Are orangs our nearest relatives?

Despite the similarity of the chimp genome to ours, a controversial paper claims a different ape as cousin

Graham Lawton

THESE days, we tend to accept without question that humans are "the third chimpanzee". The term, coined by author Jared Diamond, refers to the notion that our closest relatives are the two chimpanzee species – the common chimp and the bonobo. But could we actually be "the second orang" – more closely related to orang-utans than chimps?

That is the controversial claim made this week by Jeffrey Schwartz of the University of Pittsburgh in Pennsylvania and John Grehan of the Buffalo Museum of Science in New York (*Journal of Biogeography*, DOI: 10.1111/j.1365-2699.2009.02141.x)

The idea flies in the face of mainstream scientific opinion, not least a wealth of DNA evidence pointing to our close relationship to chimps. Schwartz and Grehan do not deny the similarity between human and chimp genomes, but argue that the DNA evidence is problematic and that traditional taxonomy unequivocally tells us that our closest living relatives are orang-utans.

Human evolution and phylogenomics researchers have so far given the paper a rough reception. Some declined to comment on it, saying they did not want to dignify the paper. One described it as "preposterous nonsense" and another as "loopy".

Others were less dismissive, though, agreeing that at least some of the ideas were worth discussing, if only to confirm the overwhelming evidence in favour of the orthodox view.

A case of misunderstood DNA

"The researchers say the evidence of genetic similarity between humans and chimps is problematic"

The *Journal of Biogeography*'s editors defended the decision to publish the paper, arguing that it is the best way to subject Schwartz and Grehan's argument to proper scientific scrutiny. Editor Robert Whittaker told *New Scientist* he had done some "soul searching" but eventually decided it was best to air the ideas.

In the orthodox account of human origins, our species belongs to a group of African apes that also includes chimps, bonobos and gorillas. Chimps and bonobos are our closest living relatives, sharing a common ancestor with us up to about 6 million years ago (see diagram). This version of events is strongly supported by DNA evidence showing that the human genome sequence is most similar to that of the chimp, followed by gorillas, with orangs the least similar of the three.

Schwartz and Grehan say that genome similarities cannot be taken as conclusive evidence of the closeness of our evolutionary relationships to the other great apes. In their scenario, around 13 million years ago, an orang-like ape lived across a huge swathe of land stretching from southern Africa to south-east Asia via southern Europe and central Asia (see map). This population evolved into different species, before extinctions in Europe and central Asia split the original geographical range and left

rump populations in east Africa and south-east Asia. The African population evolved into the human lineage while the Asian one evolved into orang-utans.

In this scenario, the other African apes are a separate lineage that split off from ours long before 13 million years ago, making orangs our closest living relative and the chimps and gorillas more distant.

This claim hinges on two contentious arguments. One is that DNA sequence similarity is not necessarily an indicator of evolutionary relatedness. The other is that, biologically, humans

"There are a few features shared with chimps but the bulk come out as shared with orangs"

are more like orangs than chimps.

The first of these is the most problematic, as almost everybody accepts genome sequences as the most reliable indicator of evolutionary relatedness. Humans share 98.4 per cent of their DNA with chimps, 97.5 per cent with gorillas and 96.5 per cent with orang-utans. This is widely taken as unassailable proof.

Grehan, however, argues that this is not scientifically justified. He points out that traditional taxonomy makes a distinction between two types of similarity – "derived novelties" and "primitive retentions". Derived novelties are traits shared by two closely related species and are taken to have evolved in a recent common ancestor. Primitive retentions are older traits with a deeper evolutionary past shared by a larger group of species.

The problem with molecular systematics, says Grehan, is it fails to distinguish between the two. "It does not matter that more DNA similarities may be found between humans and chimpanzees if these similarities are really primitive retentions," he says. The fact that humans and orang-utans are less genetically similar could be because orangs evolved more rapidly after splitting from a common ancestor with hominins.

Nonsense, says Maryellen Ruvolo, a human evolutionary biologist at Harvard University. "We know a lot about how DNA sequences change over time," and can distinguish between primitive retentions and derived novelties. Furthermore, she argues, the latest DNA sequence information indicates that humans share more derived novelties with chimps than with orang-utans.

David Reich, a geneticist at Harvard, agrees. "The molecular data overwhelmingly reject the notion that orang-utans are our closest relatives," he says.

The other half of the argument is a taxonomic analysis comparing the anatomies of humans, chimps, bonobos, orangs and 14 extinct species of ape. Based on this, Grehan and Schwartz argue that *Homo* species, orangs and australopithecines cluster into one "clade" with chimps and gorillas in another.

They say that many anatomical features we share with orang-utans appear to be recent novelties rather than primitive retentions. "There are a few features uniquely shared with chimps, but the bulk come out as [shared with] orangs," says Schwartz.

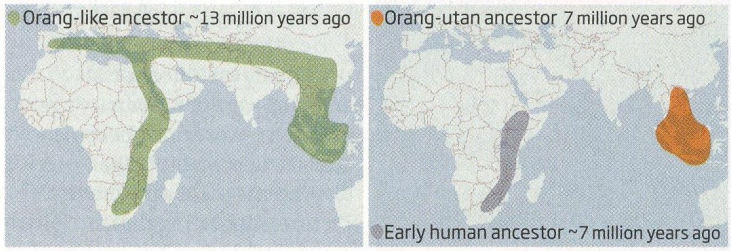
These include features of anatomy, reproductive biology and behaviour. For example, among the great apes only humans and orangs have thick tooth enamel, long hair, male facial hair, concealed ovulation, a preference for private, face-to-face mating, and an ability to construct shelters and beds. Mainstream opinion is these are due to parallel evolution.

