3 Breaking human

It is therefore probable that Africa was formerly inhabited by extinct apes closely allied to the gorilla and chimpanzee; as these two species are now man's closest allies, it is somewhat more probable that our early progenitors lived on the African continent than elsewhere.

Charles Darwin, *The Descent of Man*

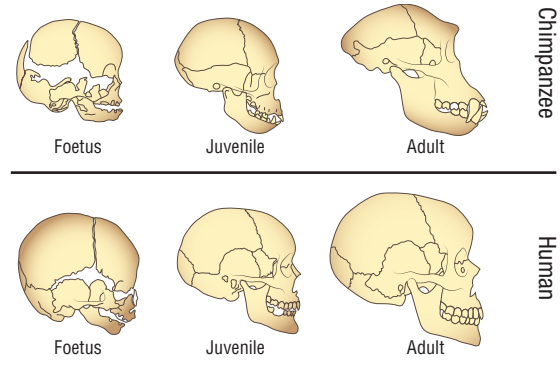
Perusing a zoo housing all living animals on Earth, most of us would conclude that out of all of them we most closely resemble the great apes. And among the great apes, we are closest to the chimpanzee in body and behaviour. It was this resemblance that led Darwin to reason that humans most likely evolved in Africa, home to the chimpanzees. He was proved correct many years later, starting with the discovery in 1924 of the 'Taung Child' skull in South Africa. The implication that humans and apes are related caused the greatest public resistance to Darwin's theory of evolution, and many objected strongly to Raymond Dart's interpretation of the Taung Child as a fossil intermediate between apes and humans. Despite all the subsequent fossil finds and artistic renditions of what our extinct ancestors looked like, many people today remain unwilling to acknowledge our evolutionary link to these distant relatives. This reluctance perhaps reflects the unsettling mix of the familiar and unfamiliar that we see in them. Culturally accustomed to thinking of ourselves as unique and separate from all other living as well as extinct life forms, and to believing we were created independently by a god, many find it difficult to accept that we evolved from an ape-like ancestor.

Raymond Dart holding the Taung Child skull

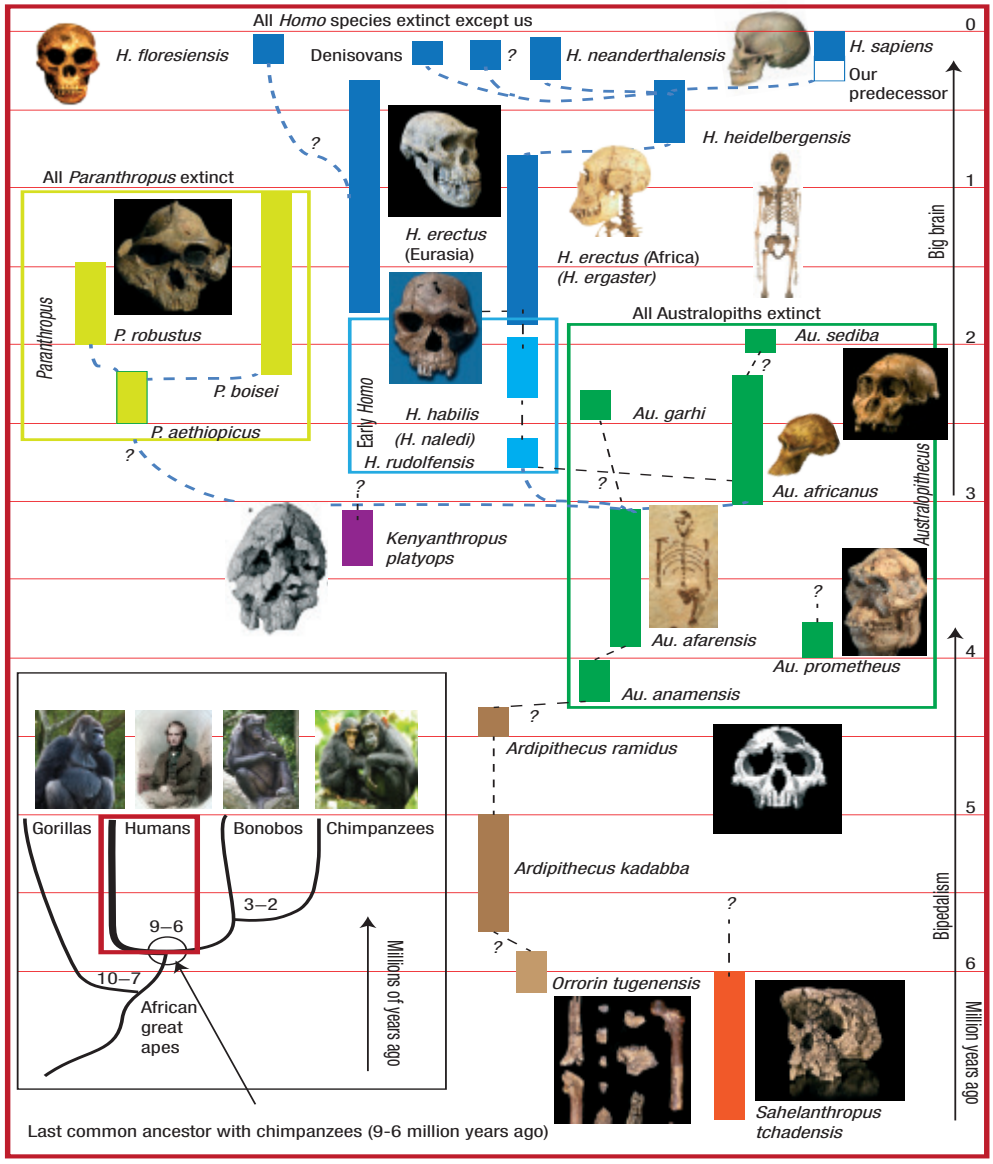
Although we may be closer to chimps than to any other animal alive today, most would also agree that we are, if not in kind then in degree, vastly different from chimps. These differences reflect just how far we have diverged from the apes since our lineage broke away. Chimps may be our closest living relative, but we did not descend from chimps. Rather, humans and chimps share a common ancestor from which both we and chimps diverged over the last 7 million years. Our shared ancestor was probably more gorilla- or chimp-like than human-like because our ancestors progressively left the forest to occupy the increasingly open habitats of woodland, savannah and grassland. It was in adapting to living on the ground as opposed to in the trees that our lineage first diverged from the other great apes.

