

## b44 Australopithecenes < southern ape, root hominin, forest >

We think back with repugnance to that ancient biological pre-human scene whence we came; there *no* life was a sacred thing. There, millions of years of pain went by without one moment of pity, not to speak of mercy. —Charles Sherrington, *Man on his Nature*, 1940.<sup>1</sup>  
 (Ether anesthesia was first successfully used 17th October, 1846, and declared the surgeon John Collins Warren (1778-1856) with tears in his eyes: “Gentlemen, this is no Humbug.”)<sup>2</sup>

In 1912 was the Piltdown hoax: “the man that never was.” The perpetrator is usually identified as Charles Dawson (1864-1916), an English solicitor and amateur geologist who vaingloriously used *dawsoni* as the species designator for a prehistoric reptile, a mammal, and a plant that he found, and his fourth “discovery” in a Sussex gravel pit of *Eoanthropus dawsoni*, “Dawson’s Dawn Man” (correctly identified in 1953 to be a fraud composed of a human skull of medieval age, a 500-year-old lower jaw of a Sarawak orangutan and filed-down to look human chimpanzee fossil teeth).<sup>3</sup>



So “the most important event of paleoanthropology in the 20th century” was truly when **Raymond Arthur Dart** (1893-1988) in 1925 finally extracted (from a block of limestone that had been blasted free at the Buxton Limeworks quarry, Taung (now in Bophuthatswana), Transvaal, South Africa) part of a skull and jaw of an individual intermediate between a human and an African great ape. The “**Taung skull**” size is that of an adult chimpanzee but Raymond Dart saw it to be that of a young child (the erupted teeth in the jaw, other than the first permanent molars, are deciduous). The jaw is humanlike in the shape of its dental arcade (parabolic rather than U-shaped) and the skull in the comparatively large size of its brain cavity is decidedly not chimpanzee. Anatomical features of the skull and an endocranial cast (which shows the pattern of structures existing on the surface of the brain) indicated to Dart that his fossil represented an upright-walking link between humans and (other) apes. Dart’s cautious name for this first discovered African “ape-man” was *Australopithecus africanus* (southern African

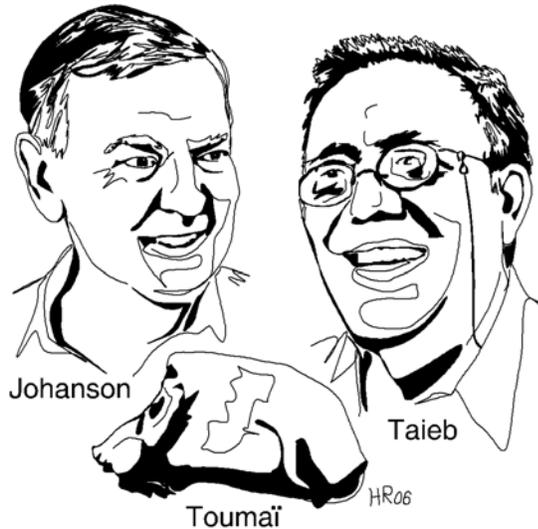
ape).<sup>4</sup> Surprise enough for most people and for newspaper headlines. What was an “ape” doing so far south of the equator where cold winters exclude living wild apes?

Dart’s interpretation was rejected by the scientific community until at Sterkfontein, South Africa, Robert Broom (1866-1951) found a second australopithecine in 1936 (a cranium, face, and upper jaw), a third in 1947 (a very well preserved adult cranium, brain size about 485 cc.) dubbed “Mrs. Ples” (as it is thought to be female), and with Don Robinson a fourth in 1949 (a nearly complete vertebral column, pelvis, some rib fragments, and part of a femur of a tiny adult female).<sup>5</sup> The *Au. africanus* pelvis, decidedly more human than apelike, is strong evidence that it was bipedal, although not with modern human’s strong striding gait. Age of *Au. africanus* at Sterkfontein is about 2.5 million years.