According to Robin Crompton, an anatomist at the University of Liverpool, UK, Grehan and Schwartz's selection of species for phylogenetic analysis is "strange", and misses out key extinct species such as *Proconsul*, considered to be the ancestor of all great apes. Even so, the paper appears to contain some good ideas, he says. "The biogeographic ideas are really quite interesting."

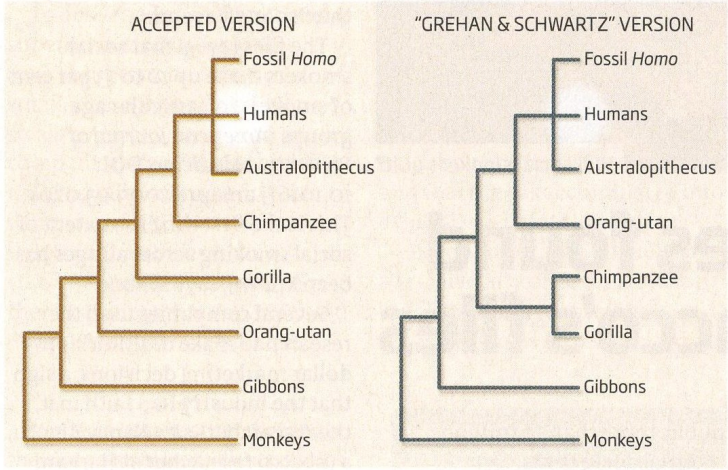
Ultimately, Grehan and Schwartz accept their claims are extraordinary but say they are worthy of proper consideration. "It's up for testing and debate," says Schwartz. ■

Our orang-like ancestor

Humans and orang-utans may have evolved from "rump" populations of an orang-like ancestor, according to Jeffrey Schwartz and John Grehan's theory



How humans fit into the family tree of apes



JAMES BALOG/AURORA

CHIMPS STILL NEW TO THE FAMILY

The idea that chimps are our closest living relatives is so entrenched that it is easy to forget that the notion was only accepted into the story of human evolution relatively recently.

Darwin himself proposed that humans evolved in Africa and shared a common ancestor with chimps and gorillas. Later biologists disagreed, though, arguing that the human lineage was so different from the other great apes that it must have been evolving on a separate trajectory for many millions of years.

In the mid-1960s, palaeontologists Elwyn Simons and David Pilbeam proposed that an extinct ape called *Ramapithecus*, which lived in what is now India and Pakistan up to about 8.5 million years ago, was a close relative of humans and possibly a direct ancestor. This gained widespread acceptance until new specimens showed it had an orang-utan-like face, whereupon the idea was quickly dropped.

Around the same time, molecular techniques started hinting at a close affinity between humans and chimps. This has been the orthodox position for more than 30 years.

Not everybody accepts it, however. Jeffrey Schwartz of the University of Pittsburgh, Pennsylvania, has been arguing since the early 1980s that orangs are our closest living relatives (*Nature*, DOI: 10.1038/308501a0). His latest research paper continues that theme.

In praise of scientific heresy

We have to think the unthinkable to take science forward, even if it annoys the establishment

WHEN it comes to scientific facts, the identity of our closest living relative is about as certain as they get. Genome sequencing has confirmed to the satisfaction of pretty much everybody that this dubious honour goes to chimpanzees.

Yet this week sees the publication of a paper that seeks to blow that fact out of the water. The authors argue that the DNA evidence is flawed and that, based on traditional taxonomy, orang-utans are clearly closer to us than chimps (see page 6).

It's true the locals call orangs the "people of the forest". But recall the old saying about extraordinary claims requiring extraordinary evidence. So far, the research appears to be failing that test. All the experts we contacted dismissed the paper's main conclusion, a reaction that seems likely to be repeated when the paper reaches the wider world.

If its claims are so outlandish, should the research even have been published? Some scientists would clearly have preferred it if the paper had never seen the light of day, and question the judgement of the journal.

That is territory we should tread with care. Ideas that mainstream opinion "knows" to be wrong occasionally turn out to be right. The insights of Galileo, Stan Prusiner – who discovered prions – and many others were once denounced as heresy. And even those that are wrong can be valuable.

Science proceeds by questioning its own assumptions and regarding every "fact" as provisional, so alternative hypotheses should be given an airing, if only to reaffirm the strength of the orthodoxy. Science that pulls up the drawbridge on new ideas risks becoming sterile. The journal recognised that and should be applauded for its decision to disseminate this challenging paper.

One possible outcome, though, is that creationists will trumpet the paper as evidence that the theory of evolution is crumbling. If the experts themselves cannot get their story straight, they will crow, why should we believe anything they say?

"If its claims are so outlandish should the research even have been published?"

That, of course, is shameless intellectual dishonesty (though what else would you expect from a movement built on intellectual dishonesty?). A paper questioning one aspect of evolution is not evidence that evolution itself is in trouble. Quite the opposite. It is science doing what it is supposed to do. We cannot censor ideas just because we are worried that a small bunch of religious fanatics will twist them for their own ends.

If the paper achieves nothing else, though, it is a reminder of how uncannily similar humans and red apes are, and what we stand to lose when – for sadly it now appears inevitable – these great apes go extinct in the wild. ■