

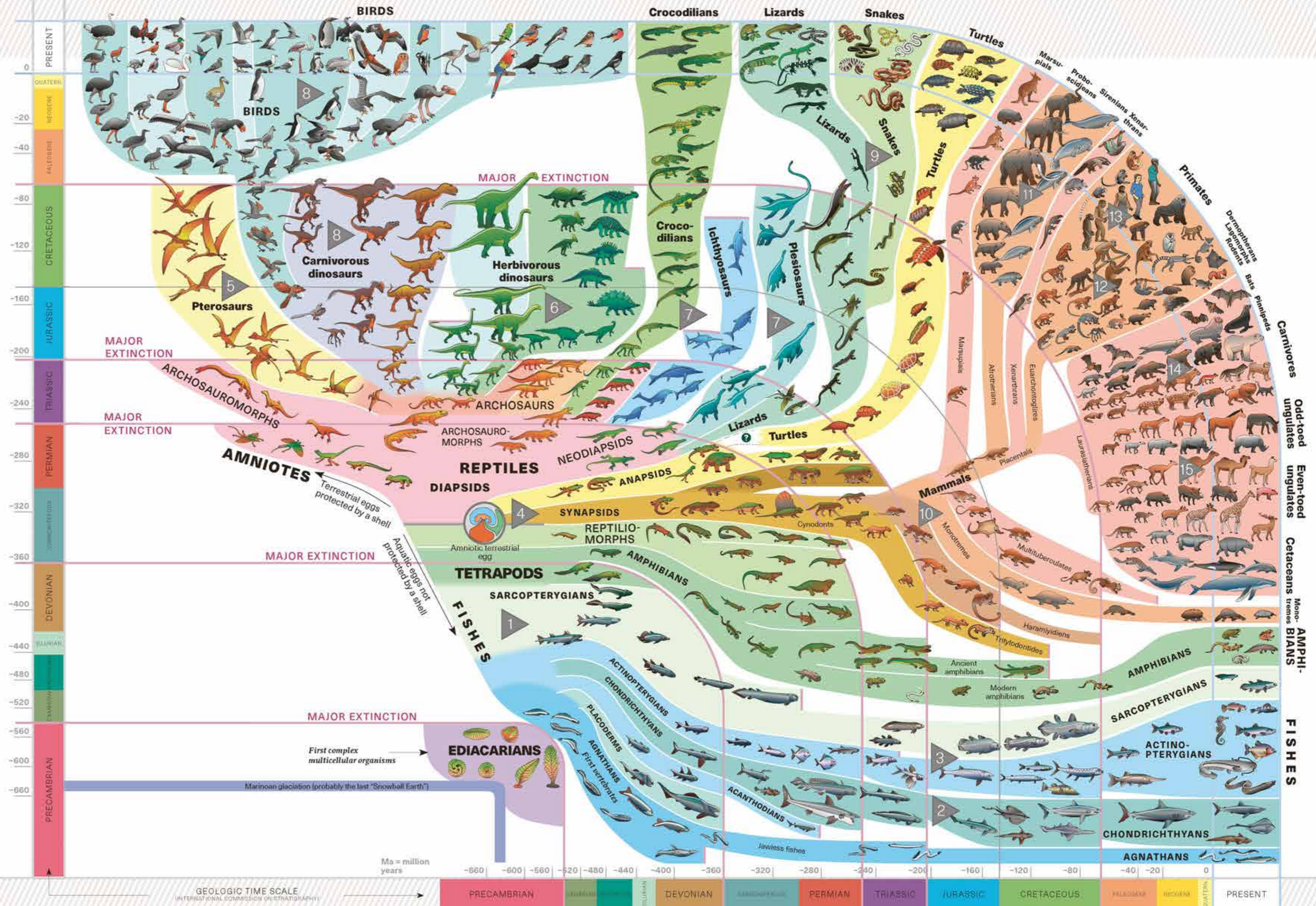
# ATLAS OF VERTEBRATES

This atlas traces the connection between the main vertebrate groups during the course of their evolution. On the right, the diagram maps out a selection of fossil and extant vertebrates, highlighting the links that connect them through time. The curvature of the timelines helps represent the increase in biodiversity through the ages.

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Each number (from 1 to 15) in this general sketch corresponds to a plate of illustrations, depicted further on in the book, detailing the evolution of the main vertebrates branches. These links reflect the evolutionary path through over 500 million years, from the ancestor common to all vertebrates – a tiny jawless fish – to both its fossilized and living legacy today.



