which comprises the temple, the ear, and the upper jaw joint. "People have said, 'This or that feature is best to track population history,' but it's never really been tested," said Harvati. With samples from individuals in 10 populations throughout the world, Harvati and Weaver compared three kinds of data: differences in skull morphology, or shape; genetic differences taken from Stanford University geneticist Luigi Cavalli-Sforza's published global database; and climatic differences, as represented by latitude and mean temperature.

They found that morphological differences did indeed correlate with genetic ones in each part of the skull. But the shape of the face was also associated with climate. For example, Greenlanders and northern Europeans, although relatively distant genetically, both tend to have flat faces.

In contrast, the vault did not reflect climate but tracked genes closely. For example, Syrians, Italians, and Greeks "clustered together beautifully," both genetically and in vault shape, revealing recent population history, Harvati says. The temporal bone tracked more ancient population history, she says. Only in this part of the skull were Africans distinct from all other populations, mapping the most ancient split seen in the genetic data. "So if you're looking deep into time, you probably want to use the temporal bone and avoid the face, because the face reflects a complex mix of genes and climate," Harvati says. Their analysis of temporal bone shape shows that living and Upper Paleolithic modern humans cluster together but that Neandertals are quite distinct from both, suggesting that they are indeed different species.

Many at the meeting praised what paleoanthropologist Steve Churchill of Duke University in Durham, North Carolina, called Harvati and Weaver's "right-headed approach." "I'm full of admiration for [Harvati's] work," said paleoanthropologist Chris Stringer of the Natural History Museum in London. Several researchers pointed out ways to improve the analysis, however, suggesting everything from better genetic data sets to more precise climatic data. And they noted that many anthropologists already rely on the temporal bone—and steer clear of the face—when sorting out evolutionary relationships. All the same, says paleoanthropologist Ian Tattersall of the American Museum of Natural History in New York City, "this is a very imaginative approach, and it's a harbinger for future advances."

–ELIZABETH CULOTTA

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The Question of Sex

For 150 years, members of *Homo sapiens* have gazed on the bones of Neandertals and wondered, "Was this one of us?" At a recent meeting in New York, many paleoanthropologists—although not all—answered "No." Yet even partisans committed to the notion that Neandertals and moderns were separate species agreed that when the groups met, at least a bit of what Ian Tattersall of the American Museum of Natural History in New York City calls "Pleistocene hanky-panky" probably took place.

Gene swappers? Most researchers say modern humans (right) and Neandertals got together—but not often.

Carbon-14 dating of fossils and artifacts suggests that Neandertals and modern humans coexisted for several thousand years in Western Europe, after moderns swept in from Africa and before Neandertals vanished about 28,000 years ago. The minority of researchers who think Neandertals and moderns belonged to a single species have no doubt about what happened next: "What do we do when we encounter anyone? We trade mates and culture," says Milford Wolpoff of the University of Michigan, Ann Arbor, who has long argued for a single interbreeding human population. "The archaeological record is clearly showing us that these groups are trading ideas, which almost certainly means they're trading mates."

Indeed, the idea of thousands of years of chaste coexistence is too much of a stretch even for many experts who believe Neandertals were a separate species. "If you're counting on humans *not* to mate, you'll be very disappointed," warned paleoanthropologist Trent Holliday of Tulane University in New Orleans, Louisiana. In his presentation, Holliday argued that any attempted gene-swapping could well have succeeded. By his count, about 1/3 of known mammalian hybrids are fertile. They include crosses between mule deer and white-tailed deer, lynx and bobcat, and many others. Primatologist Cliff Jolly of New York University, speaking from the audience, added a crucial primate example: olive and hamadryas baboons of Ethiopia, visibly distinct forms with different social structures. According to mitochondrial DNA (mtDNA), their ancestors diverged about 300,000 to 500,000 years ago, roughly the same time modern humans and Neandertals evolved in separate lineages. In the wild, the baboons freely interbreed within a narrow hybrid zone. "With them as a primate parallel, you'd expect that Neandertals and moderns would have been reproductively compatible," says Jolly.

Yet the ancient mtDNA so far gathered from a handful of Neandertals is distinct from that of both early and living modern humans. Jolly and others suggest that behavioral or cultural differences might have kept the gene pools of modern humans and Neandertals mostly distinct even in the face of some mating. Even so, they say, that doesn't mean abstinence worked perfectly. "Neandertals and moderns can be regarded as distinct species, but that does not mean that they were completely reproductively isolated," says Chris Stringer of the Natural History Museum in London, a longtime advocate of the notion that modern humans replaced the Neandertal species. "The point that came out [at the meeting] is that you can have both: distinct species, and some reproduction."

The real question, said paleoanthropologist Jean-Jacques Hublin of the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, is whether that reproduction affected later populations of *Homo sapiens*. "As for sex in the past: They [Neandertals and moderns] did it. I believe that. But does this have any biological relevance? No." Hublin, Stringer, and others at the conference see no evidence, from fossils or ancient DNA, that Neandertals are part of modern humans' ancestry. Thus they argue that hybridization must have been quite limited.

Jolly notes that a few genes that were highly adaptive for the local environment might have found their way from Neandertals to modern humans. Genes for pale skin color, for example, are advantageous in the sun-starved north. Wolpoff and a few others go further. They emphasize that even the geneticists admit that current mtDNA data cannot completely rule out a Neandertal contribution, and they cited a few Upper Paleolithic fossils that may show signs of Neandertal traits. Paleolithic hybrids may have bridged two species, but the question of their impact remains as divisive as ever. **–E.C.**

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