

related,” she says. “I think that’s probably what I would have done in retrospect.”

Penalizing researchers for actively managing their mental health is counterproductive, says Seth Campbell, a glaciologist at the University of Maine, Orono. “I’ve spent over 7 years of my life in the field and [the kind of] person I want in the field with me,” he says, is “someone that’s willing to actually get mental health support.”

Campbell hasn’t experienced any problems with the medical screening process himself. But he’s witnessed multiple cases where others have run into difficulties, which is why he signed on to the letter sent to NSF. “I want to make sure the students that I’m working with have a better situation—it seems like there’s been one issue after another in the past few years.”

Some of the scientists who received NPQ notices in recent years ended up going to Antarctica after NSF granted them a waiver. But the NPQs often come just weeks or even days in advance of scientists being deployed, leaving little time for a waiver process many describe as “stressful and confusing.” Individuals must sign a document acknowledging that they’re “not physically qualified for deployment” and that they absolve NSF and its subcontractors of liability should something go wrong in the field. The individual’s employer must sign a similar document, a requirement that often puts scientists in the uncomfortable position of disclosing personal medical information to university officials, including their direct supervisor.

The researchers *Science* spoke with acknowledge the need for a medical screening process. “You definitely should have to be physically qualified in order to go to Antarctica; I don’t think anybody’s debating that,” says University of Kansas, Lawrence, glaciologist Leigh Stearns, lead author of the letter to NSF. But they would like to see more transparency in the entire screening and appeals process and a system for applicants to report allegations of discrimination and abuse to an independent medical ethics board. “If the current system cannot be improved ... we petition that another agency or subcontractor be considered for managing polar physical qualifications,” the letter authors request.

Michael Gooseff, a hydrologist at the University of Colorado (CU), Boulder, who oversees a project that deploys 31 scientists to Antarctica each year, applauds the letter’s recommendations. “A periodic external ethics review is really a great idea,” says Gooseff, who wasn’t involved in writing the letter. He would also like to see UTMB issue its decisions earlier. “The timing of that kind of stuff prior to deploy-

ment is really, really problematic and just overstresses an already stressed system.”

Some also worry mental health NPQs could disproportionately harm women—an underrepresented group in polar science—because women are more likely than men to experience symptoms of anxiety and depression. But neither NSF nor UTMB make public any breakdown of the NPQs, which concerns some researchers.

“We’re scientists—we want to know,” Stearns says. She’s been glad to see gains in the number of women researchers in Antarctica since she first started traveling to the frozen continent in 1999. But, “Protections for women in the field have been quite slow to evolve,” she adds, referring to pervasive problems with sexual harassment, as recently highlighted in a report released last year. Stearns worries issues with the medical screening process could represent yet another barrier to attracting more women to polar research.

“I suspect if you looked at the stats that you’d see women failing these [medical qualification] exams more than men,” says Michael MacFerrin, a glaciologist at CU who received an NPQ notice ahead of a planned deployment to Antarctica in 2020 because he has type 1 diabetes. After he tweeted about his experience last year, other scientists—many of whom were women—reached out to him with NPQ stories of their own. He gave a talk about the issue at the American Geophysical Union’s annual meeting in December 2022, which inspired more-senior scientists to write the letter to NSF. They did not ask early-career researchers such as MacFerrin, a research scientist, to sign it in order to shield them from potential career repercussions.

MacFerrin and the letter writers would like to see NSF release aggregate statistics on pass/fail rates by gender, race, and disability status. NSF declined to say whether it was open to releasing such data. “We take the concerns of the community seriously and are working with our prime contractor to evaluate and increase oversight of the physical qualification program,” the spokesperson wrote.

The postdoc who received an NPQ notice after changing institutions was able to secure a waiver to travel to Antarctica last year, where she had an “amazing” experience. But she’s not sure she’d do it again. “I would have a really hard time convincing myself to try to get to Antarctica again, which is a huge bummer because I study the Antarctic Ice Sheet ... and so obviously going there can be a significant benefit for me in my career,” she says. “I’m probably better off avoiding the process until they can figure out how to make it right.” ■



People across Europe crafted figurines similar to the so-called Venus of Brassempouy.

HUMAN EVOLUTION

Ancient DNA upends European prehistory

Genes reveal striking diversity within similar ice age cultures

By Andrew Curry

Thirty thousand years ago, Europe was a land of open steppes with herds of grazing mammoth and other megafauna—and a strikingly uniform human culture. Its inhabitants, whom archaeologists call the Gravettians, dwelled in caves or in shelters built of mammoth bones. They carved palm-size sculptures from mammoth tusk, depicting mammoths, cave lions, and stylized female figurines with elaborate headdresses and exaggerated breasts and buttocks, and left their distinctive art and artifacts from Spain to western Russia. “You can make a case for saying the Gravettian is the first pan-European culture,” says University of

Tübingen archaeologist Nicholas Conard.

