

## Leaving Africa: When did our species first move out of Africa?



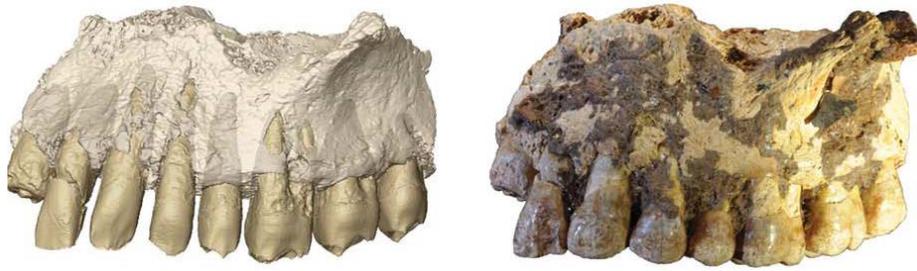
Update #8 to *Human Origins: How diet, climate and landscape shaped us*

John S. Compton ([www.johnscompton.com](http://www.johnscompton.com))

A fossil jaw bone recovered from Misliya Cave on the western slopes of Mount Carmel in Israel suggests that modern humans (*Homo sapiens*) were living there sometime between 194 and 177 thousand years ago (Hershkovitz and others, 2018). This is significantly earlier than the previously oldest evidence, dated to between 120 and 90 thousand years ago, of when our species first resided outside Africa. The estimated age range appears to be robust as it is based on multiple dating techniques applied both directly to the fossil and indirectly to material encrusting the fossil. It is the only human fossil yet to be recovered from the site after a century of excavation and it fills a critical gap in the archaeological record of when our ancestors left Africa.

### **Whose jaw is it?**

The upper jaw bone fragment has 7 intact teeth along with parts of the surrounding cheekbone and roof of the mouth. The fossil was scrutinised using high-resolution CT-scanning, which allowed for a virtual reconstruction and a detailed analysis of all of its exterior and interior features. By comparing many of its measurable features to other fossil jaw bones and teeth, the authors conclude that the fossil is most similar to modern humans and not Neanderthals. Their conclusion is strongly supported by the data and it is a critical distinction because Neanderthals, but not modern humans, were known to be living in Eurasia already at this time. But what is meant by 'modern humans'?



Fossil jaw bone on the right and its virtual reconstruction on the left, from Hershkovitz and others (2018).

A recent paper argued that our species (*Homo sapiens*) extends back to around 300 thousand years based on fossils dated from Jebel Irhoud, Morocco (Hublin and others, 2017). However, the Jebel Irhoud fossils are considered by some to represent an earlier species, with enough anatomical and behavioural differences separating them from our species. Unfortunately, the features, and hence name, of this species that immediately preceded our own are not well defined. Some refer to the Jebel Irhoud, and similarly aged fossils known from Africa, as 'early' modern humans, while I refer to them in my book *Human Origins* as our 'predecessor' species. (For a more detailed discussion on this topic see my blog "New ages from Jebel Irhoud, Morocco").

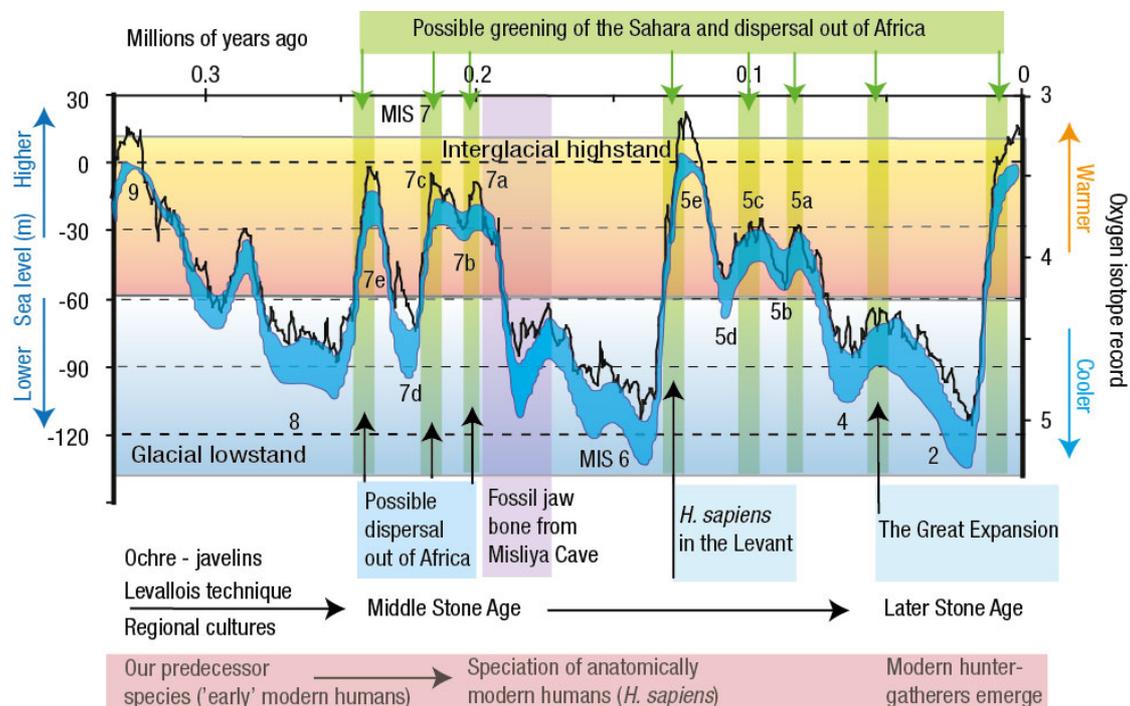
Therefore, the fossil jaw could belong to an 'early' modern human, a member of our predecessor species, or it could belong to a modern human, a member of our species. The detailed analysis of the jaw bone and teeth is unable to differentiate clearly between these possibilities. This is not surprising considering the variability in physical traits commonly associated with speciation events, and that the fossil's age overlaps with when our species first emerged in Africa 200 to 160 thousand years ago. Resolving whether the jaw belongs to our species or to our predecessor species may not be possible, but there are other intriguing aspects about the fossil.

