



Teacher Feature

DINOSAURS: FACTS and FI

Learning about dinosaurs stretches our imaginations, gives us new perspectives on time and space, and invites us to discover worlds very different from our modern world.

The study of dinosaurs is important so we understand the extinction of land animals and, the changes in biological diversity caused by earth's previous geologic and climatic changes. These changes are still occurring today. A wealth of new information about dinosaurs has been learned over the past 30 years. Science's old ideas of dinosaurs as slow, clumsy beasts have been totally turned around.

This Teacher Feature has answers to some frequently asked questions about dinosaurs; current ideas and evidence correcting popular misconceptions are presented. Although much has been discovered recently about dinosaurs, there's still a great deal

more to learn about our planet and its ancient inhabitants.

WHEN DID THE FIRST DINOSAURS APPEAR ON EARTH?

The oldest dinosaur types are known from rocks in Argentina and Brazil; they're about 230 million years old. The most primitive, *Eoraptor*, was a small meat-eating dinosaur.

ARE ALL FOSSIL ANIMALS DINOSAURS?

No. Dinosaurs are a group of ancient reptiles that had specific skeletal features. The hips, hind legs, and ankles were specialized. They allowed the legs to move directly under the body, rather than extending out from the side of the body as in modern lizards. This arrangement enabled dinosaurs to bring their knees and ankles directly below their hips and provided the necessary attachment for very strong leg muscles. Dinosaur skeletons were well designed for supporting a large body, standing upright, and running. The skulls of dinosaurs were designed for maximum strength, minimum weight, and (in some cases) grasping, holding, or tearing prey.

These skeletal features separated dinosaurs from other ancient reptiles such as *Dimetrodon*, the plesiosaurs, and pterosaurs.* In addition, fossil mammals like mammoths and saber-toothed cats,** are *not* dinosaurs.

DID PEOPLE AND DINOSAURS LIVE AT THE SAME TIME?

No! After the dinosaurs died out, nearly 65 million years passed before people appeared on earth. However, small mammals (including shrew-sized primates) *were* alive at the time of the dinosaurs. Many scientists who study dinosaurs (vertebrate paleontologists) now think that birds are direct descendants of one line of carnivorous dinosaurs.

WHERE DID DINOSAURS LIVE?

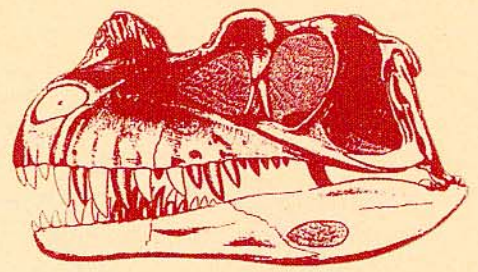
Paleontologists now have evidence that dinosaurs lived on all continents. At the beginning of the age of dinosaurs (during the Triassic Period, about 230 million years ago) the continents were all attached as a single supercontinent called Pangea. During the 165 million years of dinosaur existence, this supercontinent

*See page 4 in this issue.

**The saber-toothed cat (*Smilodon californicus*) is the Official California State Fossil. DMG has notes on *Saber-Toothed Cats* (DMG Note 13) and *Fossils* (DMG Note 51). Both are free and can be ordered by calling (916) 445-5716. Please order by note number.

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Ceratosaurus nasicornis, from Marsh (1896). Original specimen on display at U.S. National Museum.



slowly broke apart. Its pieces spread across the globe by a process called plate tectonics into what we know today. Volcanoes, earthquakes, mountain building and sea-floor spreading are all part of plate tectonics; this process continues to change our modern earth.

