Sahelanthropus, the oldest representative of humanity, was indeed bipedal

August 24 2022

Left: 3D models of the postcranial material of Sahelanthropus tchadensis. From left to right: the femur, in posterior and medial view; the right and left ulnae, in anterior and lateral view. Right: Example of analysis performed to interpret the locomotor mode of Sahelanthropus tchadensis. 3D cortical thickness variation map for the femurs of (from left to right) Sahelanthropus, an extant human, a chimpanzee and a gorilla (in posterior view). This analysis enables us to understand the variations of mechanical constraints on the femur and to interpret these constraints in terms of locomotor mode. Credit: © Franck Guy / PALEVOPRIM / CNRS – University of Poitiers

The acquisition of bipedalism is considered to be a decisive step in human evolution. Nevertheless, there is no consensus on its modalities and age, notably due to the lack of fossil remains. A research team,

involving researchers from the CNRS, the University of Poitiers and their Chadian partners, examined three limb bones from the oldest human representative currently identified, Sahelanthropus tchadensis. Published in *Nature* on August 24, 2022, this study reinforces the idea of bipedalism being acquired very early in our history, at a time still associated with the ability to move on four limbs in trees.

At 7 million years old, Sahelanthropus tchadensis is considered the oldest representative species of humanity. Its description dates back to 2001 when the Franco-Chadian Paleoanthropological Mission (MPFT) discovered the remains of several individuals at Toros-Menalla in the Djurab Desert (Chad), including a very well-preserved cranium. This cranium, and in particular the orientation and anterior position of the occipital foramen where the vertebral column is inserted, indicates a mode of locomotion on two legs, suggesting that it was capable of bipedalism.

In addition to the cranium, nicknamed Toumaï, and fragments of jaws and teeth that have already been published, the locality of Toros-Menalla 266 (TM 266) yielded two ulnae (forearm bone) and a femur (thigh bone). These bones were also attributed to Sahelanthropus because no other large primate was found at the site; however, it is impossible to know if they belong to the same individual as the cranium. Paleontologists from the University of Poitiers, the CNRS, the University of N'Djamena and the National Center of Research for Development (CNRD, Chad) published their complete analysis in *Nature* on August 24, 2022.

Collection working session between Franck GUY (left) and Guillaume DAVER (right), at the PALEVOPRIM laboratory, Poitiers (CNRS/University of Poitiers). Credit: © Franck Guy / PALEVOPRIM / CNRS – University of Poitiers