Our close relationship to chimps is substantiated by the fact that we share an estimated 95% to 98.8% of our DNA with chimps. And yet we appear to be a lot more than 1.2% to 5% different from chimps. This discrepancy reflects how far a little tweaking of the genome can go in producing two closely related but very different species. Although we share many identical genes with chimps, how strongly and when these genes are expressed can produce very different outcomes. For example, by either slowing development up to when our ancestors reached sexual maturity (neoteny) or speeding up to when they reached sexual maturity (progenesis) could explain why we more closely resemble infant as opposed to adult chimps. Relatively few changes in our DNA can produce significant differences because the expression of our traits and features involves the complex interaction of many genes as well as factors outside our genome, such as environmental and cultural influences.

Seven million years is a long time over which natural selection and other processes of evolution could shape our lineage. Since our breakaway, a total of perhaps as many as 25 different species or subspecies of our lineage have so far been discovered. These different species define our hominin (Hominini) tribe, which sits as a



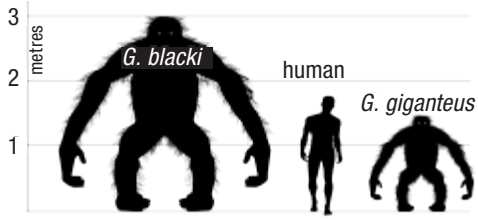
We more closely resemble infant than adult chimps



nested side branch within the great ape family tree. Similar to our descent through the much larger vertebrate tree of life presented in Chapter 2, our hominin tree or lineage includes species both within and outside of our direct line of descent. Many gaps in the fossil record remain and the details are debated as to how all of the known fossils in our lineage relate to one other. However, the many discoveries since the Taung Child provide a reasonable outline of our evolution away from our ape ancestor.

The other living great apes have their own separate evolutionary lineages, but we know little about these. Once the land bridge connecting Africa to Eurasia was too

Fossils define as many as 25 extinct species that make up our hominin tribe, nested within the African great ape family tree (lower left), with the human (*Homo*) branch in blue



Estimated size of extinct giant apes

dry to support forests, the great apes evolved separately in Asia and Africa. Asia has two species of orang-utans, but the fossil record reveals extinct giant apes (*Gigantopithecus*) up to 3 metres tall and over 500 kilogrammes that lived up until around 300 thousand years ago. Among the African great apes there are two species of the genus *Gorilla*, the western gorilla and the eastern gorilla, and two species of the genus *Pan*, the chimpanzee and the bonobo. DNA evidence suggests chimpanzees and bonobos shared a common ancestor as recently as 1 to 2 million years ago. And, of course, there is us. Although perhaps as many as 4 to 5 species in our lineage – closely related to us and belonging to our genus *Homo* – managed to live until fairly recently, we *Homo sapiens* are the only member of our lineage still standing today. How did we initially break away from our great ape family and what were the major events that led to the evolution of our human genus *Homo?*

Walking on two legs

Besides birds, who carry it forward from their distant Cretaceous ancestors the dinosaurs, we are one of just a few animals to move about fully upright on two legs. It was the evolution of our unique striding gait that first set us apart from all other apes; our big brain evolved only much later. Walking upright on two limbs rather than four limbs to become fully bipedal has for a long time been explained by the savannah hypothesis, which views walking upright as a straightforward adaptation to an increasingly open, less treed habitat. How might the transition to walking have come about?

Tropical forests with their nearly continuous tree cover are the principal habitat of many modern apes. The orang-utans are mostly tree dwelling, and when they do walk on all fours on the ground they use their fists for support, whereas African

Some bipedal dinosaurs evolved into birds; gorillas and chimps knuckle-walk, while we stride fully upright