Australopithecenes were hominins. This is shown by the position of their foramen magnum which is further forward than in knuckle-walking (evolved in parallel in chimpanzee and gorilla)<sup>6</sup> apes and indicates that australopithecenes walked upright habitually. Their range was exclusively Africa. Evolutionary trends in the hominins were to decreasing tooth-size and to increasing brain-size (**Figure b44.1**) but with brain size small at birth.<sup>7</sup> In proportion to leg length, the arms of *Au. africanus* (2.6 to 3 million years ago) are relatively long indicative of a retention of tree-climbing ability. *Au. africanus* became extinct 2.4 million years ago but *Au. robustus* (*Paranthropus*) continued to coexist for a further million years as distinct species along side *Homo* species.

In 1946, Dart began investigations of the Makapansgat Limeworks cave which yielded several *Au. africanus* among a vast “carried in” selection of other mammal bones that could have been useful

to the ape-men as tools and weapons. Charles Kimberlin (Bob) Brain (1931-) recalls that when he had asked Dart why his serious scientific writing included images as: “[In] the predatory transition from ape to man [our ancestors] slaked their ravenous thirst on the hot blood of victims and devoured livid, writhing flesh,” his reply had been: “That will get ‘em talking.” Brain later reassessed the evidence for Dart’s “osteodontokeratic (bone-tooth-claw) culture.” His more realistic African cave taphonomy indicated that the cave had been a repository for leopard’s carrion and Dart’s “mighty hunters” were likely to have been “the hunted.” As his alternative ideas emerged, Brain discussed them all with Dart and he relates this anecdote: “To my great relief, he was delighted, saying: ‘This is wonderful—at last we are getting closer to the truth!’ He immediately nominated me for an award.”<sup>8</sup>



The known variety of australopithecenes became rapidly added to after **Maurice Taieb**, who first explored the entire Afar region, discovered Hadar and other Pliocene hominin sites in the Awash Valley. *Australopithecus garhi* is known from 2.5 million year old cranial and dental remains from the Hata beds of Ethiopia’s Middle Awash.<sup>9</sup>

The known range of australopithecenes was greatly extended by Michael Brunet’s finding in 1997 at Bahr el Ghazal near Koro Toro, Chad (**Figure b44.2**), of an australopithecene mandible associated with animals biochronologically estimated to be 3.0 to 3.4 million years old (Middle Pliocene). The sediments (poorly consolidated, fine-grained sandstone) and animals of the australopithecene site record lakeshore locations in areas of woodland and savannah (a word of Floridian-Indian language origin, is used in Africa and elsewhere to describe a grazed grassland

dotted with trees with canopies above grass fire and non-climbing predator level).<sup>10</sup> Significantly, there, non-hominin ape fossils are absent. This suggests that such were confined, as is the preference of chimpanzees today, to more forested habitats. Australopithecenes could have been forest dwellers who forayed as scavengers into the savannah and so split their time between tree climbing and two-legged walking. The presence of primitive australopithecenes west of the Great Rift Valley of Africa lessens the likelihood that its coming into being 5 million years ago had much to do with the divergence of our ancestors and those of chimpanzees (isolated, today, to its west).

Ancient (3 to 3.6 million years ago) gracile australopithecenes found in East Africa are called *Australopithecus afarensis*. Best known of these is the 3.2 million year old fossil “Lucy” found by **Don Johanson** in 1974 and named for *Beatles’* LSD referent song popular at the time.<sup>11</sup> Advanced features of *Au. afarensis* are humanlike foot structure (nonopposable big toe), pelvis shape, and relatively short arms in proportion to leg length (suggesting less time was spent in trees for feeding, sleeping, and protection). Its apelike features are long and curved fingers, relatively long arms, funnel-shaped chest, and, reported by Brian G. Richmond and David S. Strait in 2000, wrist bones that could lock to facilitate knuckle walking as in the quadrupedal locomotion of African apes wherein forward body weight is supported on the backs of the second of the three rows of finger bone.<sup>12</sup>

Did the later *Au. africanus* revert to more primitive condition in these features? Lee Berger has long held, and Henry McHenry concurs, that the East African *Australopithecus afarensis* was a sister species to an as-yet undiscovered species that evolved into the South African *Au. africanus* (that is more apelike than stone tool using if not making<sup>13</sup> *Au. afarensis*).<sup>14</sup>