### **Why the fossil is important**

We humans evolved in Africa and that our ancestors would rapidly expand beyond Africa given half a chance doesn't come as a surprise considering how quickly they filled the varied habitats of the African continent. The archaeological record tells us that our ancestor *Homo erectus* left Africa soon after they evolved over 1.85 million years ago, as did *Homo heidelbergensis*, a species intermediate between *H. erectus* and us, around 400 thousand years ago. What is surprising in light of these earlier exits out of Africa is the apparent delay between when our species emerged in Africa around 200 thousand years ago and when our species left Africa. Previously, the earliest evidence was from the Skhul and Qafzeh caves dated to 120 to 90 thousand years ago. This latest fossil find from Misliya Cave, a cave close by to the Skhul and Qafzeh caves, tells us that our species (or possibly our predecessor species) was living outside of Africa much earlier, at a time that overlaps with when our species first appeared in the fossil record in East Africa. Occupation of the Levant (modern day Israel, Syria, Lebanon and Jordan) is significant because it is the closest habitable region to Africa, located just across the Sinai Peninsula, the sole land bridge linking Africa and Eurasia. However, the archaeological record suggests that the Levant was not continuously occupied.

Instead our ancestors appear to have left Africa in episodic pulses, many of which were limited to the Levant where, even there, they did not last for long.

One possible explanation for episodic exchange across the Sinai is the dynamic of the Sahara-Arabian Desert. Normally this severe desert is a barrier to movement. However, there is evidence of brief, wetter periods when the Sahara-Arabian Desert turned green with grass making it habitable. Greening of the desert tends to occur during the transition from glacial to interglacial periods, and most likely coincides with expansion of animals (including humans chasing after them) out of Africa. For example, movement into the Levant 120 to 90 thousand years ago appears to coincide with multiple greening events interspersed throughout the MIS 5 interglacial period (5e, 5c and 5a), which followed on from the MIS 6 glacial period during which severe desert likely prevented any exchange.

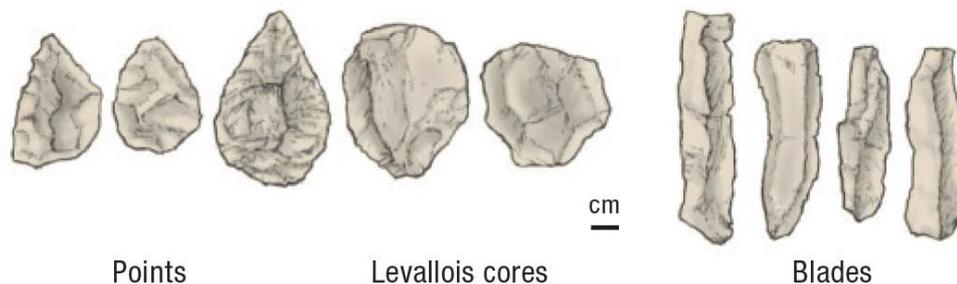


Plot showing time periods when the Sahara may have greened and humans may have moved out of Africa associated with major glacial to interglacial climate variations spanning the last 300 thousand years (adopted from Compton, 2016).

The MIS 6 glacial period was preceded by the MIS 7 interglacial period, which like the MIS 5 interglacial had several warmer and wetter intervals designated 7e (242 ka), 7c (220 ka) and 7a (205 ka). Greening during any of these three wetter intervals, all of which predate the age of the fossil jaw bone, may have allowed movement beyond Africa into the Levant. Although the Skhul and Qafzeh caves are nearby the Misliya Cave, there is no evidence that the area was continuously occupied. Instead, those living in the Levant during the warm MIS 7 interglacial period probably didn't survive the long and severe MIS 6 glacial period. This would imply that those who came after the MIS 6 glacial during

greening events associated with the MIS 5 interglacial period represent separate pulses out of Africa.

