



**Figure 1 | A hominin taxonomy.** Species are ordered according to the period of their fossil record and, left to right, according to their resemblance to modern humans: those with large brains, small chewing teeth and jaws similar to those of *Homo sapiens* are found to the left, those with large chewing teeth and jaws to the right. *Australopithecus afarensis*, an infant female specimen of which has been found in Dikika, Ethiopia<sup>1,2</sup>, lived between 4 million and 3 million years ago. Its small brain is not much larger than that of a chimpanzee, but its dentition has features akin to those found in more modern hominins.

the inside of your elbow against which your left thumb rubs if you hold your right elbow with your left hand. In a three-year-old infant, this tiny piece of bone is still separate from the main shaft of the humerus. One must travel forward in time more than three million years, to a Neanderthal infant from Dederiyeh<sup>6</sup>, Syria, to find a comparably complete hominin infant skeleton.

This anatomical cornucopia was not evident when the specimen was found in 2000: most of the Dikika infant was invisible, hidden within a slab of sandstone. Zeresenay Alemseged has devoted many thousands of hours over a five-year period to removing, painstakingly, the cement-like matrix that surrounds the delicate bones. The patience, time, skill and effort required to preserve and expose the morphology of this and other similar early hominin fossils<sup>7</sup> should not be underestimated.

But why are Alemseged *et al.*<sup>1</sup> so sure that the infant belongs to *A. afarensis*, and can we have confidence in its age — both the geological age of the fossil and the age of the child it represents? The geological age is secure. The Dikika sediments contain crucial evidence of the same layers of ash that have provided reliable argon–argon isotope ages at other East African fossil sites<sup>2</sup>. There are also subtle and not so subtle differences between the faces of *A. afarensis* and the other hominin taxa known from similarly aged rocks, and the Dikika infant already shows signs of the type of upper jaw and nasal morphology that is seen only in *A. afarensis*. These signs are a rounded area above the upper teeth; a separation between the bone covering the roots of the upper canine teeth and the edge of the opening for the nose; and hourglass-shaped nasal bones that fit into a recess in the frontal bone much like a tenon fits into a mortise.

The second of the two age estimates, the chronological age of the infant, is less secure.

All one can do is use the kind of computed-tomography imaging familiar from modern hospitals to compare the development of the yet-to-emerge permanent tooth germs of the Dikika infant with the teeth of modern human and chimpanzee infants of known ages<sup>8</sup>. The best match is with three-year-old chimpanzees. But it is highly unlikely that the pace of development of *A. afarensis* was exactly the same as that of modern chimpanzees. So, for now, the chronological age of the Dikika infant must remain an informed guess.

The discoverers of the Dikika fossil have only just begun the task of capturing all the data contained in the specimen, but already these preliminary data<sup>1</sup> are informing the controversy of how *A. afarensis* moved. If its mode of locomotion was exclusively on two legs, one would expect that the limb bones and the organs that help it to balance would be more similar to those of the only living bipedal higher primate (that is, us) than to those of chimpanzees and gorillas. These primates walk on two feet only rarely, if at all.

Alemseged *et al.*<sup>1</sup> pay careful attention to the shoulder, hand and the semicircular canals of the inner ear, the morphologies of which record the motion of the body. The shoulder-bone (scapula) of the fossil is more like that of a gorilla than a modern human, and the bones of the only complete finger are curved like those of a chimpanzee. Chimpanzee finger bones begin life only slightly curved, but become more curved when the hands are used to climb branches<sup>9</sup>; this is what seems to have happened in the case of the Dikika infant. Lastly, images of the inner ear of the specimen show it to have semicircular canals more like those of chimpanzees than of modern humans<sup>10</sup>. The fluid-filled semicircular canals are crucial in maintaining balance, and so all three lines of evidence suggest that the locomotion of *A. afarensis* was unlikely to



## 50 YEARS AGO

If Pierre Charron in his "Treatise on Wisdom" was himself wise, the true science and study of man is man. Things, of course, were easier in the sixteenth century, when fossil men were not in the laboratory or the study... Alas, in recent years the study of man has been attempted and magnified by all classes and conditions of men: geologists and palaeontologists; anatomists and anthropologists; statisticians and geneticists; blood-group specialists and geochronologists; and adventurers and plain unvarnished liars. From *Nature* 22 September 1956.

## 100 YEARS AGO

The recent correspondence on the subject of radium, started in the *Times* by Lord Kelvin, has... apparently closed without any very definite conclusion being reached... Lord Kelvin's opening challenge was broad and sweeping. He took exception to the statement... that the production of helium from radium has established the fact of the gradual evolution of one element into others, and denied that this discovery affected the atomic doctrine any more than the original discovery of helium in cleveite. The obvious conclusion was that both cleveite and radium contained helium. He also stated that there was no experimental foundation for the hypothesis that the heat of the sun was due to radium, and ascribed it to gravitation... Prof. Armstrong, it is true, immediately enrolled under Lord Kelvin's banner... [His] letter merely served to provide Sir Oliver Lodge with justification for his favourite theme, which appears to be that whereas chemists have an instinct of their own for arriving at their results, reason is the monopoly of the physicist, whose results the chemist usually manages to absorb in the end. No better argument against the unfairness of this could be provided than by the history of radio-activity itself, which owes at least as much to the chemist as to the physicist. From *Nature* 20 September 1906.

50 & 100 YEARS AGO