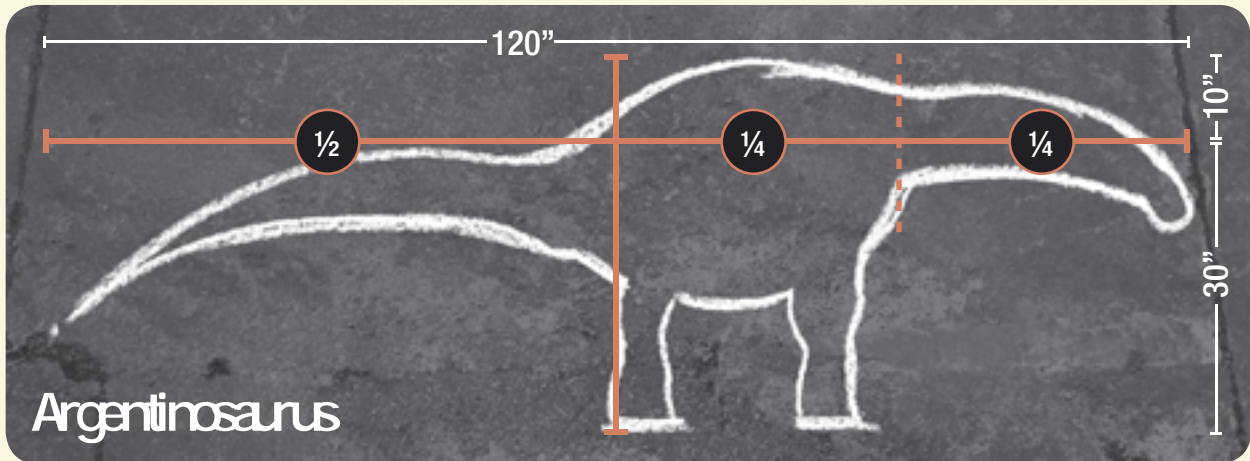
## You will need :

- » a measuring tape or measuring stick
- » a lot of chalk
- » a photo camera (optional)

To draw a life-size Argentinosaurus, first draw a 120-foot horizontal line. Then, draw a 40-foot vertical line, with about 10 feet standing above the horizontal line.

Then, divide the horizontal length into two halves, and divide the front half into two equal parts: the back half is the tail, while the front half is equally divided between the body and the neck and head. Draw out the silhouette around these guidelines. Use the drawing on this page to help you.

Then, you can have children lie on the ground, one above the other, to see how many you need to be as high or as long as the argentinosaurus.



You can do the same exercise with the Giganotosaurus.

To start off, draw a square box, 30 feet x 30 feet. Draw a diagonal from bottom left to top right, and draw the dinosaur around the diagonal, using the picture on this page.

To get a better sense of the size of these huge dinosaurs, you can also take a photograph from the school's top floor. Have one or more children lie down by the silhouette, to give a measure of the scale of these giant creatures.

# Earth, but not as We Know It

We generally see the map of the Earth as something stable and permanent. At the scale of a human life, that may seem true. However, over the course of millions of years, continents have always moved over the surface of the planet.

During the Triassic period, all of today's continents formed a single land mass called Pangea. It started breaking up about 180 million years ago. First, two land masses broke apart : Gondwana, comprising what has become Africa and South America, and Laurasia, comprising North America, Europe and Asia.

pieces of Earth's crust, called tectonic plates, also move. Earthquakes, volcanic activity, the rise of mountain chains and the movement of continents are a result of the tectonic plates' moving and colliding.

As the continents moved apart, in the Dinosaur age, weather, climate and other conditions changed in various parts of the world. The dinosaurs and all other creatures and plants living at the time adapted and evolved to respond to these conditions, creating a great variety of ecosystems in every region. This change in conditions is very likely what allowed dinosaurs in Patagonia to become especially big.



**JURASSIC 135 million years ago**



**PRESENT DAY**

At the time when Argentinosaurus and Giganotosaurus roamed the Earth, about 100 million years ago, the shapes of today's continents were just starting to emerge. Gondwana separated into South America and Africa. They were still much closer together than they are today.

Why are the continents moving ? Because Earth's crust is « floating » on the earth's mantle, formed of liquid molten rock. As the thick molten rock moves below, the various

The movement of tectonic plates affect the world regularly. The deadly tsunami of December 26, 2004 was the result of a major shift in the plates under the Indian ocean. This event caused a huge earthquake of a magnitude of 9.0 on the Richter scale and a giant wave that killed over 200,000 people in several countries. Often invisible, the movements of Earth's crust are a force to be reckoned with.