To add to the puzzle is a 3.5 million year old Lucy-like skull, but with smaller teeth and flatter face, found by Kenyan researchers, including Meave Leakey, when on a 1998-99 National Geographic Society expedition. Continuing the splitters tradition of the Leakeys, Meave favors the classification of this as a new species *Kenyanthropus platyops* (flat face).<sup>15</sup> As such, it could be on the line to the

*Homo* genus (which is decidedly not so for the later Australopithecine species). In keeping with the bushiness of our ancestral tree (**Figure b44.3**),<sup>16</sup> the divergence to a species of our own genus *Homo* could have already been well underway: In 1978, at the *Footprint Tuff* site (so called for the thousands of fossilized tracks, including the footprints of elephants, giraffes, rhinoceroses and several extinct Pliocene mammal species preserved there in ash falls erupted from Sadiman, a Great Rift Valley volcano) that Mary Leakey was studying, Paul I. Abell discovered footprints made by hominins that walked bipedally and had a *modern* foot shape. These 3.6 million year old footprints, 20 kilometers east of Laetoli, Tanzania, are still the oldest direct evidence of hominin behavior.<sup>17</sup>

With more primitive teeth and skull features than *Au. afarensis*, are australopithecines, called *Australopithecus anamensis*, 4.07-4.17 million years old.<sup>18</sup> The unsurprise is the mixture of features so that Ian Tattersall can write: “Fragments of the tibia (shinbone) show that *Au. anamensis* almost certainly walked upright”<sup>19</sup> (as its toe bone is shaped like australopithecine Lucy’s); and, Owen Lovejoy can write: “subtle but clear evidence is that *Ardipithecus* walked on two legs,”<sup>20</sup> but Richmon & Strait can write: “*A[u]. anamensis* and *A[u]. afarensis* retain specialized wrist morphology associated with knuckle-walking”<sup>21</sup> (so removing *Au. afarensis* from the clade hominin).

In 1994, Tim White, Gen Suwa and Berhane Asfaw reported that fossils of 17 individual hominins (skull fragments, teeth, arm bones, and part of a child’s lower jaw) in the Afar area of Ethiopia belong to a previously unknown 4.4 million year old hominin species. They named this earliest then known hominin species *Australopithecus ramidus*<sup>22</sup>—since renamed *Ardipithecus ramidus* (*ramid* means *root* in the local Afar language).

In 2001, Yohannes Haile-Selassie described from Ethiopia the fragmentary remains (a partial jaw, a few teeth, several hand and foot bones, and pieces of an upper-arm bone and a collarbone) of at least five *Ardipithecus* individuals who lived 5.2 to 5.8 million years ago. The bones are chimp sized. Dental features are as in other hominins but not in any fossil or living ape. In particular *Ardipithecus kadabba* represents an early phase in the development of human anterior teeth; a transition between unimpressive canines (characteristic of *Homo* and *Australopithecus*) that wear down from the tips, and large, daggerlike canines (characteristic of chimpanzees).<sup>23</sup>

The rise of bipedalism in hominins has commonly been rationalized as adaptation to grassy savannas—to look over its tall grass (somewhat ingenuous, as mature grass variably stands 3-6 feet high), or to dissipate heat when trekking across its hot distances (where presumably grass is seasonally low, grazed down, burned off, or absent due to drought). Recently, Noel T. Boaz implicates in his book *Eco Homo* (1997) the episodic drying of the Mediterranean 5.5 million years ago to a salt lake, the “Messinian event” (see Topic b45). His scenario is the instantiation of the Sahara in what had been forested north Africa. Increasing aridity fragmented the forest and opened out areas to grassland in which our ancestors found opportunities.<sup>24</sup> Yet associated fossils of extinct elephants, rats, and monkeys and soil chemical-analyses by Giday Wolde-Gabriel indicate for *Ardipithecus* a shady forest habitat.<sup>25</sup> What selected for the bizarre mode of locomotion, which is bipedalism, has found 13 overriding-single-cause explanations.<sup>26</sup> To these are added nuanced just-so stories: *Lowly Origin* by Jonathan Kingdon,<sup>27</sup> *Upright* by Craig Stanford,<sup>28</sup> and, extrapolating from orangutans’ hand-assisted locomotion on flexible branches, a preadaptation, by S. K. S. Thorpe.<sup>29</sup>

