



APATOSAURUS

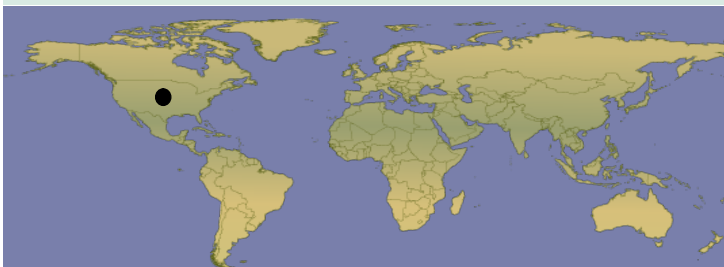
(a-PAT-o-SAWR-us) "Deceptive Lizard"

CLASSIFICATION

Kingdom.....	Animalia
Phylum.....	Chordata
Class.....	Sauropsida
Superorder.....	Dinosauria
Order.....	Saurischia
Suborder.....	Sauropodomorpha
Infraorder.....	Sauropoda
Family.....	Diplodocidae
Genus.....	<i>Apatosaurus</i>
Species.....	<i>ajax</i>

FOSSIL LOCATION

North America (United States)



SIZE

Length 19-25 m (62-82 ft)
Height 9.1 m (30 ft)

WEIGHT

19-30 tons
(41,887-66,138 lbs)

DIET

Herbivore

LIFESPAN

Approximately
100 years

TIME PERIOD

Apatosaurus
Late Jurassic
150.8-145.5 million years ago



Triassic Period

250 - 201 million years ago

Jurassic Period

200 - 146 million years ago

Cretaceous Period

145 - 65 million years ago

INTRODUCTION

Apatosaurus was a **sauropod** dinosaur that inhabited the western United States during the Late Jurassic period roughly 150 million years ago. Sauropods were large, plant-eating quadrupeds with small heads, long necks, long tails, and columnar legs. Although *Apatosaurus* was not the biggest sauropod in existence, it grew to 25 meters (82 feet) in length from head to tail, stood about 9 meters (30 feet) high, and weighed up to 30 tons.

In 1879, two years after American paleontologist O.C. Marsh identified and named the first *Apatosaurus* specimen, he received the remains of a dinosaur similar in appearance to *Apatosaurus*, which he called *Brontosaurus*. Before long, the large, herbivorous dinosaur known as *Brontosaurus* was popularized in the media, and was one of four dinosaurs featured on a US postal stamp. In actuality, "Brontosaurus" was simply a misnomer of *Apatosaurus*, a discovery that was made in 1903. Since the name *Apatosaurus* was published first, the scientific community required that *Brontosaurus* be renamed *Apatosaurus*, and the former has simply faded from the annals of paleontology.