But despite appearances, the Gravettians were not a single people. New DNA evidence, published this week in *Nature*, shows Gravettians in France and Spain were genetically distinct from groups living in what is now the Czech Republic and Italy. “What we thought was one homogenous thing in Europe 30,000 years ago is actually two distinct groups,” says Mateja Hajdinjak, a molecular biologist at the Max Planck Institute for Evolutionary Anthropology who was not part of the new study.

The Gravettian data are part of a larger trove of ancient European DNA that reveals striking genetic diversity within apparently unified prehistoric cultures. The sweeping study analyzed 116 newly sequenced genomes and hundreds of previously published ones, ranging from about 45,000 years ago, when the first modern humans reached the continent, to about 6000 B.C.E., and from the Iberian Peninsula to the western steppes of modern-day Russia. It “fill[s] gaps in space and time,” says the study’s lead author, Cosimo Posth, a geneticist at Tübingen.

In period after period, the genetic evidence suggests conclusions drawn from archaeological evidence such as tools, hunting styles, and burial rituals need to be re-evaluated. “These cultural units archaeologists think about as coherent populations don’t stand up to the test,” says Felix Riede, an archaeologist at Aarhus University who was not part of the study. “It’s a major step forward.”

Many of the samples were in poor condition and some came from unusual contexts, like the now-submerged landscape between the British Isles and the Netherlands known as Doggerland. New analytical methods and increasingly powerful DNA sequencing tools enabled researchers to squeeze information from extremely degraded bones and teeth, including some that contained just 1% of their original genetic material.

When it comes to the Gravettians, the genetic evidence helps explain subtle regional differences in tool types and subsistence strategies that have puzzled archaeologists for decades. Archaeologists had noted “slight cultural differences, but up till now we didn’t know if it was the same or different populations,” Hajdinjak

says. For example, only people in Eastern and central Europe constructed mammoth bone shelters. University of Leiden archaeologist Alexander Verpoorte, who was not part of the new study, adds, “When you zoom in a little bit, even the female figurines are made in different ways from different materials, deposited in different settings and found in different contexts.” Now, it seems they were the handiwork of distinct populations.

The DNA also sheds light on what happened to these ancient Europeans when

surprise,” Posth says. “The Gravettian population completely disappears.” Instead, after the glacial maximum, people in Italy show genetic links to the Near East, suggesting a new population arrived from the Balkans.

About 14,000 years ago, when temperatures across the continent rose sharply in the space of a few centuries, archaeologists recognized cultural changes. But they thought the changes reflected an existing population adapting to hunt in warmer, more heavily forested landscapes. Instead, DNA shows an almost complete population replacement:

The people who survived the glacial maximum, known as the Magdalenians, all but vanish and are replaced by populations moving north from postglacial Italy.

The study also looked at the final era of hunter-gatherers in Europe, beginning 10,000 years ago as warming continued to transform the open steppe to dense forests and rich wetlands. Here, again, the genes revealed a surprising wrinkle: Despite broadly similar hunting and gathering lifestyles, people in Western Europe remain genetically distinct from those east of the Baltic Sea.

They even looked different: Genetic data suggest that before the arrival of farmers in northern Europe around 6000 B.C.E.,

hunter-gatherers in Western Europe had dark skin and light eyes. People in Eastern Europe and Russia, meanwhile, had light skin and dark eyes. Most surprising, despite the lack of geographic barriers between modern-day Germany and Russia, the two groups spent millennia not mingling. “From 14,000 years ago to 8000 years ago, they do not mix at all,” Posth says. But he acknowledges that the team’s samples don’t cover the continent completely, and the likely contact zones—in Poland and Belarus, for example—lack samples. More genetic data from those areas might show the two populations mixing locally.

Archaeologists are expected to welcome the new genetic data, even though they may force many to re-examine old ideas, says Jennifer French, an archaeologist at the University of Liverpool who was not part of the study. “This genetic data shows we’ve oversimplified what was going on in terms of population interaction,” she says. “It provides a lot more nuance than we’ve been able to with archaeological data alone.” ■



The Gravettians, as shown in this reconstruction, had a common culture with sophisticated art and artifacts. But they were two distinct populations.

the climate worsened between 25,000 and 19,000 years ago, a time known as the last glacial maximum when much of Northern and central Europe was blanketed in ice more than 1 kilometer thick. Archaeologists had assumed people including the Gravettians retreated into ice-free areas in southern Europe beginning about 26,000 years ago, then filtered back north several thousand years later as the glaciers melted. That scenario appears to hold true in the Iberian Peninsula and the south of France: People living there before the ice reached its peak persist through the worst of the cold spell, then surge back north and east as the continent warms.

But the Italian Peninsula, long thought to have been a relatively secure refuge, showed something different. Despite what looked to archaeologists like evidence of continuous occupation during and after the glacial maximum, DNA reveals the refuge was actually a dead end. “We expected Italy to be a climate refugium, but there’s a sharp and complete turnover—it’s a big