A French team in 2001 announced the discovery in Kenya of a 6 million year old new genus *Orrorin* (local Kenyan for “original man”) *tugenensis* with femurs indicative of bipedalism and modern-looking thickly enameled molars and robust jaws intermediate between non-hominin apes and hominins.<sup>30</sup>

In Chad, a fossil assemblage 42 of animal species (includes fish, crocodiles, turtles, hippopotamuses, monkeys, rodents, and antelopes of a forested and grassed lakeland) indicates an age of 6 and 7 million years for the layer worked in 2001 by Michael Brunet in which Ahounta Djimdoumbaye found a nearly complete skull, two lower-jaw fragments, and three isolated teeth of *Sahelanthropus tchadensis*. Dubbed “**Toumaï**,” which means “hope of life” in the local African dialect, this primate has the small teeth and flat face of a hominid with a chimp-size brain—if male (as its visorlike brow

does suggest). However, if a female, Christopher B. Stringer suggests, Toumaï is likely to be a small version of the male skulls in an ancient ape lineage.<sup>31</sup>

Human and chimpanzee DNA sequences differ on average by 1.2 percent. This scales divergence from a common ancestor to about 4 to 6 million years ago. DNA differences scale divergence of humans from gorillas to about 6 to 8 million years ago, and from orangutans to about 12 to 16 million years ago. Apes and monkeys diverged from a common ancestor as exemplified by *Saadanius hijazensis* (*saadan* is the Arabic term for apes and monkeys) some 30 to 35 million years ago.<sup>32</sup>

Modern primates have relatively large brains, limbs capable of prodigious leaping, and to help this and for spotting insects and other prey to be caught, forward-facing eyes for stereoscopic judgement of distance and grasping hands and feet with nails instead of claws. 55 million years ago, small long-tailed, members of the genus *Carpolestes*, had long hands and feet and, diagnostic of primates, grew nails on opposable digits, but had claws on its other fingers and toes. From a fairly complete fossil, excavated in Wyoming, and first described by Jonathan I. Bloch in 1994, *Carpolestes* clung to branches. This close relative of a yet to be identified contemporary ancestor of monkeys, apes, and people did not have limbs designed for leaping, and had side-facing eyes.<sup>33</sup>

A tiny prosimian Eocene fossil jaw (*Eosimias*, “dawn monkey”) found by Wen Chaohua, suggests to Chris Beard that the common ancestor of monkeys, apes and humans evolved in Asia.<sup>34</sup> □

### Figure b44.1<sup>35</sup> Brain size and total tooth volume comparisons

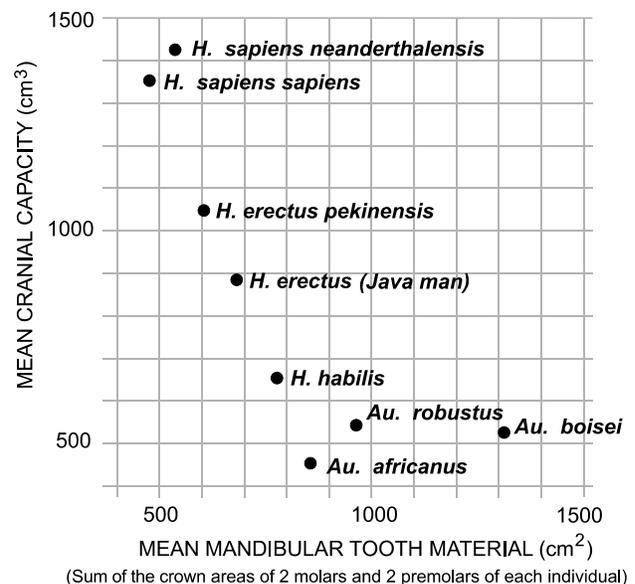
The cerebral cortex is the part of the brain that, for better or worse, makes us human. Children who have abnormal development of the cerebral cortex fail to achieve the kind of talents we pride ourselves on, such as language.  
—Christopher A. Walsh.<sup>36</sup>

