

## ARCHAEOLOGY

# Did Modern Humans Get Smart Or Just Get Together?

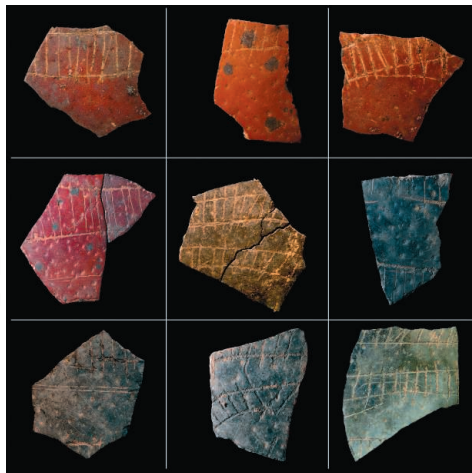
The first archaeological signs of art and symbolism may mark new heights of social interaction rather than a cognitive leap

When did humans start to do the things that make us human? The archaeological record is the obvious place to find out, but it presents a puzzle: About 40,000 years ago in Europe, when modern humans had moved into the continent, there was a burst of creativity expressed in everything from cave paintings to figurines to jewelry and complex tools. Some researchers have argued that this explosion of artistic material culture reflects a leap in human cognition—the point when we finally got smart enough to think symbolically

Perhaps our complex culture does not stem simply from individual cognition but from the shared knowledge we construct in groups, Shennan proposed in a talk at a recent high-level meeting on what makes humans unique.\* In this view, complex culture requires a “cultural ratchet”—the cumulative effect of many people’s contributions over time, each building on the other. (A recent computer tournament explored the power of such social learning compared with individual innovation; see p. 165.) If so, factors such as population



**Primitive style.** Early artists made shell beads in Israel 90,000 years ago (*above*) and etched eggshells in Africa 60,000 years ago (*right*).



and craft complex tools, perhaps because of an advance in working memory (see p. 160).

But over the past decade, signs of such “modern” behavior have been found much earlier. Marine shell beads turn up in Israel about 90,000 years ago, then disappear. Chunks of red ochre with geometric scratchings and tiny shell beads pop up about 70,000 years ago or more in Africa and then vanish; etched ostrich eggshells then appear about 60,000 years ago. Complex behavior seems to flicker in and out of the record (*Science*, 6 February 2009, p. 709).

The pattern is “pretty hard to reconcile with a gene” that conferred a cognitive advance, says anthropologist Robert Boyd of the University of California, Los Angeles (UCLA). So several researchers, including Boyd and Stephen Shennan of University College London (UCL), have suggested another kind of explanation: demography.

size and structure may have helped to kindle, extinguish, and rekindle modern behavior.

This demography-based theory is an intriguing idea, but researchers have struggled to test it. At the meeting, one presenter backed the idea with simulations, and one with data.

Shennan presented modeling of demographic effects on culture, done with UCL colleagues Adam Powell and Mark Thomas. They simulated how culture would evolve in a population made up of small bands of humans, assuming that people could learn from others how to make a kayak or craft jewelry but that the learning process was not perfect. Larger groups had a higher probability of creating innovations that went beyond the previous best, so individuals in big groups, or who often traveled among groups, had a better chance of

\*Human Uniqueness and Behavioral Modernity Workshop, Arizona State University, 20–22 February.

learning from an improved version.

In the simulations, bigger populations with more migration showed more cultural accumulation (*Science*, 5 June 2009, p. 1298). Populations that became smaller and more isolated actually lost culture. “We found that you could get stable, lasting differences between regions,” Shennan said in his talk. He and colleagues compared their models with the archaeological record, using genetic data from living people to roughly estimate ancient population sizes. They found that the population densities during Europe’s cultural flowering 40,000 or so years ago were reached in Africa about 100,000 years ago—not long before cultural complexity arose there.

Next came Boyd, who set out to test the model in the real world. He analyzed data from previously studied traditional societies on 10 islands in Oceania. Working with UCLA graduate student Michelle Kline, he compared the number and complexity of tools used to forage for marine resources on each island.

Boyd and Kline found a clear picture: Islands with bigger populations had more tools, whereas smaller populations had fewer tools. “The results are very strong,” says Boyd. “Nothing else seems to matter at all.” Shennan was enthusiastic about the data: “The predictions of the model were borne out in a modern situation where you can collect information on all the relevant variables,” he says. “That doesn’t happen all the time.”

Translated into the past, this theory suggests that any cognitive leap happened perhaps 90,000 years ago or earlier and that bursts of complex culture may reflect bigger populations or more contact among groups. That may be true in Europe of 40,000 years ago, says archaeologist Francesco D’Errico of the University of Bordeaux in France, who thinks modern humans and Neandertals may have had similar cognitive abilities.

Conversely, if climate deteriorated and patches of habitat were farther apart, more isolated groups might lose culture. That happened on the island of Tasmania, where people lost the ability to craft bone tools and boats when they were isolated by rising sea levels about 10,000 years ago, Boyd notes.

At this point, says Shennan, theory and data “add up to a very strong alternative to the cognition model. Now we need more model development, testing, and data collection.” But workshop co-organizer Curtis Marean of Arizona State University, Tempe, points out that cognition also plays a role, for example, influencing the rate of innovation in Shennan’s models. “It’s not just demography or cognition. We need to pull all of these together.”

—ELIZABETH CULOTTA