# The Strength to Shape Continents

## You will need :

- » a ball of modeling dough
- » various hard objects
- » a flat working surface

**You have the power to make mountain chains rise over continents . If they're small and made of modeling dough, that is...**



**1** Flatten your ball of modeling dough to a thickness of about ¼" (1 cm).



**2** Lift the modeling dough off the working surface and lay it back down again without pressing. The dough should be flat on the surface, without sticking to it.



**3** Pick a hard object of a roughly comparable size to the modeling dough. The lid from the dough container, a thick wooden ruler, a wood or plastic block could do the trick.



**4** Put the hard object flat on the table and slowly press it into the modeling dough. As you press further, the dough will fold up and create ridges and troughs like that of a mountain range.

The thickness of the dough, the shape of the objects, the speed of the movement and the pressure applied, as well as the dough's consistency, will produce varying results, showing the haphazard nature of mountain formation.

# Big Time

It's sometimes difficult to get a sense of just how long dinosaurs dominated the planet. Time has to be counted on an astronomical scale.

Humanity invented agriculture and writing and began building cities about 10,000 years ago. To us, this may seem like a long time ago. But for the planet, for the universe, all of human history is as short as the blink of an eye.

By comparison, the Dinosaur era lasted around 180 million years. That's 18,000 times as long as all of human history. And it is as long as 2.5 million human lifetimes. But for our planet, the dinosaur is just one chapter in a story that has lasted around 5 billion years.

Often, when we look at a mountainside or a cliff, we can see that the rock is laid out in hundreds of thin layers. These layers have accumulated over hundreds of millions of years, giving a longer sense of time called the geological scale.

For geologists, paleontologists and astronomers and other scientists who study long-term phenomena, time is measured at a completely different scale. Millions of years become a basic unit of measurement, while a single year or a decade hardly counts at all.

For example, astronomers have determined that our planet is located in one of the "arms" of our galaxy, the Milky Way. The galaxy slowly rotates as it moves in space. And it takes 225 million years for our solar system to go around the galaxy just once. If you count one rotation of the galaxy as one hour, the Earth is 20 hours old, dinosaurs lived 48 minutes, and the first hominids appeared about... 48 seconds ago.

In a time when we think that every moment counts, when communications between people all over the

Earth's long natural history is clearly visible in the exposed ground layers found in places like Patagonia. As you go further down these layers, you go back millions and millions of years into the past.

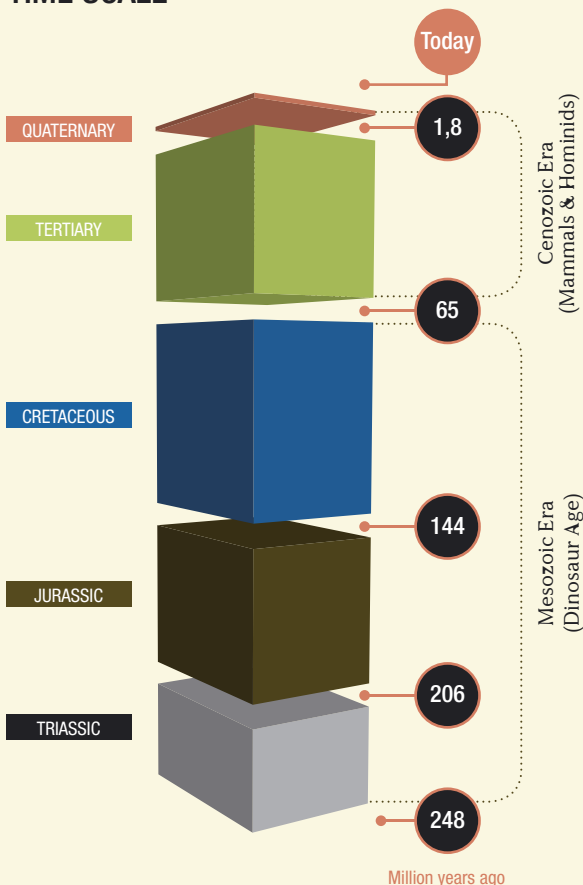


planet has become instantaneous, it can be useful to keep in mind these other ways to consider time. Does an extra second really matter that much?