And language constrains the way we experience the world and even how we think.<sup>37</sup>

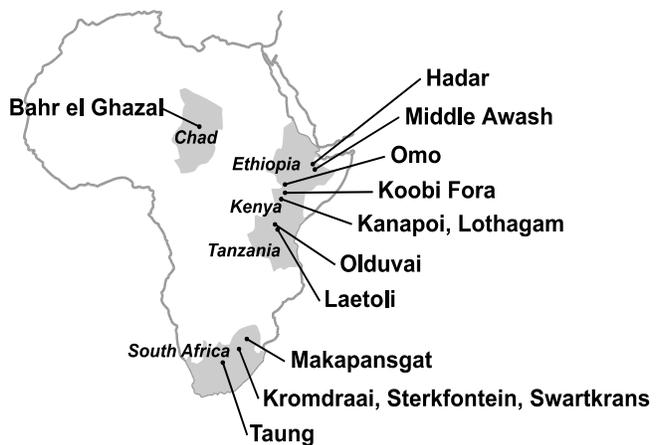
The cerebral cortex is essentially a flat sheet. In a mouse’s skull, it covers the brain neatly as a smooth sheath. Our skull cavity is far larger but not to the proportion of the human cerebral cortex that is 1,000 times the area of a mouse’s and is the largest structure of the human brain. To fit, the human cerebral cortex, which is a little thicker than orange peel, folds and refolds into the deep creases of our brain’s surface. Canine and premolar comparisons are another issue. David R. Began summarizes: “Crowned interlocking canines are usually associated with agonistic (aggressive) displays typical of primate societies characterized by strong male competition. A shorter canine crown in humans is interpreted as an indication of greater levels of male coalitionary behavior, or at least reduced competitiveness. Chimpanzee males are intermediate between humans and most other great ape males in canine crown height and competition levels, and “pygmy [*sic*] chimpanzee” or bonobo (*Pan paniscus*) are intermediate between chimpanzees (*Pan troglodytes*) and humans. But the remarkable reduction of canine crown height in humans is thought to signal a dramatic increase in the degree of male cooperation, cited as a hallmark of human origins.”<sup>38</sup>

Note: Chimpanzees were never cave dwellers and the species name *Pan troglodytes* is a whimsy coined by German physiologist and anthropologist Johann Friedrich Blumenbach (1752-1840), after a perhaps mythical (from the Middle Ages) African race of cave dwellers.<sup>39</sup>

A molar and two incisors, collected near Lake Baringo in Kenya’s Rift Valley by Sally McBrearty from the Middle Pleistocene Kapthurin Formation that dates 545,000 years old and yields *Homo erectus* and *Homo rhodesiensis* fossils, were identified as chimpanzee by Nina Jablonski in 2005.<sup>40</sup> This rules out Adriaan Kortlandt’s hypothesis that the Rift Valley was a barrier that allowed for human and chimpanzee divergence.<sup>41</sup>



