

h12 Archosauria < hole in acetabulum, dinosaurs >

The combination of such characters ... all manifested by creatures far surpassing in size the largest of existing reptiles will, it is presumed, be deemed sufficient ground for establishing a distinct tribe or suborder of Saurian Reptiles, for which [*Iguanodon*, *Megalosaurus* and *Hylaeosaurus* but omitting (the now recognized dinosaurs): *Streptospondylus*, *Cetiosaurus*, *Thecodontosaurus* and *Poekilopleuron*] I would propose the name of Dinosauria. —Richard Owen, April 1842.¹

Of reptiles (class Reptilia), the ruling reptiles (subclass Archosauria) (**Table h12.1**) had their heyday in the Mesozoic. They differed from other reptiles in their evolutionary tendency toward bipedalism that required the legs to be like pillars under the body and not splayed out to the side as was so for evolving members of the other reptilian subclasses Synaptosauaria (includes placodonts, plesiosaurs, nothosaurs), Lepidosauria (includes order Squamata (lizards and snakes) and order Rhyncocephalia (all long extinct except for two endangered species of tuatara in New Zealand)²), Anapsida (includes turtles), Ichthyopterygia (ichthyosaurs), and Synapsida (from which mammals evolved).³ An archosaur is recognized by the specific modification, in the pelvis, to the socket (acetabulum) into which the femur head fits. As archosaur legs are beneath the body, the femur head presses upward and not inward as the out-to-the-side legs of other reptiles would push it. As a result, ruling reptiles have an upper leg bone (femur) with a head (ball projection) at the side of its top. This presses upward against the upper part of the acetabulum. A telling evolutionary feature that this allows, and which is a defining characteristic of the dinosaurs, is a hole in the lower part of the acetabulum.

Table h12.1 Classification of the ruling reptiles

Class Reptilia (reptiles).

Subclass Archosauria (ruling reptiles).

Order Thecodontia (extinct ancestral ruling reptiles). Stemming from these are:

Order Crocodilia (crocodiles),

Order Pterosauria (extinct flying reptiles),

Order Ornithischia (“bird-hipped” dinosaurs so named in 1887 by Harry Govier Seeley (1839-1909) who first described that diagnostic feature)⁴ with a tetra-radiate arrangement of hip bones in which the pubic bone points backwards and has a forwards projecting part (called the *anterior process*) (**Figure h 12.1**), and

Order Saurischia (“reptile-hipped” dinosaurs—Seeley, 1887) with a tri-radiate arrangement of the hip bones.⁵

Teeth and bone fragments of a reptile evidently twice the size of an elephant, described by William Buckland in *Notice on the Megalosaurus or great Fossil Lizard of Stonesfield [slate quarry mine, Oxfordshire]*, 1824, caused a sensation.⁶ He had published to beat Gideon Mantell’s announcement. (Earlier found fossils had been misidentified—**Footnote h 12.1**). More fossil evidence of these extinct beasts, each find avidly reported in the press, prompted Richard Owen (an anti-evolutionists who championed Cuvier’s vision of multiple extinction and creation events to account for the fossil record) to claim in April 1842 the coining (in a backdated *Report of the British Association for the Advancement of Science*, 1841, and in a limited “preprint,” of its pages 60-204, entitled *Report of British Fossil Reptiles, Part II*, by Richard Owen) the formal name “Dinosauria” (Gk. *deinos*, fearfully great; *saurus*, a lizard) for these awesome (all then known were huge) “crowns of reptilian creation.”⁷

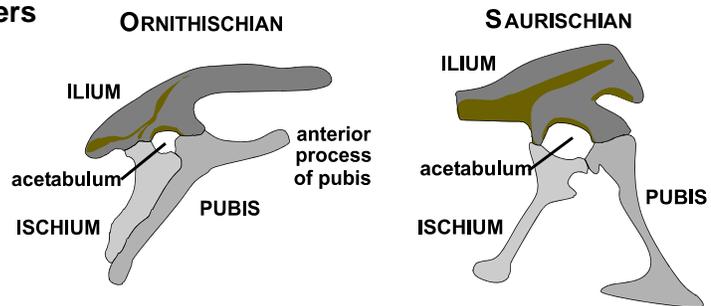
Dinosaurs (530 genera found and statistically possible is another 1300)⁸ form a paraphyletic group (which is a grade that does not include all the descendants of its oldest ancestor), as birds, which are derived from a dinosaur ancestor, are *not* included.