# Getting the Timeline Right

**Millions of years are easier to measure if you cut them down to scale. Here are two ways to go about it.**

## TIME SCALE



## 1. A Day in the Life of Earth

Using a smaller unit of time as a “scale model” of Earth’s natural history is a good way to get a better sense of just how long the Dinosaur era lasted.

For the purposes of this exercise, consider that the dinosaur age began about 240 million years ago. These 240 million years can be measured as a single day. If 24 hours = 240 million years, then 1 hour = 10 million years.

Following that scale, one million years becomes 6 minutes, and so on, until you break it down to the duration of human civilization (about 10 000 years – or 3.6 seconds). Measuring a country’s history on that scale becomes quite an experience.

Other exercises can use weeks or months or a year to transpose the long measurements of time into a smaller scale.

## 2. Prehistory in a Few Feet

For others, it may be easier to get a sense of scale through a physical measurement. Drawn on the blackboard, a 10-foot line can be used to create a scale, with each foot counting for 24 million years, and 1 inch counting for 2 million years. (In metric scale, a 2.4 meter line can be used similarly, with 10 centimeters counting for 10 million years).

On a 12-foot line, the presence of hominids on Earth, estimated at around 7 million years, counts for 3.5 inches, and human history counts in small fractions of inches.

A longer line can also be drawn out on the classroom floor using tape, or on a playground using chalk.

# Dinos with more Depth

Thanks to 3D computer graphics, dinosaurs look more real than ever on the giant format IMAX screens

One of the thrills of giant screen movies is that they make you feel like you're really there. 3D movies are especially good at this, as objects seem to move right in front of your nose.

To produce this effect, filmmakers rely on the fact that our eyes are both facing forward. Having both eyes up front - unlike most dinosaurs or birds, for instance - means that we have a good sense of depth and distance. Both eyes see things from a slightly different angle.

Thanks to this ability called stereoscopy, it's easy for us to evaluate how far things are from us and how they stand, relative to one another. If you look with just one eye, that capacity is greatly reduced.

Photographers have known this principle for a long time. Over a hundred years ago, they were already using two cameras side by side to create two slightly different images, which they printed together as special post-cards.

Looking through a special viewer, each eye sees only one of the images. The brain then brings both images together, creating an impression of depth and an image that feels more "real".

## Two images, one screen

In photography, it's easy to set up a viewer, so that each eye can see each picture separately. In a movie theater, however, there is only one screen. Both images have to be projected at the same time.

This is why you must wear special glasses to see 3D movies. Glasses with one red lens and one green lens were the original way to go about it. A red-image and a green-image were projected on screen at the same time.

Today, other techniques like polarized lenses or liquid crystal filters are generally used. Whatever the precise technique used, the lenses act as a filter, so that each eye only perceives one of the two images.

Most IMAX theaters use polarization. Polarization is the way light waves can move about vertically or horizontally. Polarized sunglasses use this principle to reduce glare and blinding from the sun. They only let one type of waves come through. In IMAX 3D, one eye sees a horizontally polarized image and the other, a vertically polarized image, which our brain then assembles into a convincing three-dimensional image.

So when you'll see a big dinosaur snapping its jaws at you, don't worry. It's just your brain playing tricks on you. But what a neat trick!

Although computer graphics play an important part in creating realistic images, solid objects can still make the work faster and more precise.

Highly detailed clay models of *Argentinosaurus* and *Giganotosaurus* were created and then scanned, to make these giants as true to life as possible.



# Parallax at your Fingertips

**To create a sense of depth, 3D filmmakers rely on a phenomenon called parallax. Here's how you can demonstrate single-handedly – even with just one finger.**



In a 3D film, two images are projected at the same time on screen, with the glasses filtering each image toward one eye. There is a greater discrepancy between the two images for objects in the foreground, in accordance with the principles

Stretch your arm horizontally in front of you. Stick your thumb out upwards. First look at your thumb with both eyes opened. Then, look with only your left eye opened, and then only with your right eye opened. You will see that your thumb seems to change position, relative to background objects.

Repeat the exercise folding your arm halfway back, and then bringing your thumb only a few inches from your nose.

As you bring your hand closer to your face, the effect becomes more pronounced. The thumb seems to move farther to each side. Focusing at the same time on the thumb and the background becomes more and more difficult.

In 3D movies, the two images of an object shown at the forefront will be projected farther apart on the screen than the more distant objects. This allows our brain to “read” the objects as being closer or farther from us.