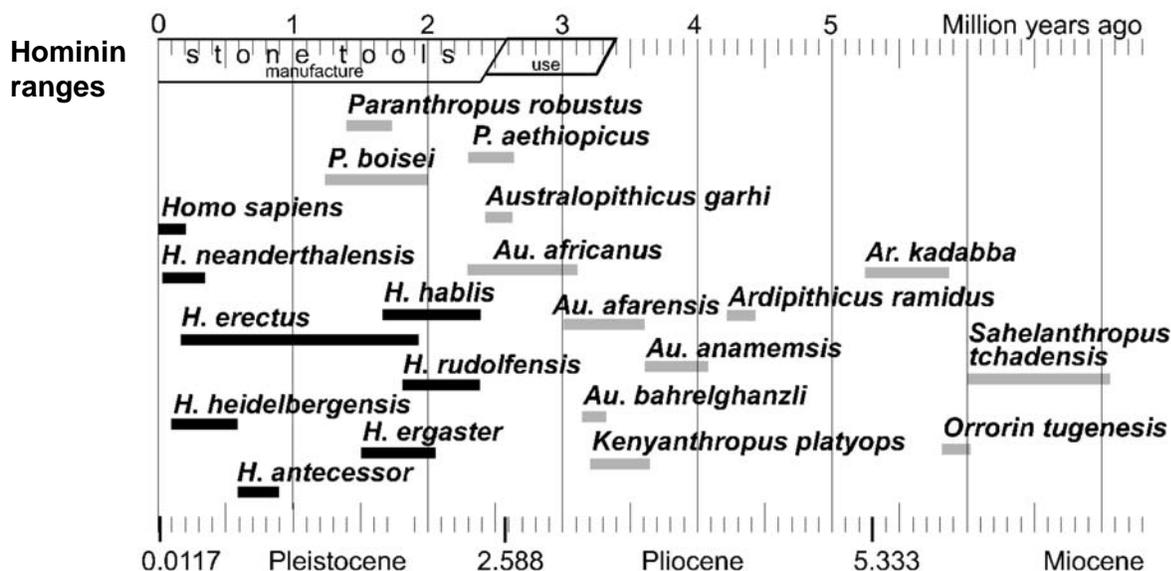
**Figure b44.2 Geographic locations of australopithecene sites**



**Figure b44.3 Which is our ancestor exactly?**

Are we evolved from Neanderthals or *H. erectus*? Definitely, we are not evolved from Neanderthals (*H. neanderthalensis*) who went extinct soon after some of our ancestors (*H. sapiens*) arrived in what had been Neanderthals' exclusive, and isolated, domain for a 130 thousands years. Our ancestors, of which only our line persists, evolved elsewhere from some 200 thousand years ago from and among more ancient species of our genus that diverged from *H. erectus* persisting in Flores, Indonesia, until 27 to 53 thousand years ago (?) and which evolved some 500 thousand years ago from and among Pleistocene hominin lines that diverged some 2 million years ago from surviving Pliocene hominin lines that radiated 4 million years ago from a line of the first Miocene hominins that had diverged sympatrically<sup>42</sup> some time 6 to 8 million years ago from a putative hominid ancestor in common with that of living chimpanzees.

Hominins evolved to adapt not so much to specific conditions, as is so for our less encephalized hominid cousins, but to face change with imagination and doings.<sup>43</sup>



*Musings:* Humans emerged on Earth after some 4.5 billion years of time. There is no good or found reason why it took so painfully long for this to happen. Also, the universe is at least 14 billion years old. Trillions of stars like our Sun (now halfway though its time to when, as a red giant, it evaporates Earth) are and were throughout the universe, and probably about many are and were Earthlike planets.<sup>44</sup> Life is not extraordinary and is likely to be or have been on any of these. Surely numerous places had ample time to have evolved self-aware life by at least 9 billion years ago. But only silence!

**Footnote b45.1** "Egypt is the Nile and the Nile is Egypt," scribed Herodotus and that contraction of habitability began 5000 years ago when hyperaridity set in throughout the Sahara where before for five millennia Neolithic nomads had herded cattle and hunted ostrich, giraffe, elephant and other animals as their desert rock paintings and carvings record and before for two hundred millennia Paleolithic hunters had ranged as their discarded stone tools record.<sup>1</sup> The Nile itself is a valley with a thick infill of alluvium that tops marine clays deposited in a channel that equals the Grand Canyon in depth but is more than three times as long to where it was discovered by the drilling-to-know in 1960 the geology of the Aswan High Dam site.<sup>2</sup> Evidently, the Nile had rejuvenated its course beginning some six million years ago when its flow for half a million years plus could seek grade with the dried-out floor of the Mediterranean basin and cut at Aswan 600 miles up river at elevation 500 ft above msl (present mean sea level) to 600 ft below msl and at Cairo to 8000 ft (~2.5 km) below msl.<sup>3</sup>