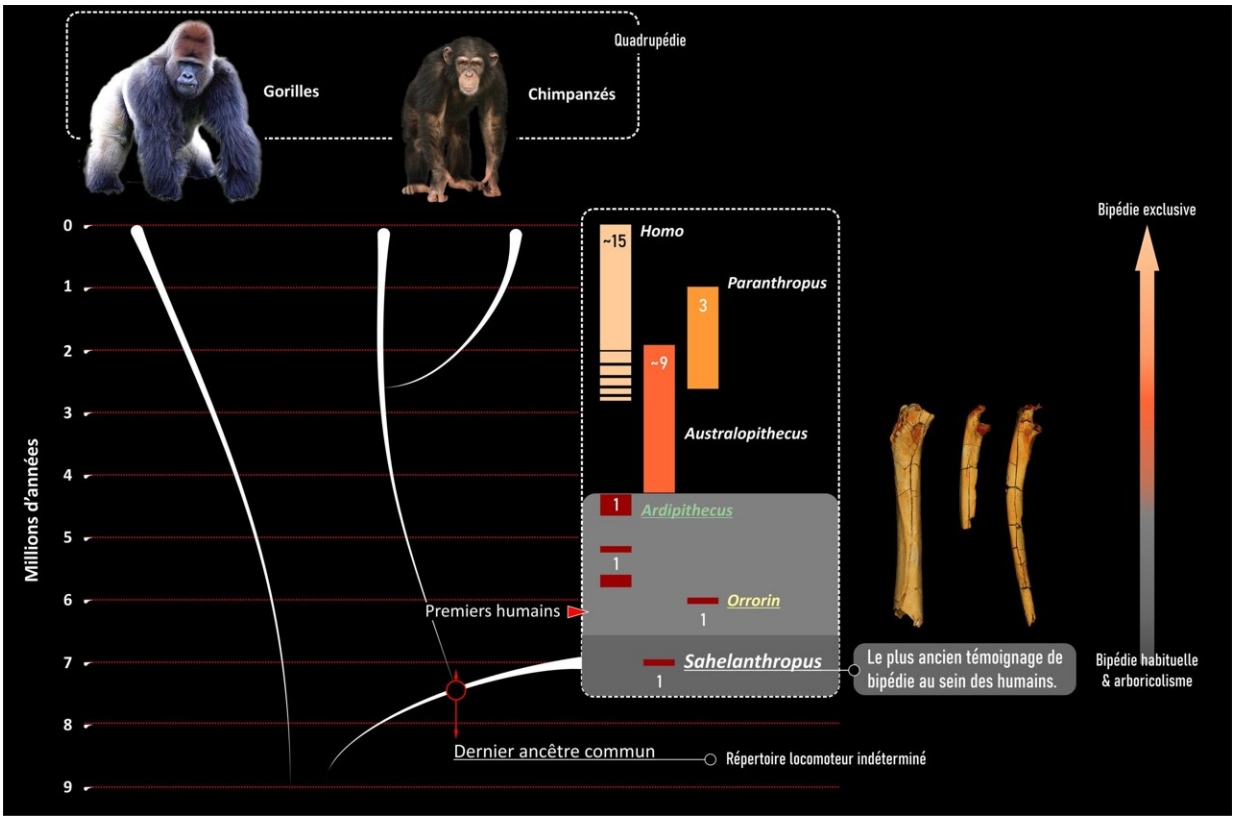
Representation of the modes of locomotion practiced by Sahelanthropus. Bipedalism was common among the earliest known representatives of the humankind, probably on the ground but also in trees. It coexisted with other types of movement in a tree environment, including quadrupedal movement using firm hand grips, clearly differing from that of gorillas and chimpanzees who use the back of their phalanges for support ("knuckle walking"). Credit: © Sabine Riffaut, Guillaume Daver, Franck Guy / PALEVOPRIM / CNRS – University of Poitiers

The femur and ulnae were subjected to a battery of measurements and analyses, concerning both their external morphology, and their internal structures using microtomography imaging: biometric measurements, geometric morphometrics, biomechanical indicators, etc. These data

were compared to those of a relatively large sample of extant and fossil apes: chimpanzees, gorillas, orangutans, Miocene apes, and members of the human group (Orrorin, Ardipithecus, australopithecines, ancient Homo, Homo sapiens).

The structure of the femur indicates that Sahelanthropus was usually bipedal on the ground, but probably also in trees. According to results from the ulnae, this bipedalism coexisted in arboreal environments with a form of quadrupedalism, that is arboreal clambering enabled by firm hand grips, clearly differing from that of gorillas and chimpanzees who lean on the back of their phalanges.

The Djurab Desert, where the fossil sites that yielded the postcranial remains of Sahelanthropus tchadensis are located. Credit: © MPFT, PALEVOPRIM / CNRS – University of Poitiers



Humanity separated from the chimpanzee group during the recent Miocene, most probably between 10 and 7 millions of years before present. This divergence resulted in very distinct morphologies: the limb bones, for example, present differences notably linked to a quadrupedal locomotion for chimpanzees and a bipedal locomotion for extant humans. Credit: © Franck Guy / PALEVOPRIM / CNRS – University of Poitiers

The conclusions of this study, including the identification of habitual

bipedalism, are based on the observation and comparison of more than twenty characteristics of the femur and ulnae. They are, by far, the most parsimonious interpretation of the combination of these traits. All these data reinforce the concept of a very early bipedal locomotion in human history, even if at this stage other modes of locomotion were also practiced.

More information: Franck Guy, Postcranial evidence of late Miocene hominin bipedalism in Chad, *Nature* (2022). DOI: 10.1038/s41586-022-04901-z.
www.nature.com/articles/s41586-022-04901-z

Standing up for the earliest bipedal hominins, *Nature* (2022). DOI: 10.1038/d41586-022-02226-5

Provided by CNRS