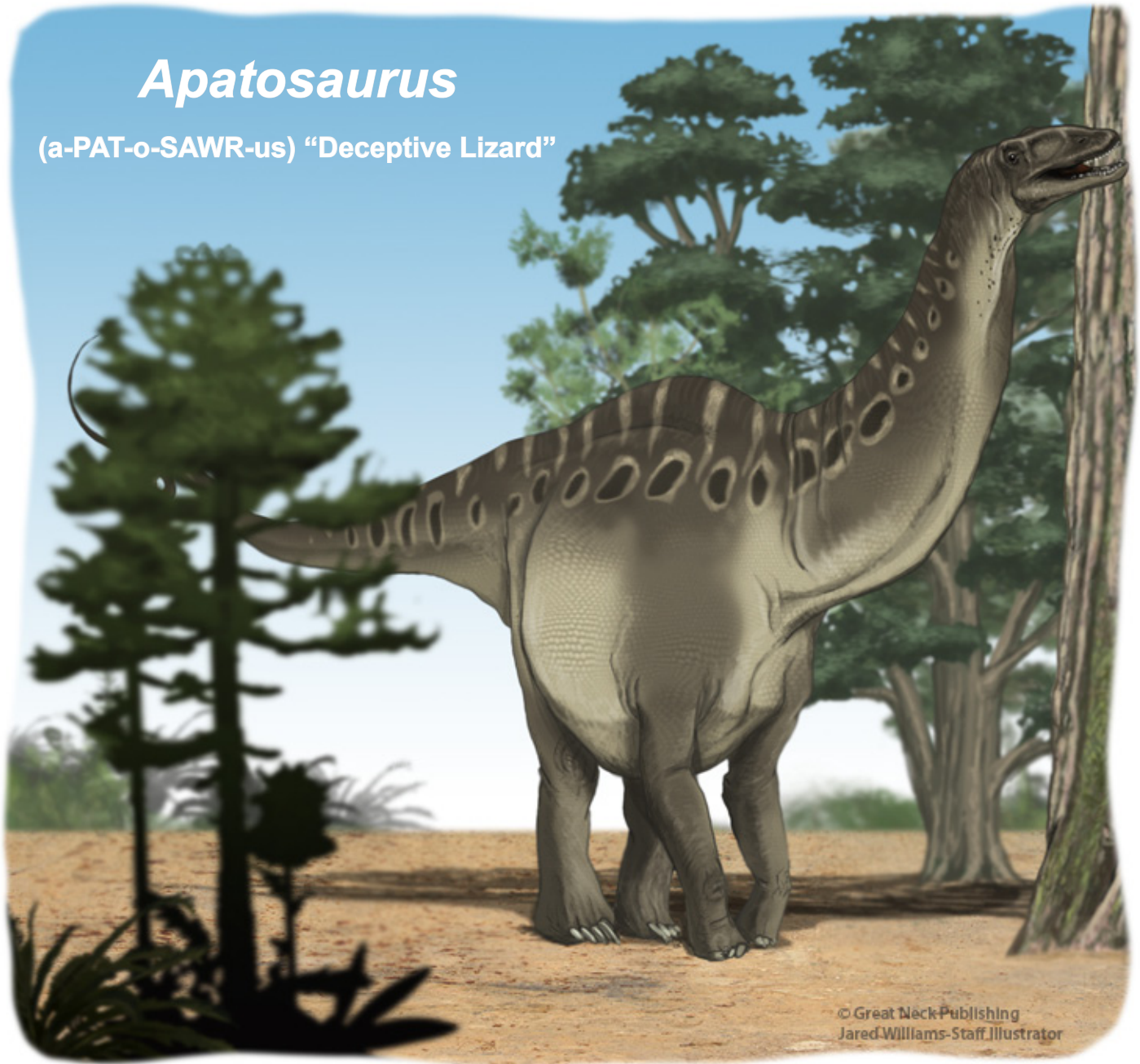
CLASSIFICATION

Scientists use two primary methods to classify organisms. Linnaean taxonomy groups organisms in a hierarchical system according to overall physical similarity, while an alternate method called cladistics attempts to create categories that better reflect the evolutionary relationships between species.

According to Linnaean taxonomy, *Apatosaurus* diverges from all other dinosaurs at the order level saurischia. It belongs to the infraorder sauropoda, which is defined by small heads, long necks and tails, large legs, peg-like teeth, and quadrupedal locomotion. A member of the diplodocidae ("double beams") family (along with *Diplodocus* and *Barosaurus*), *Apatosaurus* had attributes common to all diplodocids, including **nares** near the top of the skull between the eye sockets, a long, horse-like skull, and teeth located only in the front of the jaws.

Apatosaurus

(a-PAT-o-SAWR-us) “Deceptive Lizard”



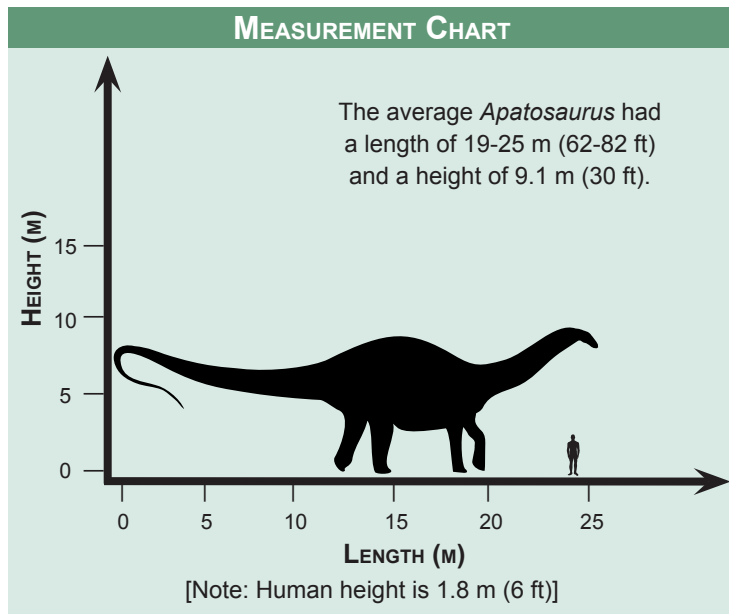
The phylogenetic system of classification groups organisms together based on their evolutionary relationships, which are determined by shared physical traits. Each grouping, or **clade**, consists of an original ancestor and all of its descendents, the original ancestor also being the most recent ancestor of its descendents in the grouping. *Apatosaurus* belongs to the diplodocoidea clade, a sauropod clade which also includes *Rebbachisaurus*, *Dicraeosaurus*, *Barosaurus* and *Diplodocus*. It is defined by a reduced number of teeth, a long whip-like tail, and nares between the eye sockets.