Iron-and-concrete representations of the same “antediluvian” creatures displayed in the Crystal Palace 1854 exhibition, England, thrilled the viewing public.⁹ Totem use of the Dinosaur image continues today although the name lost its formal significance when additional fossil collecting revealed that the “dinosaurs” encompass two orders of reptiles no closer to each other than they are to the other formally described orders of reptiles. Recently, the two dinosaurian orders have been argued to derive from a shared ancestor which had diverged from other reptilian stocks. So the word Dinosauria¹⁰ is back in use as the name of the clade that includes Saurischians and Ornithischians.

The Cretaceous herbivorous dinosaurs could have added to their diet the fruits and other parts of flowering plants which had appeared and were evolving. Other available forage included continuing Jurassic and Late Triassic herbivorous dinosaur stables. These were the edible parts of evergreen conifers (pine trees, redwoods, and their like), ginkgos, cycads, horsetail rushes, ferns, lichens and mosses. The carnivorous dinosaurs would have variously scavenged, gobbled the eggs of others (**Figure h 12.2**), and preyed upon anything, including other dinosaurs, that moved during the day (adaptations for night hunting, such as good hearing, have not been discerned for any). □

Figure h 12.1¹¹ The two Dinosaur orders

The acetabulum (the socket into which the head of the femur fits) has a hole in its lower part. *Note:* the ornithischian “bird-like pelvis” is an evolutionary feature convergent on birds which had diverged separately from saurischian stock. Romer in 1966 began arguing against continuing the collective term dinosaur for what by his lights is a polyphyletic group with separate origins for the orders Saurischia and Ornithischia from several different thecodontian groups. Others agreed. However, numerous autapomorphies in species included in these orders suggested to Bakker and Galton in 1974,¹² and Bonaparte in 1976,¹³ that analyses can establish their monophyletic origin and so the clade Dinosauria. Others agree.¹⁴



Footnote h 12.1 The illustration, bound before page 143 of *The Natural History of Oxford-shire* by Robert Plot, 1677, is considered the first depiction of a dinosaur fossil. Plot had “made an extensive study of ‘formed stones’ or fossils, without appreciating that they could be used to identify strata. The controversy on the origins of fossils was then at its height. Plot argued, from the differences between fossil shells and any known specimens of the living shellfish they were thought to represent, that fossil shells were crystallizations of mineral salts; their zoomorphic appearance was as coincidental as the regular shapes of stalactites or snowflakes. Large quadruped fossils he considered the remains of giants, except for one identified as that of an elephant through comparison with an Elephant skull in the Ashmolean museum. This curious object is now thought to belong to *Megalosaurus*.”—DSB (Dictionary of Scientific Biography).¹⁵

Tilgate Forest quarry in the core of the Weald dome Sussex, England, yielded giant fossil bones from ripple-marked deltaic sandstones that Mantell determined stratigraphically to be Secondary (and so to antedate the Tertiary, Cuvier’s “age of mammals”—the Secondary being Cuvier’s “age of reptiles”). Hard by the quarry, his wife Mary found (or bought) a gigantic, worn-by-use, fossil tooth. If from the quarrystone, it was astonishing first-evidence of an extinct giant, herbivorous, land “lizard.” Fame beckoned and then was thwarted when friend Lyell, upon showing the tooth to Cuvier in Paris, June 18, 1823, had it pronounced to be that of a hippo. However, Cuvier’s rightful claim to being a “greater scientist” included his gracious acceptance of fallibility. From the same environ, and out of the quarrystone, Mantell doggedly collected a complete set of similar teeth showing “every graduation of form from the perfect tooth in the young animal to the last stage, that of a mere bony stump worn away by mastication.” On receiving a suite of these (Spring of 1824), Cuvier agreed (“elles ne sont point d’un animal carnassier”). Mantell with visiting Cuvier when later at the Hunterian Museum Royal College of Surgeons to examine modern reptile carnivore teeth known to curator William Clift (1775-1849), the assistant curator Samuel Stutchbury (1798-1859) drew their attention to a herbivore reptile he had just prepared, a Barbadian iguana, with teeth, except for being 20 times smaller, mostly like those of the fossil teeth. “*Iguanosaurus*” tried Mantell. On the strength of his paper “Notice on the *Iguanodon*” (genus name suggested by Conybeare), read February 10, 1825, Mantell was nominated and elected a Fellow of the Royal Society.¹⁶

Footnote h 12.2 No longer rare, dinosaur eggs of several varieties and from several habitats were first found in 1923 in Algui Ulaan Tsav, Mongolia.