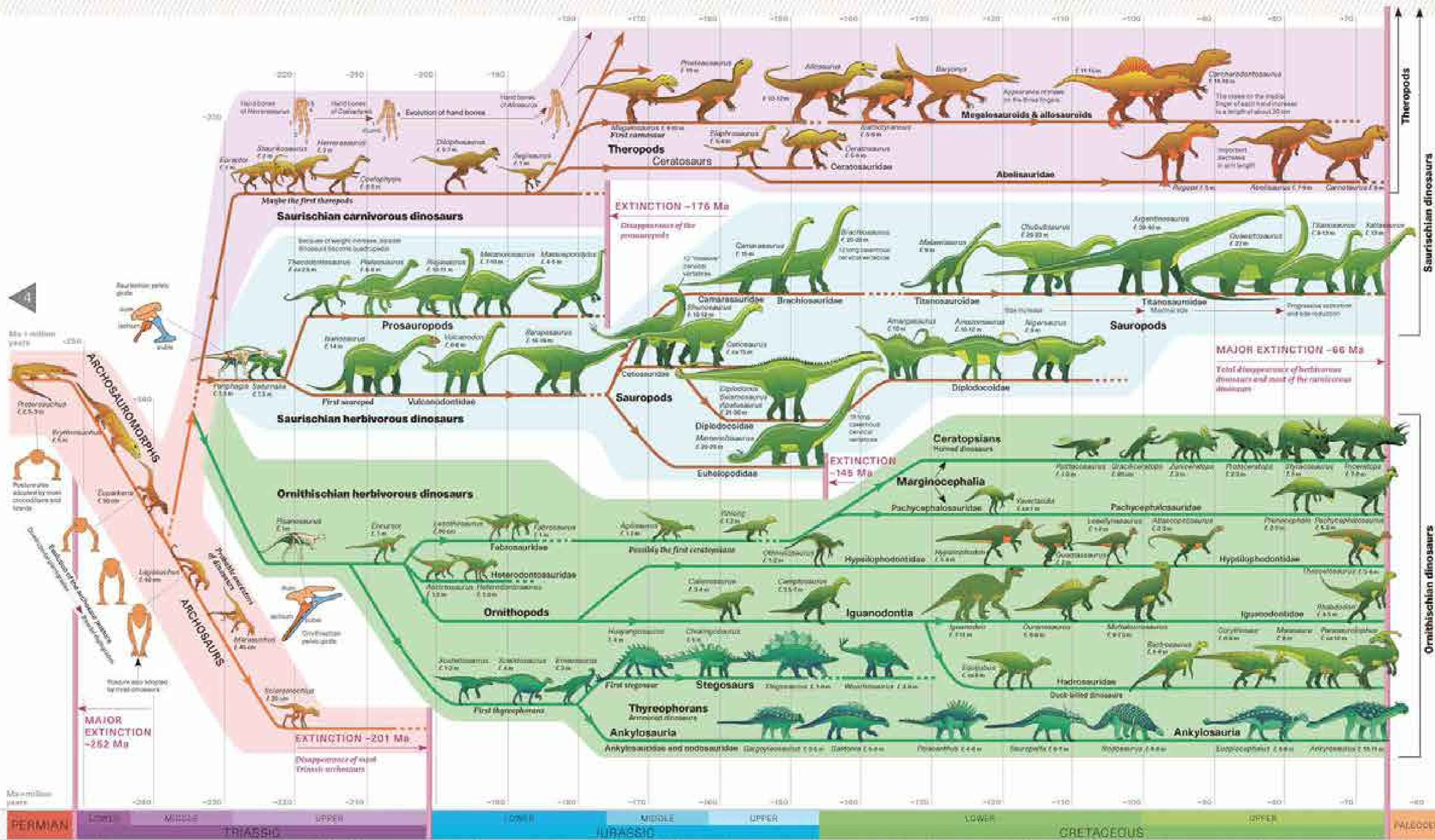


Despite denoting "terrible lizards" as in *deinos sauros*, dinosaurs are more closely related to crocodilians. Although their origin is uncertain, they could have descended from the archosaurs (*Lagosuchus* and *Marasuchus*), as they share many similar traits, including the two-legged gait and the upright, bipedal posture. It is indeed the posture that sets apart the dinosaurs from other reptiles such as crocodiles, lizards or turtles, and not, as is often believed, their enormous size. Their size is just as varied as those of mammals.