Episodic occupation of the Levant is supported by the archaeological evidence, which indicates significant differences in the cultures of those who frequented the Misliya Cave compared to those who later frequented the nearby Skhul and Qafzeh caves. Although the jaw bone is so far the only human fossil found, the bones of other animals, fire hearths and over a thousand stone tools give an indication of how those in the Misliya Cave lived. They were skilful hunters capable of taking down prime-aged prey, which they mostly butchered in the field and carried back to the cave to cook over a fire. They hunted in nearby woodland and savanna habitats and hunted mostly fallow deer and mountain gazelle, as well as other antelope, auroch (feral cows), ostrich, tortoise and hare. Their stone tools are dominated by Levallois flakes, points and blades made from local flint nodules. Levallois refers to a technique for making stone tools of uniform size and shape struck from a specially prepared stone core. The prepared Levallois core acted like a die and ensured consistent production of quality stone tools. The Levallois technique has deep roots but its full development is associated with the transition to early modern humans (our predecessor species) around 300 thousand years ago, about the same time that the first throwing spears with Levallois points emerged in East Africa (Sahle and others, 2013).



The Levallois technique involves preparing cores from which stone tools, such as points or blades, can be struck.

The major difference in the archaeological records is not so much reflected in the stone tools, but rather in the extent of symbolic cultural artifacts. The exceptional fossils from the Skhul and Qafzeh include several skulls that clearly are those of modern humans. Not only did their bones look like ours, they also behaved modern in that they buried their dead with symbolic burial goods, such as antler horn, used ochre body paint, and made some of the earliest shell jewellery. The stone tools used and the animals hunted were largely similar, but none of the symbolic artifacts, so strongly associated with modern human behaviour has yet been reported from the Misliya Cave. Those who frequented the Misliya Cave either never possessed these symbolic cultures or somehow lost them along the way.

Therefore, the jaw bone from Misliya Cave suggests movement of either members of our species or our predecessor species out of Africa during earlier greening events associated with the MIS 7 interglacial period. Such movement

out of Africa as far as the Levant is not surprising because the Afro-Arabian mix of animals (fossil and living) indicates that the Levant is part of the transition zone between North Africa and the Arabian Peninsula. Animals, including humans, can move back and forth along the narrow land bridge of the Sinai Peninsula that tethers the two when the Sahara-Arabian Desert becomes habitable, and retreat or fade away upon return of severe desert. The jaw bone from Misliya Cave helps fill the gap of the anticipated movement of our ancestors associated with the wet and habitable intervals of the MIS 7 interglacial period.

The more intriguing movements are those that carry on beyond the Levant, when our ancestors managed to expand into the broad spectrum of habitats that exist throughout the vast Eurasian continent. The first to make the crossing and expand into much of Eurasia was *Homo erectus*, followed by *Homo heidelbergensis*, who would evolve into the Neanderthals and Denisovans, while those who remained in Africa evolved into us *Homo sapiens*. There is evidence that our species expanded as far as China during the MIS 5 interglacial period, but otherwise our species does not appear to have amounted to much outside of Africa during either the MIS 7 or MIS 5 interglacial periods. The reason why is perhaps because Eurasia had become occupied by our cousins, the Neanderthals and Denisovans, whose populations were possibly too formidable for us to displace. It would take the later expansion by those possessing the equivalent of modern-day hunter-gatherer cultures around 60-50 thousand years ago, the so-called Great Expansion, before our species would effectively conquer the world.



The Great Expansion when our species went global (ages in thousand of years ago, ka).

### Further reading

Callaway, E., 2018. Israeli fossils hint at early migration. *Nature* 554, 15-16.

Compton, J.S., 2016. *Human Origins, How diet, climate and landscape shaped us*. Earthspun Books, [www.johnscompton.com](http://www.johnscompton.com).

<https://johnscomptonblog.wordpress.com/2017/08/07/new-ages-from-jebel-irhoud-morocco/>

Hershkovitz, I., and others, 2018. The earliest modern humans outside Africa. *Science* 359, 456–459. DOI: 10.1126/science.aap8369

Hublin, J.-J., and others, 2017. New fossils from Jebel Irhoud, Morocco and the pan-African origin of *Homo sapiens*. *Nature* 546, 289-292.  
<http://dx.doi.org/10.1038/nature22336>.

Misliya Cave site, for details visit:  
<http://misliya.haifa.ac.il/archaeology/archaeology.html>

Sahle Y., Hutchings W.K., Braun D.R., Sealy J.C., Morgan L.E., *et al.*, 2013. Earliest stone-tipped projectiles from the Ethiopian Rift date to >279,000 years ago. *PLoS ONE* 8(11): e78092. doi:10.1371/journal.pone.0078092.

Stringer, C., and Galway-Witham, J., 2018. When did modern humans leave Africa? *Science* 359, 389-390. DOI: 10.1126/science.aas8954

© John S. Compton ([www.johnscompton.com](http://www.johnscompton.com))