## Other ways of looking at it

Here are some other exercises that anyone can do while walking or riding in a car.

1. As you walk down a street or a road, locate a large non-moving object like a parked truck, an advertising board, a telephone poll or a small building. As you walk, notice what the object is hiding behind it, what you see appearing or disappearing behind the object, and how much the object is hiding as you get closer or farther away.

2. As you ride down a city street in a car, note how buildings play hide and seek behind others, and how they appear and disappear, depending on how close or how big other buildings are. On an open road, see how small objects close to the road can sometimes hide much bigger ones that are farther away. Note: only passengers should attempt this exercise.



# To find out more



Dinosaurs are a popular subject and resources abound for all ages and interests. Here are a few suggestions.

## Web Sites

### Zoom Dinosaurs

A wide-ranging look at the world of dinosaurs, with a timeline, descriptions of hundreds of species, a look at paleontologists, etc.

<http://www.enchantedlearning.com/subjects/dinosaurs/>

### Dino Directory

A solid compendium of dinosaurs, classified by era and country where they were discovered, by London's Natural History Museum.

<http://internet.nhm.ac.uk/jdsml/nature-online/dino-directory/>

### Dinosaurs at the BBC

News, features and complements to the remarkable BBC documentaries on the prehistoric world.

[http://www.bbc.co.uk/sn/prehistoric\\_life/dinosaurs/](http://www.bbc.co.uk/sn/prehistoric_life/dinosaurs/)

### Dinosaur Floor

An educational site focusing on the reasons behind the end of the Dinosaur Age.

<http://www.cotf.edu/ete/modules/mse/dinosaur.html>

### Dinosaurs of Argentina

A Discovery Channel educational page focusing on Patagonian dinosaurs.

<http://school.discovery.com/lessonplans/programs/dinosargentina/>

### I Want to Be a Paleontologist

An interesting page on the profession by The Paleontological Research Institution in Ithaca, NY.

<http://www.priweb.org/ed/lol/careers.html>

### Museo Carmen Funes

A page about the museum whose director is Rodolfo Coria.

[http://www.interpatagonia.com/paseos/carmen\\_funes/index\\_i.html](http://www.interpatagonia.com/paseos/carmen_funes/index_i.html)

### Tectonics

An educational web page about tectonic plates, with animated gifs and solid information.

<http://www.ucmp.berkeley.edu/geology/tectonics.html>

## Books

### Steve Parker, ed., *Dinosaur: The Complete Guide to Dinosaurs*, Firefly Books, 2003.

A remarkable illustrated overview of dinosaurs and the life forms that preceded and followed them, put in context in a straightforward and precise manner.

### David Burnie, ed., *The Concise Dinosaur Encyclopedia*, Kingfisher, 2004.

A realistically-illustrated encyclopedia for the whole family, with features on the dinosaurs habitat, behavior, families, etc.

### Eyewitness Dinosaurs, Dorling Kindersley, 2004

The well-known, highly visual series of books by British publisher Dorling Kindersley, with well-presented information in short clips, for all reading ages.

### Luis M. Chiappe and Lowell Dingus, *Walking on Eggs*, Scribner, 2001.

A scientific book describing the discovery of thousands of dinosaur eggs at Auca Mahuevo by the authors and Rodolfo Coria, with good context on prehistoric Patagonia.

## DVDs and Videos

### Discoveries Argentina : Dinosaurs

A simple video that offers a direct look at the locations where the greatest discoveries in Argentina have been made, with interviews with top Argentine paleontologists, including Dr Rodolfo Coria.

### Walking With Dinosaurs

Dating back to 1999, this six-part series produced by the BBC remains one of the top television documentaries about the dinosaur era. *Chased by Dinosaurs*, another BBC title, is a worthy follow-up.

### When Dinosaurs Roamed America

A 90-minute Discovery Channel special focusing on the dinosaurs that lived in North America.

Answers from page 7: 1-b, 2-c (Argentinosaurus could reach 130 feet (40 m) in length and about 100 tons, while the largest blue whale ever caught was nearly 95 feet (30 m) long and weighed 158 tons), 3-c, 4-d, 5-b (dinosaur fossils were found in the islands of Antarctica), 6-a, 7-d (The fossil records provide no indication of color), 8-b (although dinosaurs did develop wings and some dinosaurs could fly, the dominant flying reptiles of the dinosaur age were pterosaurs).

