

## ARCHAEOLOGY

# Did Neandertals Truly Bury Their Dead?

**LA FERRASSIE, FRANCE**—The French Dordogne is known for its hearty wine, rich foie gras—and spectacular prehistoric finds. This hamlet is home to one of the most famous: During excavations here beginning more than 100 years ago, French archaeologists discovered the skeletons of seven Neandertals, including four children and infants, and the most complete adult Neandertal skull ever found. They concluded that all were deliberately buried, making this site pivotal to contentions that Neandertals had symbolic capacities.

Until now, that is. New excavations at La Ferrassie, co-directed by archaeologists Alain Turq of the National Museum of Prehistory in nearby Les Eyzies-de-Tayac and Harold Dibble of the University of Pennsylvania, are in part designed to reexamine this question, which many researchers had long thought was itself dead and buried. “People are starting to talk about Neandertal burials again,” Dibble says. “It’s getting heated.”

The stakes are high: Most archaeologists still think that Neandertals engaged in mortuary rituals like modern humans do, which means that they shared with our species a richly symbolic activity. “This is a critical issue,” says archaeologist Paul Pettitt of the University of Sheffield in the United Kingdom, who is not a member of the team. “Burial is thought to be a symbolic act in itself and thus is highly pertinent to our evaluation of Neandertals’ symbolic abilities” and cognitive capabilities (*Science*, 10 August, p. 642).

To find out more about how the La Ferrassie skeletons were buried, and whether they were deliberately placed or washed in from a higher point, the team has opened new excavations immediately adjacent to where two adult Neandertals were found. They’re conducting microscopic studies of the sediments and comparing them to sediments clinging to a foot bone uncovered in the original excavations. Of course, new fossils may also help, and last month the team dug up a human heel bone in the new excavation area, though more analysis is required to confirm it as Neandertal.

The roughly 30 team members reflect the field’s broader debate, for despite collegial working relationships, they are deeply divided on the burial question. Turq and many other French members of the team see no reason to question the dominant paradigm that Neandertals, like many prehis-

toric modern humans, buried their dead. But Dibble and his North American colleagues do question it. “La Ferrassie has always been considered the mother of ritual burial,” Dibble says, “but how much of that is interpretation versus real evidence on the ground?”

The North Americans say their point of view was bolstered by the team’s excavations at the nearby Neandertal site of Roc de Marsal. There, a complete skeleton of a Neandertal child found in 1961 was long considered to be strong evidence for burial. But Dibble and his colleagues, including geoarchaeologist Paul Goldberg of Boston University, applied micromorphology—a relatively new approach that puts entire archaeological sites under the microscope to find clues to how bones and artifacts were deposited—and concluded that Roc de Marsal may not have been a deliberate burial after all (*Science*, 20 November 2009, p. 1056, and 9 December 2011, p. 1388). In a paper published last year in the *Journal of Human Evolution (JHE)*, Goldberg and some other team members argued from a microscopic and macroscopic study of the

protected” by some sort of burial practice that included covering the body with earth. Maureille agrees, adding that parts of the skeleton such as the lower vertebrae would be particularly susceptible to coming apart once the soft body tissues disintegrated if it were not deliberately buried. Maureille adds that the issue of whether the pit was natural or dug by Neandertals is not relevant, because the body could have been deposited deliberately in a natural cavity. Pettitt, in recent publications, has argued that disposing of bodies in natural depressions is a form of “funerary caching,” and that the deliberate digging of graves may have developed later as a way of artificially creating such burial spaces.

A core issue in the debate is the criteria that should be used to define a deliberate burial, and how well they are fulfilled at the approximately 20 Neandertal sites where burial has been claimed. Traditionally, these have included whether a skeleton has been found in a deliberately dug pit or a natural depression; whether the bones are articulated, suggesting that they were protected from scavengers; the position of the



**Mother of burial sites.** Archaeologists have reopened excavations at La Ferrassie to see how seven Neandertal skeletons really got there.

sediments in and around the burial site that the pit in which the child was found was a natural depression, and that its body, which was lying face down, may have slid down into the pit from above.