ANATOMY

Easily identifiable as a sauropod, with its small head, extremely long neck and tail, large body, and columnar legs,

Apatosaurus grew to 25 meters (82 feet) in length and stood up to 9 meters high (30 feet). *Apatosaurus*' horse-like skull had nares positioned high up between the eye sockets. Its peg-shaped teeth, located in the front of its jaws, were suitable only for tearing vegetation, not for chewing. Its legs descended from its body in vertical columns similar to an elephant, and its ankles and feet were compactly boned.

Apatosaurus carried its neck at a downward-sloping angle to the ground. Its fifteen neck vertebrae fit together in a way that limited side-to-side and upward movement. It could lower its head several feet below ground level, but would have been unable to hold its neck erect like a giraffe's. Its tail, which was comprised of eighty-two vertebrae, tapered whip-like from the



diameter of a trashcan close to the body to that of a pencil at the tip. *Apatosaurus* vertebrae were light and thin-walled, and some contained air sacs, empty spaces that filled with air during respiration.

INTELLIGENCE

University of Chicago paleontologist James A. Hopson used the ratio of brain to body mass, called the encephalization quotient (EQ), to measure the intelligence of dinosaurs. Hopson found that dinosaurs generally fell within a range of 0.1 to 2.0, with a few reaching as high as 5.8, with 8.0 being the value calculated for the human brain.

According to the encephalization quotient, sauropods were among the least intelligent of all dinosaurs. *Apatosaurus*, whose mouse-sized brain was disproportionately small for an animal of its mass, had an EQ of roughly 0.2. The most intelligent dinosaurs, the carnivorous dromaeosaurids and troodontids, had EQs of 5.8. The size of *Apatosaurus*, however, would have protected it from most predators.

REPRODUCTION & POPULATION

For a long time, it was unclear whether *Apatosaurus* and all other sauropods were **viviparous**, meaning they gave birth to live young, or laid eggs. The confusion was laid to rest when fossilized sauropod eggs were discovered. It is uncertain, though, what kind of care *Apatosaurus* extended to its eggs and hatchlings, if any.

There is a lack of information about juvenile *Apatosaurus* because so few specimens have been collected. Several

studies of the bone composition of adults have determined that juveniles grew quickly, achieving near-adult size and sexual maturity in anywhere from ten to twenty-five years. (One study that examined bone tissue, however, concluded that it took *Apatosaurus* seventy years to reach full maturity at a maximum annual growth rate of 520 kilograms, or 1,146 pounds). Rapid growth may have been advantageous to survival since large body mass deters predators.

DIET

Paleontologists have determined that *Apatosaurus* was strictly herbivorous due to its physiology—its teeth were designed to pull leaves and branches off of plants and trees, not to tear or chew meat. Its large size meant that it needed to consume enormous amounts of vegetation, more than a ton a day some estimate. It most likely ate whatever vegetation was available, such as **gymnosperms** like cycads, ferns, and horsetails, since it could not afford the energy expenditure of being selective. To aid digestion, *Apatosaurus* may have swallowed **gastroliths**, or stones that helped break down fibrous plant material, although there is no direct evidence of this. It probably also had a very long digestive tract that allowed plant material time to ferment and break down even further.

