Walking with Ancestors

Simon Grose reports that the recent discovery of two hominid fossils in Kenya has stirred a debate about the identification of our ancestors.

Around 353,000 babies are being born into the world every day this year, including just 700 or so in Australia. Many of their parents – or parent – will worry about being able to properly feed them, or whether they may have contracted HIV in the womb.

Whatever circumstances these new children and their families face, every birth evokes a degree of hope. First, that the baby is fit and well. Beyond that, a myriad of hopes can be evoked – to lead their nation, to be rich, beautiful, a sporting champion, or merely that they will be fed, educated, and safe from harm.

But no parents cradle their newborn and wonder if they have spawned a new species. For the 150,000–200,000 years that our species has trod the globe, billions of *Homo sapiens* babies have been born, and none have broken the *Homo sapiens* mould.

Within that mould there has been much genetic variation. Some individuals are much taller or shorter than normal, others markedly more or less intelligent than normal. People with Down's syndrome carry one more chromosome than is normal, while others inherit chromosomal variations from the normal 23 pairs.None of these variations are sufficient to define them as other than *Homo sapiens*.

It happens though. The uncountable millions of species of plants and animals living now or in the past were all the product of a genetic shift from their forbears. For *Homo sapiens*, the fossil record contains evidence of at least 14 species that preceded us on the evolutionary pathway over the past 4.6 million years, either as direct ancestors or as relatives of those ancestors.

Fossil finds from the banks of Lake Turkana in Kenya, recently reported in *Nature*, opened a window onto this process. They also exposed different classificatory interpretations imposed by researchers, and revealed how the media can be led to exaggerate the implications of new scientific data.

In an article that is indicative of coverage around the world, Agence France Press reported: "The discovery of two fossils has challenged the belief that our ancestors *Homo erectus* evolved from *Homo habilis*, according to a new study [that] suggests that the two species may in fact have co-existed for some 50,000 years in East Africa".

This interpretation came off *Nature*'s publicity material, despite the authors' acknowledgement towards the end of their report that "it is nonetheless possible that *H. erectus* evolved from *H. habilis* elsewhere, and that the Turkana basin was a region of secondary contact".

For Prof Colin Groves of the Australian National University's School of Archaeology and Anthropology, the findings were interesting but untoward. "It just shows that *habilis* was there till much later than we thought, and reinforces that primitive species live alongside their descendants," he said. "I don't know whey they puffed it so much."

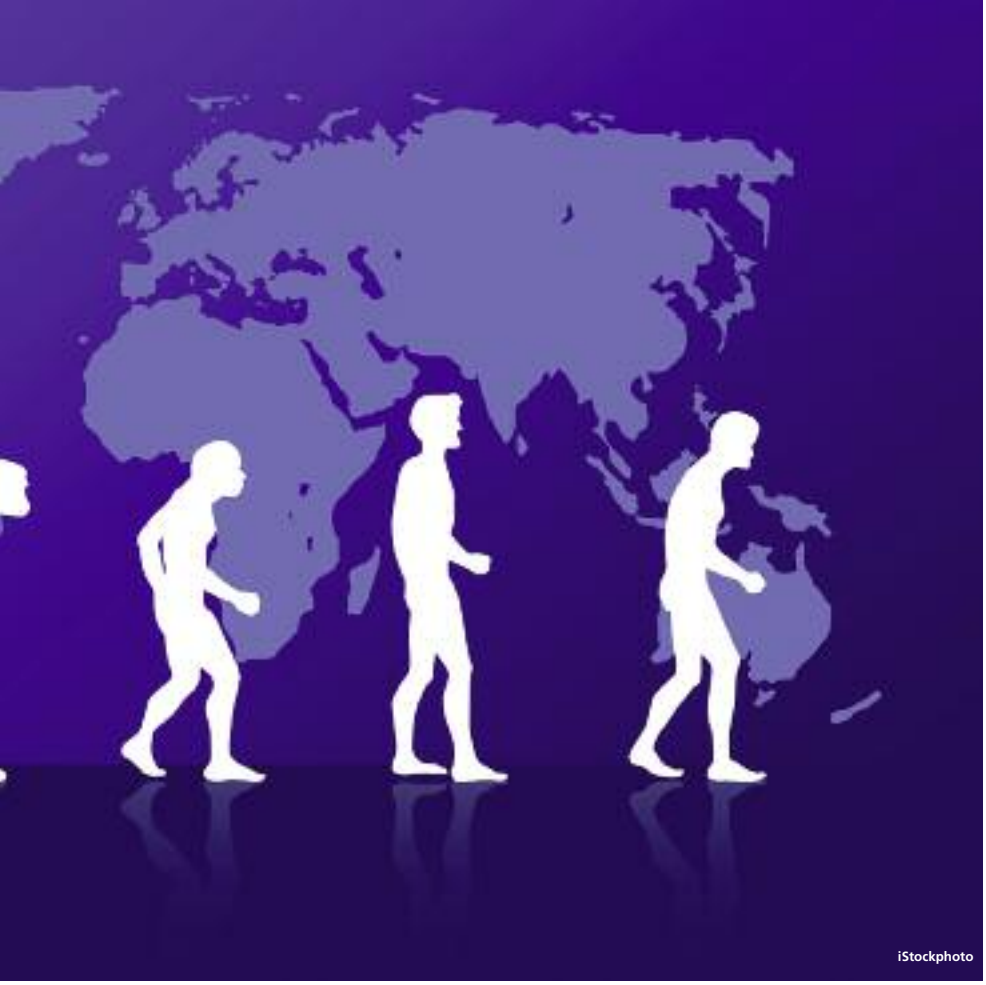
The deduction that *H. habilis* and *H. erectus* shared the same landscape at the same time is not new. In 2003, an edition of *Scientific American* devoted to human evolution opened with an artist's impression of the banks of Lake Turkana 1.8 million years ago. Both species were depicted in the same grassy woodland along with two other bipedal species, the bigger *Homo rudolfensis* and the more primitive *Paranthropus boesei*.