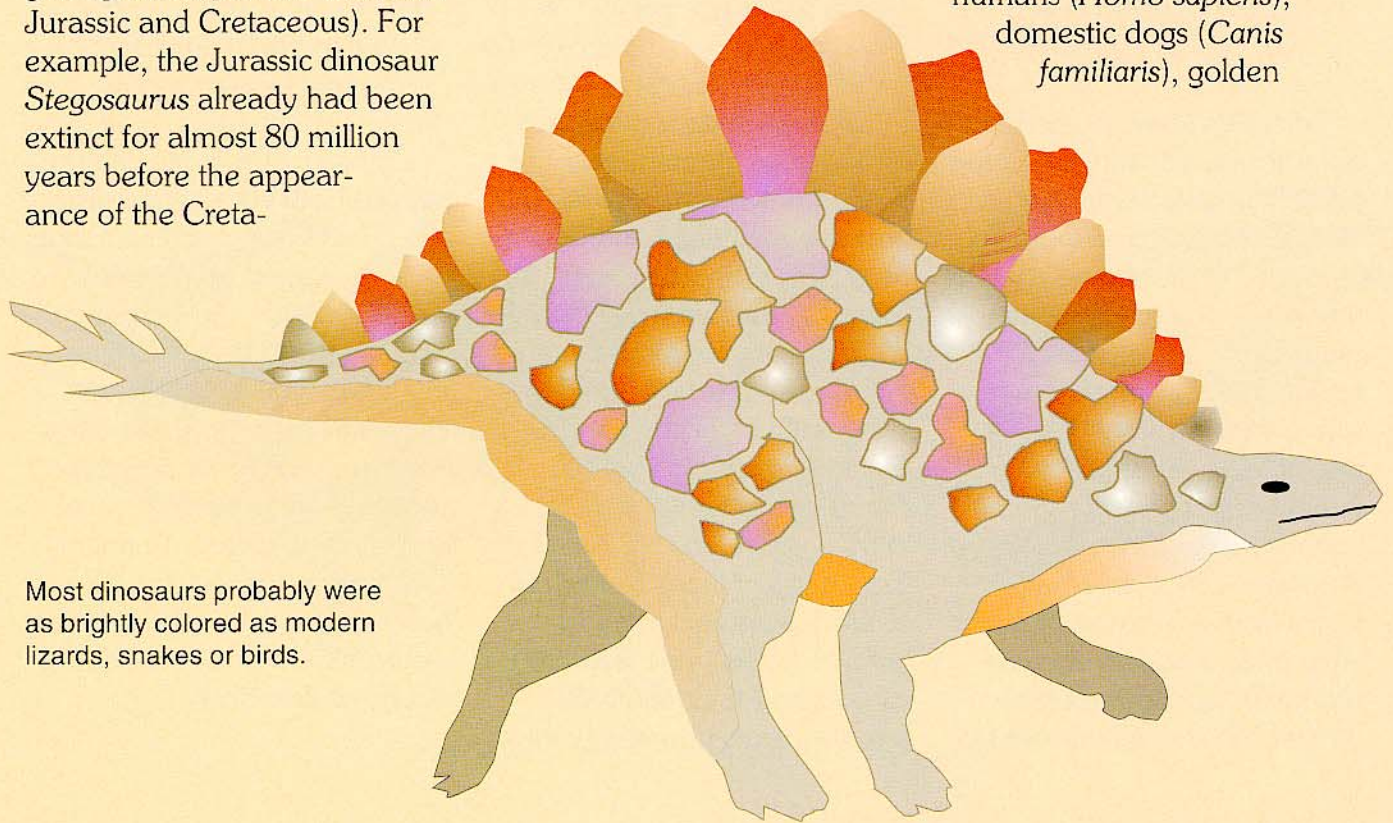
DID ALL DINOSAURS LIVE TOGETHER, AND AT THE SAME TIME?

Dinosaurs were separated by time and geography. The 'age of dinosaurs' (Mesozoic Era) included three consecutive geologic time periods (Triassic, Jurassic and Cretaceous). For example, the Jurassic dinosaur *Stegosaurus* already had been extinct for almost 80 million years before the appearance of the Creta-