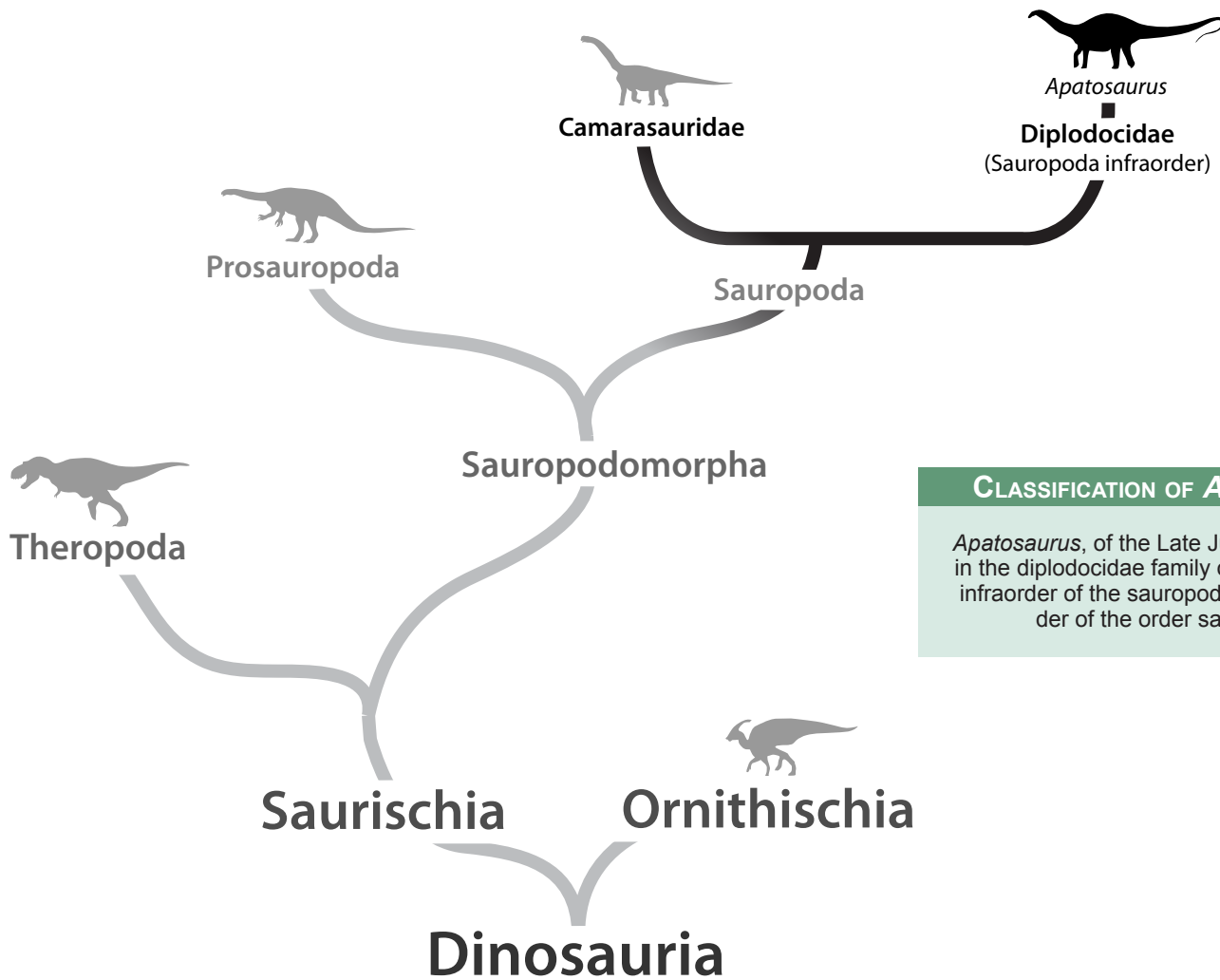
It is debatable whether *Apatosaurus* could reach the tops of very tall trees since its neck movement was limited. One theory is that it was able to rear up for short periods of time on its hind legs. Several factors support this theory: *Apatosaurus* had a center of gravity near its hips, the front of its body was lighter than the back, and its front legs were shorter than its hind legs.

BEHAVIOR

Footprints preserved in rock provide evidence that *Apatosaurus* may have been a social animal that travelled in herds with other sauropods. *Apatosaurus* had a slow gait of 3–5 kilometers (1.9–3 miles) an hour, but unusual tracks from a juvenile *Apatosaurus* suggest that not only could a juvenile run, it ran elevated on its hind legs. The location of *Apatosaurus* and Jurassic plant remains within the Morrison Formation in North America imply that *Apatosaurus* may have migrated in search of food. It likely did so in herds that offered extra protection against predators. Some paleontologists speculate that it used its whip-like tail for defense.

HABITAT & OTHER LIFE FORMS

Apatosaurus specimens have been found in Colorado, Oklahoma, Wyoming, and Utah; these states, along with New Mexico, Montana, and South Dakota, comprise the Morrison Formation.



Rich in plant and animal fossils, the Morrison Formation is a 1.5 million square-kilometer (579,153 square-mile) area of Late Jurassic rock. During the Late Jurassic period, the southern region of the formation was hot and arid, while the wetter northern region contained swamps and lakes.