Nor do the *Nature* paper's authors deal with the fact that the fossil they classify as *Homo erectus* would be classified by others – including Groves – as *Homo ergaster*.

This highlights ongoing differences over the classification of ancient species in the fascinating area of human evolutionary theory. Whereas Groves and others see sufficient variation between fossils to classify *H. ergaster* and *H. erectus* as separate species, others see sufficient similarities to classify them both as *H. erectus*.

For those who classify them separately, *Homo ergaster* existed from 1.8–1.2 million years ago and *Homo erectus* branched of from this line around 1.3 million years ago, possibly surviving until as late as just 100,000 years ago. For the other camp it was the same species all along.

If the first theory is correct, *Homo erectus* was not a direct ancestor of ours but an earlier branch from *Homo ergaster*, from which *Homo sapiens* branched off later. If the second is true, *erectus* was one of our direct ancestors and lived alongside *Homo habilis*,



who has left no successors.

It's all a matter of degree because the longer a species survives, the more it changes. The fossil record between us and what most believe to be our immediate ancestor, *Homo heidelbergensis*, includes two dated at 195,000 years ago, of which Groves says one has several characteristics akin to *Homo sapiens*. These individuals were single genetic steps in a process that took tens of thousands of years, triggered by isolation of a core group.

Although, in Groves' judgement, *Homo erectus* existed as a species for around 700,000 years less than the *Nature* authors believe, "the end ones certainly are strikingly different from the early ones", particularly in the larger size of their brains.

This process of evolution within a species is termed anagenesis. The more dramatic event, when a species divides into two, is known as cladogenesis.

Geographic isolation is considered necessary for cladogenesis. "When a small part of a lineage becomes separate from the rest, changes occur very quickly in that small group… until finally new characteristics become fixed," Groves explains.

The "hobbit" species *Homo floresiensis*, whose remains were discovered on the Indonesian island of Flores in 2003, is an example where the nature of their environment provides strong clues to their evolutionary destiny. "The most likely explanation for its existence on Flores is long-term isolation, with subsequent endemic dwarfing, of an ancestral *H. erectus* population," its discoverers said in *Nature* in 2004.

Being isolated did not necessarily mean that the new species would be shorter than its forbears, but the particular environment in which they were isolated provided evolutionary pressure in that direction.

Tropical rainforests can be poor sources of the calories that a hominid needs, and there is yet no evidence that the hobbits were farmers in any way. Existing evidence indicates that the hobbits would have had a small variety of animal prey to hunt, and the biggest predators in the landscape were large lizards, of which the Komodo dragon is a modern survivor.

"Under these conditions, selection should favour the reduced energy requirements of smaller individuals," the authors wrote. "Dwarfing… may have been the end product of selection for small body size in a low calorific environment, either after isolation on Flores, or another insular environment in south-eastern Asia."

If the group that brought forth *Homo sapiens* did so because of their isolation, they must have had a different set of isolated circumstances to deal with. If our major difference to our predecessors is our intelligence, or our capacity to develop language, or our sense of consciousness, what kind of particular evolutionary pressures would have been required to cause that?

Groves says there are no obvious or agreed answers to this question. There is basic consensus that it happened in Africa, although the area between eastern Turkey and southern Israel is a possibility. The available evidence shows that *Homo heidelbergensis*, believed to be our immediate forbear, roamed in eastern and southern Africa. The oldest *Homo sapiens* fossils were found in modern Ethiopia, but that does not necessarily mean they first occurred there.

Somewhere, however, a bunch of *H. heidelbergensis* became isolated, probably due to a natural phenomenon such as an earthquake. Subsequent generations sourced from their limited gene pool produced genetic variations that allowed them to develop language and other skills that set them apart from their ancestors to the ultimate extent that a new species was created.

From their obscure isolation they spawned a species so successful that it now has more than 6.6 billion individuals roaming the globe. That, and the fact that around 200,000 more *Homo sapiens* are born each day than die, ensures a diminishing likelihood that any group of them will become sufficiently isolated anytime soon to kickstart a new breed.

So new parents should not expect their babies to be anything other than *Homo sapiens*.