**THE POSTURE OF THE DINOSAURS**  
Primitive dinosaurs looked like small crocodiles standing on hind feet. A creeping gait with folded limbs changes into an upright gait enabling locomotion despite bearing greater weight. The femoral head curves so as to anchor in the pelvis. Moreover, movement changes from the plantigrade type (loading the whole sole) to the digitigrade type (loading the toes). In the course of evolution, even the heaviest carnivores remained two-legged. On the other hand, most herbivores became four-legged due to an increase in body weight.

**THE REIGN OF THE DINOSAURS**  
Dinosaurs first appeared in the Triassic, 230 million years ago. They quickly subdivided into two branches: characterized by the shape of their pelvis: the primarily herbivorous ornithischians and the saurischians. The latter further subdivided into carnivores (theropods) and herbivores to which belong the "long necks" or sauropods.

Dinosaurs dominated life on Earth for 165 million years, until the mass extinction at the end of the Cretaceous, 66 million years ago, following fallout of a giant meteorite in addition to extreme volcanic activity. The few dinosaurs to survive this terrible holocaust were small and feathered: birds (see plate D1).



# THE TRIBE OF BIPEDAL PRIMATES

## Origin and evolution of Hominini

### THE FIRST BIPEDAL PRIMATES

8 to 10 million years ago, an ape began moving about mainly on two feet, giving rise to the **Hominini** tribe, characterized by bipedalism (Plate 3). Its oldest known representative, *Sahelanthropus tchadensis* (Toumaï, 7.2 million years old) was discovered in Chad Central Africa. Its occipital foramen position (below and behind the skull) corresponds to that of a straightened spine, making it possible to infer bipedal locomotion and hands now free to hold and carry food or other objects. It evolved into at least twenty different species, whose links of descent are often uncertain due to the paucity of fossils.

Younger Hominini (*Orrorin* and *Ardipithecus*) have been discovered in East Africa, where the **Australopithecine** (southern monkey) lineage emerged as well 4.4 million years ago. This line then separates into two branches: the probable East African ancestor of *Homo* and *Paranthropus* and the South African branch, which could have engendered *Homo naledi*. The first cut-stone tools dating back 3.3 million years were found together with the bones of *Australopithecus africanus* and *sediba*.

The **Paranthropus** (from Greek *para* or beside and *anthropos* of human) lived in a mostly wooded environment. Males had a big, flat crest at the top of the skull, attaching the muscles needed to power jaws strong enough to grind down hard-shelled fruit. Like their ancestors, the Hominini, they fed on plants, tubers, fruits, roots, insects and possibly small animals.

### THE HUMAN LINE

The genus *Homo* emerges about 2.5 million years ago, about the same time as single-sided cut stones. *Homo* are characterized by a higher cranial capacity (> 600 cm<sup>3</sup>) than their ancestors and a flatter face. Thanks to his cut stones, *Homo habilis*, though still largely vegetarian, eats increasingly more meat by carving up the carcasses of herbivores killed by other animals. While developing new tools and weapons (bifacial hand axes) to hunt down big game, *Homo erectus* also begins to master the use of fire.

The oldest traces of *Homo* outside Africa are 2.1 million-year-old cut stones discovered in China, with no indication as to which species produced them. Among the first migrants are *Homo georgicus*, *ergaster*, *erectus* and *heidelbergensis*, the ancestor of *Homo neanderthalensis* who, living in regions affected by a succession of glaciations, was forced to feed on mainly meat and fish. Stronger than *Homo sapiens* and with a slightly larger brain, it was one of the first species to bury its dead. A close cousin, *Homo denisovensis*, represented only by a finger phalanx, a toe bone and two teeth, was found in the cave of Denisova in southern Siberia. However, the DNA in his bones clearly identified him as a species distinct from his contemporaries.

### OUR SPECIES

Discovered in Morocco and dated ~315,000, the oldest remains of *Homo sapiens* had a brain volume twice that of *Homo erectus*, whose inventions he exploited, such as the use of sophisticated tools and weapons or the cooking of food. Far less energy is spent in chewing or digesting cooked food (meat and vegetables). Adapting to the new diet, his jaw decreased in size, allowing for considerable enlargement of the cranium with a corresponding increase in brain volume. Simultaneously, the cortex surface increased by folding inside the skull, thus forming convolutions characteristic of the brains of more recent species.

From about 10,000 years ago, *Homo sapiens* embraces both edible crops and animal husbandry. He selects a few plant and animal species that may be reproduced locally. The resulting abundance of less diversified food, together with a more sedentary lifestyle, leads to an increase in births.