Dinosaurs that co-existed with *Apatosaurus* in the Morrison Formation during the Late Jurassic include *Camptosaurus*, *Camarasaurus*, *Allosaurus*, *Diplodocus*, *Stegosaurus*, and *Haplocanthosaurus*. Aquatic and semi-aquatic animals include fish, frogs, and crocodiles. **Pterosaurs** (flying reptiles) and rat-sized mammals were present also. Cycads, conifers, and sequoias probably grew in the dryer areas, while ferns, tree ferns, horsetails, and Ginkgoes grew near water.

RESEARCH

Until the 1960s, *Apatosaurus* was believed to have been semi-aquatic. There are several reasons for this conclusion. First, it

had nares near the top of its skull. Nineteenth and early-to-mid twentieth-century paleontologists assumed that the location of the nares allowed it to breathe while partially submerged in water. Second, it grew to an enormous size, which, they postulated, could only have happened in a supportive medium such as water.

The general consensus among paleontologists is that *Apatosaurus* was terrestrial, meaning that it lived on dry land. Research indicates that it would have been impossible for *Apatosaurus* to be submerged up to its head in water because the water pressure against its chest would have prevented it from breathing. The location of its remains also supports the theory that it was terrestrial. *Apatosaurus* fossils and tracks have been found in sandstone that came from dry regions, places it would have been unable to access if it was semi-aquatic. Finally, paleontologists have determined that it was terrestrial by simply comparing it to living elephants, terrestrial animals that have similar leg structure.

VOCABULARY

Clade: A group of animals that scientists believe share a common ancestor.

Gastroliths: Small stones consumed by animals to help break down fibrous plant material in the digestive tract.

Gymnosperms: Plants that produce naked seeds (meaning they are not enclosed in an ovary), such as cycads, conifers, and Gingko; the first seed plants to evolve, they differed from angiosperms in regards to flowers and seed encasement, and first evolved in the upper Devonian period (about 385 to 359 million years ago).

Holotype: A specimen that characterizes an entire species.

Nares: The nasal openings in the skull.

Pterosaurs: Any of an extinct group of flying reptiles that existed during the Mesozoic and became extinct in the Late Cretaceous.

Sauropods: Any of a wide-ranging infraorder of dinosaurs noted for the extreme size of some Jurassic species, including *Apatosaurus* and *Diplodocus*. Sauropods flourished in the Jurassic, and lived as herbivorous browsers.

Viviparous: Giving birth to live young fertilized inside the body of the mother.

Apatosaurus ajax is the **holotype** of the species; however, there are six other species: *Apatosaurus grandis* (1877), *Apatosaurus excelsus* (1879), *Apatosaurus louisae* (1915), *Apatosaurus minimus* (1917), *Apatosaurus alenquerensis* (1957), and *Apatosaurus yahnahpin* (1994).

BIBLIOGRAPHY

Books:

Norell, Mark A., Eugene S. Gaffney, and Lowell Dingus. *Discovering Dinosaurs: In the Museum of Natural History*. New York, New York: Alfred A. Knopf, Inc., 1995.

Svarney, Thomas E., and Patricia Barnes-Svarney. *The Handy Dinosaur Answer Book*. Farmington Hills, Michigan: Visible Ink Press, 2000.

Weishampel, David B., Peter Dodson, and Halszka Osmólska. *The Dinosauria*. Berkeley, California: University of California Press, 2004.

Periodicals:

Henderson, Donald M. "Topsy Punters: Sauropod Dinosaur Pneumaticity, Buoyancy and Aquatic Habits." *Proceedings of the Royal Society: Biological Sciences* 271, Suppl. 4 (2004): 180–183.

Kissel, Richard A. "The Sauropod Chronicles: The Largest Creatures Ever to Have Walked the Earth Were Animals Such As Apatosaurus—Aka Brontosaurus. Paleontologists Are Revising the Picture of How They Lived. Again." *Natural History Magazine* 116, Issue 3 (2007): 34–35.

Taylor, Michael P., and Darren Naish. "The Phylogenetic Taxonomy of Diplodocoidea (Dinosauria: Sauropoda)." *PaleoBios* 25, 2 (2005): 1–7.

Websites:

American Museum of Natural History. "Sauropod Biomechanics." <http://www.amnh.org/exhibitions/dinosaurs/sauropod/>. Accessed May, 2010.

Carnegie Museum of Natural History. "Apatosaurus." <http://www.carnegiemnh.org/programs/media/Apatosaurus.pdf>. Accessed May, 2010.

Smithsonian.com. "Where Dinosaurs Roamed." <http://www.smithsonianmag.com/history-archaeology/phenom-dino-200805.html>. Accessed May, 2010.

JAMIE ARONSON TYUS

Copyright of Dinosaurs & Ancient Creatures: Apatosaurus is the property of Great Neck Publishing and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.