populations." Other now-extinct sequences, for example, might well include traces of DNA indicating that *Homo sapiens* interbred with Neandertals—evidence that has disappeared from modern genetic material.

Most scientists, however, will need far more evidence to be talked out of the replacement scenario. Evolutionary biologist S. Blair Hedges of Pennsylvania State University, University Park, says the key piece of evidence, the LM3 sequence, must be replicated in independent laboratories in order to be convincing. Svante Pääbo of the Max Planck Institute for Evolutionary Anthropology in Munich, who obtained the first Neandertal DNA in 1997, agrees. "We know from many failures in our laboratory that contamination can rear its head in many forms," he says, and the Australian researchers did not meet his criteria—which include cloning, sequencing, and replication in independent labs—for ascertaining that the DNA sample is authentic. Although Pääbo says that at this point he can't evaluate the study's conclusions, he notes that extinct sequences such as LM3's might simply indicate that humans used to have more genetic variation than they do today. Still, "these scenarios do not change the observation that mtDNA found in humans alive today go back to a recent common ancestor in Africa."

But Thorne says that DNA from living populations alone will never reveal the true story of human origins. Finding this surprise in an ancient Australian "makes clear that it is the lineages that have been lost in the past that may hold the key," he says.

—CONSTANCE HOLDEN

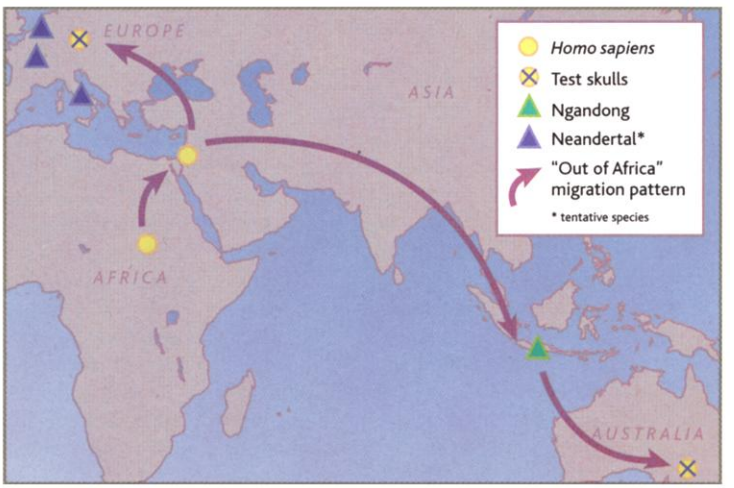
Skull Study Targets Africa-Only Origins

While Australian researchers invoke ancient DNA to discredit the notion that "Out of Africa" migrants completely replaced earlier humans, Milford Wolpoff is assaulting it with bones. Wolpoff, an anthropologist at the University of Michigan, Ann Arbor, has long championed multiregionalism—the dissident view that several populations of early humans evolved modern traits, merging into one *Homo sapiens* species through interbreeding. On page 293 of this issue, he and collaborators put the two rival scenarios to the test. Applying a statistical technique little used by anthropologists, they analyzed 25 ancient skulls from throughout the Old World and determined that three relatively recent ones had both local and African ancestry. "The implication of this finding is that replacement cannot be correct," Wolpoff says. Most other paleoanthropologists, however, remain unconvinced.

Borrowing an analytical technique called pairwise comparison from their colleagues who study DNA data, Wolpoff's team drew up a list of skeletal features and scored the presence or absence of each one in several sets of fossils. The fewer the differences, they assumed, the more likely a pair of skulls is to be closely related. The work is "a welcome attempt to quantify previous claims" of multiregionalists, says Chris Stringer of the Natural History Museum in London, although he disagrees with the study's conclusions. Adds Janet Monge, a physical anthropologist at the University of Pennsylvania in Philadelphia who says she's still undecided about multiregionalism, "It's as objective as any test that I have seen put forth on human evolution."

The researchers started with a 14,000-year-old skull from southeastern Australia and a pair of partial adult male skulls from Moravia in the Czech Republic—two distant places that the Out of Africa migrants would have had to reach in populating the globe. They compared the Australian skull with archaic human fossils from Ngandong, Java—likely ancestors if modern humans evolved locally—and with six fossils from Africa, close relatives if the Out of Africa hypothesis is correct. In analyzing the Moravian skulls, they used four Neandertal skulls from throughout Europe—the putative local ancestors—and five skulls of early modern humans from Qafzeh and Skhul caves in Israel, who would have been part of the replacing population from Africa.

Wolpoff and colleagues examined the skulls for features such as the flatness of the forehead or the size of a bony projection behind the ear. "We know these traits are diagnostic for distinguishing the ethnicity of modern skulls," Wolpoff says. Then, through pairwise comparisons, they ranked the skulls in order of decreasing similarity. The Australian skull wound up much closer to the Java fossils than to the African or Israeli fossils—possible evidence of Asian roots. The results for the Moravian fossils were less dramatic but indicated that dual European and African ancestry was possible, Wolpoff says.



CREDIT: J. MOGLIA

Mixed beginnings. Ancient skulls in Australia and the Czech Republic suggest that anatomically modern humans had deep-rooted local ancestors as well as African ones.

The work puts "another nail in the coffin of replacement," says Geoffrey Clark, a paleoanthropologist at Arizona State University in Tempe, a longtime advocate of multiregionalism. Paleoanthropologists in the Out of Africa mainstream, however, leaped to voice their skepticism. "I and a number of other workers have previously analyzed these crania and have come to very different conclusions about their affinities," says Stringer. Stringer says he reached pro-replacement conclusions after studying facial features of skulls—features he wishes Wolpoff and colleagues had been able to include in their work. Philip Rightmire of the State University of New York, Binghamton, criticizes the group's choice of specimens; he thinks that another Australian skull, which looks much different from the one Wolpoff picked, would have yielded different results. All in all, Ian Tattersall of the American Museum of Natural History in New York City says of the study, "I don't think it's going to change anybody's position."

But Monge says she welcomes Wolpoff's "provocative and evocative" work. Pairwise comparison will give her and her students a new way of looking at casts and fossils, she adds. "Often you don't see very much coming out from the [multiregional] side," she points out, "so it's good to get these data out there."

—ELIZABETH PENNISI