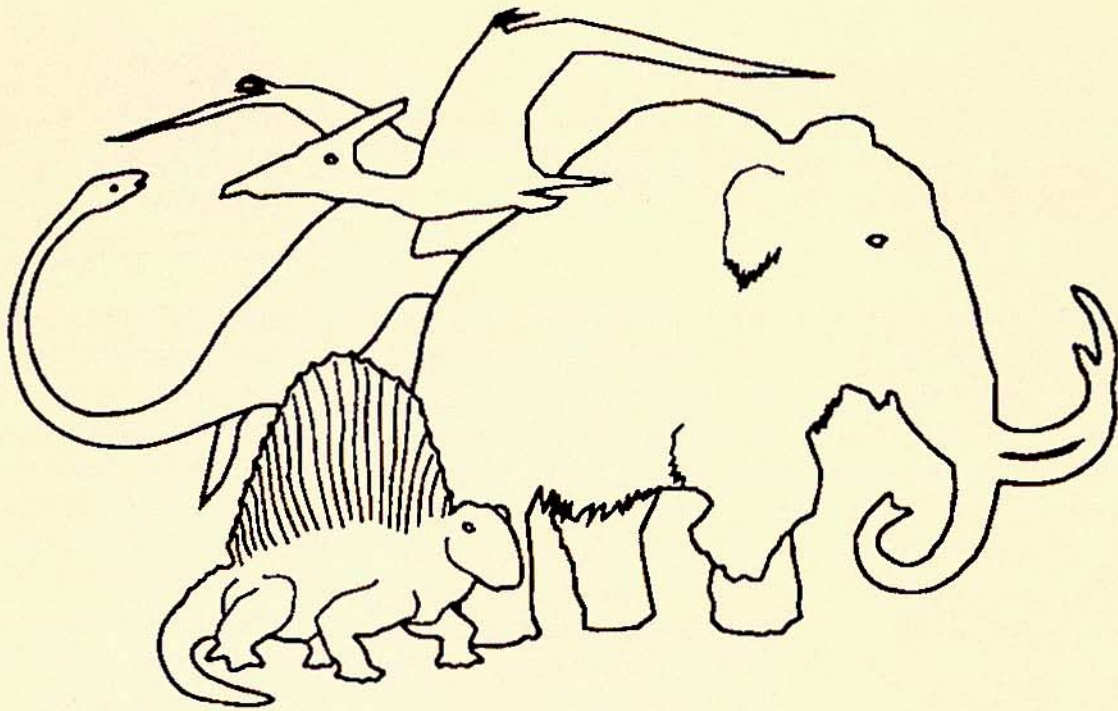
ceous dinosaur *Tyrannosaurus*. In fact, the time separating *Stegosaurus* and *Tyrannosaurus* is greater than the time separating *Tyrannosaurus* and you. At the beginning of dinosaur history (Triassic Period about 230 million years ago), the supercontinent Pangea existed. Many dinosaur types were widespread across it. However, as Pangea broke apart, dinosaurs became scattered across the globe on separate continents. New types of dinosaurs evolved separately in each geographic location.

HOW ARE DINOSAURS NAMED?

Dinosaurs generally are named after a characteristic body feature, the place where they are found, or a person involved in the discovery. Usually the name consists of two Greek or Latin names (or combinations)—the genus and the species name. For example, the Greek and Latin combination *Tyrannosaurus rex* means "king of the tyrant lizards." Biologists name modern animals exactly the same way. Some examples include humans (*Homo sapiens*), domestic dogs (*Canis familiaris*), golden



Most dinosaurs probably were as brightly colored as modern lizards, snakes or birds.



These ancient animals are *not* dinosaurs!

eagles (*Aquila chrysaetos*), box turtles (*Terrapene carolina*), and rattlesnakes (*Crotalus horridus*).

WERE DINOSAURS WARM-BLOODED?

Scientists have conflicting opinions on this subject. Some paleontologists think that all dinosaurs were “warm-blooded” in the same sense that modern birds and mammals are; that is, they had rapid metabolic rates. Other scientists think it unlikely that any dinosaur could have had a rapid metabolic rate. Some scientists think that very big dinosaurs could have had warm bodies because of their large body size, just as some sea turtles do today. It may be that some small dinosaurs

were warm-blooded. It’s hard to find evidence that shows what dinosaur metabolisms were like.

WHAT DID DINOSAURS EAT?

Some dinosaurs ate lizards, turtles, eggs, or mammals. Some hunted other dinosaurs or scavenged dead animals. Most, however, ate plants (but not grass, which hadn’t evolved yet). Rocks that contain dinosaur bones also contain fossil pollen and spores that indicate hundreds to thousands of types of plants existed during the Mesozoic Era. Many of these plants had edible leaves, including evergreen conifers (pine trees, redwoods, and their relatives), ferns, mosses, horsetail rushes,

cycads, ginkgos, and in the latter part of the dinosaur age, flowering (fruiting) plants. The last of the dinosaurs certainly had fruit to eat.

DID DINOSAURS COMMUNICATE?

Dinosaurs probably communicated both vocally and visually. The chambered headcrests on some dinosaurs such as *Corythosaurus* and *Parasauroplophus* might have been used to amplify grunts or bellows. Defensive posturing, courtship behavior, and territory fights probably involved both vocal and visual displays. An angry *Triceratops* bull shaking his head at you, even silently, would have made himself very clearly understood!