Turq and team member Bruno Maureille of the University of Bordeaux in Talence, France, were not convinced, however, and declined to sign the *JHE* paper. “We completely agree with the observations, but we disagree on their interpretation,” Turq says. In Turq’s view, a skeleton found intact—as was mostly the case at Roc de Marsal—“automatically indicates the corpse was

body; and the presence or absence of “grave goods,” such as stone tools, that might suggest ritual.

Back in 1989 and 1999, archaeologist Robert Gargett, formerly of the University of New England in Armidale, Australia, contended that none of these criteria were fully met in Neandertal burials. But at the time, most archaeologists rejected Gargett’s arguments. “They were based on nothing, no data,” Maureille says. Gargett, now with the Ronin Institute for Independent Scholarship headquartered in Montclair, New Jersey, praises Dibble and his colleagues for “hav-

ing the audacity” to reopen the question at Roc de Marsal and La Ferrassie.

Within the team today, the clashing views come down to different notions about the default hypothesis: Turq, Maureille, and other like-minded researchers say that for relatively intact Neandertal skeletons, the default hypothesis should be that they were buried deliberately. But other team members start with the opposite view. “The default hypothesis is that it’s not a deliberate burial unless you have positive evidence that it is,” says archaeologist Dennis Sandgathe of Simon Fraser University in Burnaby, Canada, who was the first author of the *JHE* paper.

Dibble thinks the key question is not whether a burial was deliberate, but whether archaeologists confront “a burial or a funeral.” A burial, Dibble says, is simply a “disposal” of a body, while a funeral, com-

plete with ritual activity, is a real “symbolic” act. An additional criterion is whether a “cultural pattern” can be detected, says team member Shannon McPherron, an archaeologist at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany. Prehistoric modern human burials, particularly those more recent than the time of the Neandertals, routinely include beads and red ochre, but “there is no patterning in this [Neandertal] stuff,” McPherron says.

But Pettitt, like many others who are not ready to embrace the doubts of Dibble and

his colleagues, says that “we archaeologists can set the bar too high.” The only “serious way to deal with this issue,” he says, “is to excavate.” And that is just what the team at La Ferrassie is doing, as it attempts to figure out how seven individuals found here a century ago came to this last resting place.

—MICHAEL BALTER



**Was I buried, or not?** Some researchers say that the Roc de Marsal Neandertal child (reconstructed, right) was not buried deliberately.

## LASER FUSION

# Ignition Facility Misses Goal, Ponders New Course

The National Ignition Facility (NIF), a \$3.5 billion laser fusion lab in California, looks certain to miss its deadline at the end of this month for achieving ignition, a self-sustaining fusion reaction that yields more energy than was put in to make it happen. This milestone is considered key for NIF’s twin goals: demonstrating the feasibility of fusion energy, and ensuring the reliability of the U.S. nuclear weapons stockpile. By law, the National Nuclear Security Administration (NNSA), part of the U.S. Department of

Energy, has until 60 days after the deadline to produce a report explaining what barriers to ignition remain, how they can be overcome, and what implications there are for the stockpile.

Managers at Lawrence Livermore National Laboratory, the home of NIF, are playing down the significance of the end of the National Ignition Campaign (NIC), the series of experiments due to run until the end of fiscal year 2012 on 30 September. “The NIC is a milestone, and we’re not going to

achieve that milestone. But we will continue to explore and continue to do ignition science experiments,” says Livermore Director Penrose Albright. Others view the missed deadline differently. “It’s going to be a big deal here,” says a congressional aide who asked to remain anonymous.

Meanwhile, to prepare the report for Congress, dozens of researchers from five NNSA-funded national laboratories and from industry are examining NIC in detail and may recommend a new direction for research at

NIF. “We’re working very hard to describe the state of understanding and the path forward,” says Mary Hockaday, deputy associate director for weapons physics at Los Alamos National Laboratory in New Mexico, who is leading the first draft of the report.

NIF uses an approach called inertial confinement fusion (ICF) in which a huge laser—NIF’s is the most energetic in the world—fires beams from many directions at a tiny capsule containing a mixture of the hydrogen isotopes deuterium and tritium. The powerful laser pulse causes the capsule to implode, crushing the hydrogen fuel to a density 100 times that of lead and heating it to millions of degrees. In theory, the hydrogen nuclei should fuse to



**Dead center.** At the end of a positioner arm, the tiny target sits in the center of NIF’s 10-meter-wide reaction chamber.