WHAT COLORS WERE DINOSAURS?

Direct fossil evidence for dinosaur skin color is unknown. Paleontologists think that some dinosaurs had protective coloration, such as pale undersides to reduce shadows, and irregular color patterns (camouflage) to make them less visible in vegetation. Those dinosaurs that had enough armor, such as the stegosaurs and ceratopsians, may not have needed protective coloration. They may have been brightly colored as a warning to predators or as a display for finding a mate.

WERE DINOSAURS SOCIAL ANIMALS?

Some dinosaurs were social creatures. Recently discovered evidence indicates they traveled together and that some

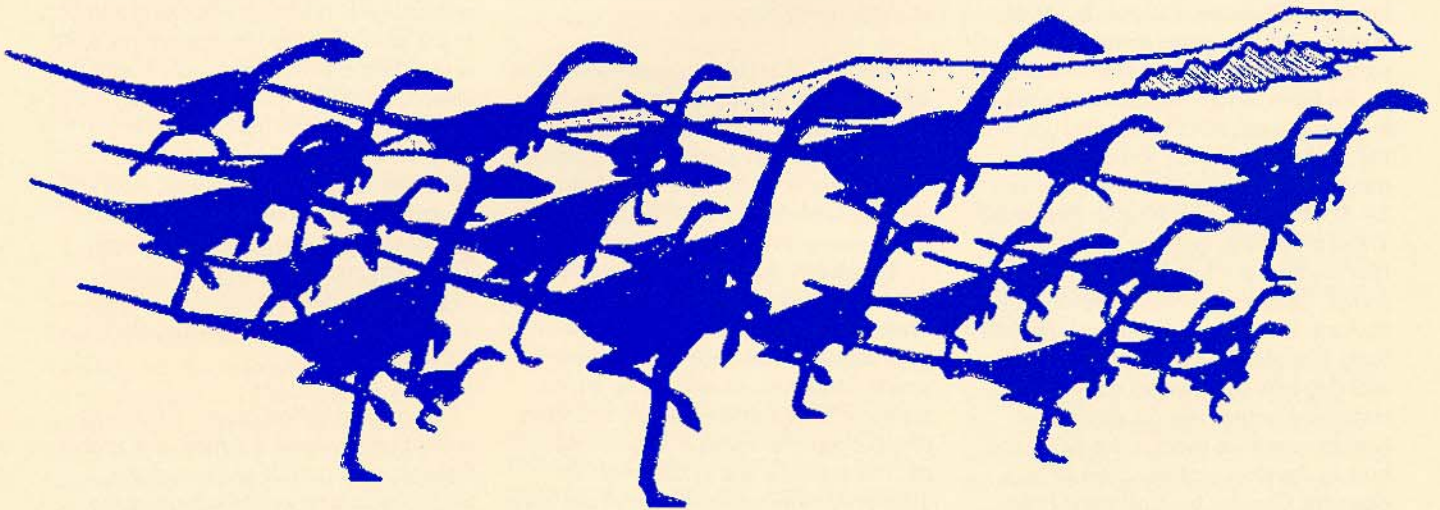
may even have migrated. Dinosaur fossils have been found above the Arctic Circle, where food supply would have been seasonal. Hadrosaur nest sites have been found with eggshells and skeletons of baby dinosaurs (with slightly worn teeth) still in the nests. This suggests that some babies stayed in their nest after hatching and were probably fed by parents.

WHY DID DINOSAURS DIE OUT?

There are dozens of theories to explain a probable cause or causes. Throughout the Mesozoic Era, dinosaur species were evolving and becoming extinct for various reasons. The unusually massive extinction at the end of the Cretaceous eliminated the last of the dinosaurs, flying reptiles, large swimming reptiles, and many

other marine animals. There is now widespread evidence that a meteorite impact was partially responsible for this extinction. Other factors such as extensive release of volcanic gases, climatic cooling (with related changes in ocean currents and weather patterns), sea-level change, low reproduction rates, poison gases from a comet, or changes in the earth's orbit or magnetic field may have contributed to the extinction.

Information taken from *Dinosaurs: Facts and Fiction* by Ronald J. Litwin, Robert E. Weems and Thomas R. Holtz, Jr. 1998. U.S. Geological Society.



Group behavior of the Triassic dinosaur *Coelophysis*.