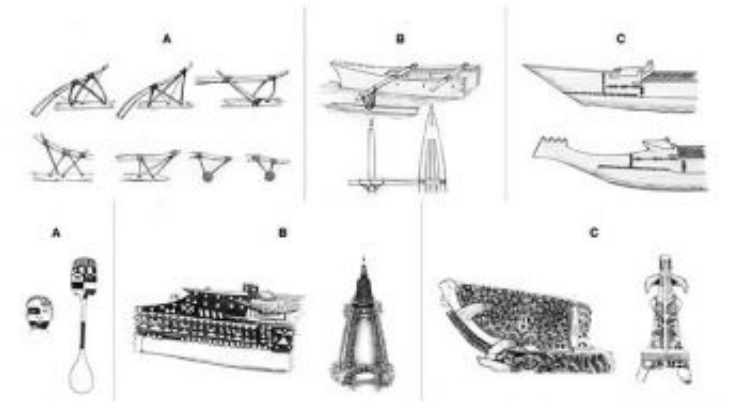
Human culture subject to natural selection, Stanford study shows

February 18 2008



Functional traits (top) for Polynesian canoes may affect whether a voyage for fishing, warfare or colonization succeeds. In box A, a detail of outrigger attachments on a Tahitian canoe; in B, a Samoan canoe “sewn” together with sennit (coconut fiber cord); in C, a canoe from Manihiki showing a pattern of sewn washstrake pieces. Symbolic traits, bottom, for Polynesian canoes presumably have no differential effect on survival from group to group. In box A, a painted paddle from Rapanui (Easter Island) alongside a face tattoo from the Marquesas Islands; in B, a canoe from Manihiki decorated with inlaid shell; in C, a carved figurehead on Maori war canoe.

The process of natural selection can act on human culture as well as on genes, a new study finds. Scientists at Stanford University have shown for the first time that cultural traits affecting survival and reproduction evolve at a different rate than other cultural attributes. Speeded or slowed rates of evolution typically indicate the action of natural selection

in analyses of the human genome.

This study of cultural evolution, which compares the rates of change for structural and decorative Polynesian canoe-design traits, is scheduled to appear Tuesday, Feb. 19, in the online *Proceedings of the National Academy of Sciences*.

"Biological evolution of inherited traits is the essential organizing principle of biology, but does evolution play a corresponding role in human culture?" said Jared Diamond, a professor of geography at the University of California-Los Angeles and author of Guns, Germs and Steel. "This paper makes a decisive advance in this controversial field."

The Stanford team studied reports of canoe designs from 11 Oceanic island cultures. They evaluated 96 functional features (such as how the hull was constructed or the way outriggers were attached) that could contribute to the seaworthiness of the canoes and thus have a bearing on fishing success or survival during migration or warfare. They also evaluated 38 decorative or symbolic features (such as the typeae design traits from island group to island group. Statistical test results showed clearly that the functional canoe design elements changed more slowly over time, indicating that natural selection could be weeding out inferior new designs. This cultural analysis is similar to analyses of the human genome that have been successful in finding which genes are under selection.

The field of cultural evolution is controversial because not all historians, social scientists or even biologists agree that cultural change can be understood in an evolutionary context. Some say that human beliefs and behaviors are too unpredictable.

But Nina Jablonski, chair of the Anthropology Department at Pennsylvania State University, said she is sold on the research. "This

paper is revolutionary in its approach ... one of the most significant papers to be written in anthropology in the last 20 years," she said.

Authors of the study said their results speak directly to urgent social and environmental problems.

"People studying climate change, population growth, poverty, racism and the threat of plagues all know what the problems are and what we should be doing to solve them," said Paul Ehrlich, the Bing Professor of Population Studies at Stanford.

Ehrlich, author of The Population Bomb and other books on dilemmas facing contemporary human society, said he does not understand why more effort is not going into urgently needed solutions. "What we don't know, and need to learn, is how cultures change and how we can ethically influence that process," he said.

Deborah S. Rogers, a research fellow at Stanford, said their findings demonstrate that "some cultural choices work while others clearly do not."

"Unfortunately, people have learned how to avoid natural selection in the short term through unsustainable approaches such as inequity and excess consumption. But this is not going to work in the long term," she said. "We need to begin aligning our culture with the powerful forces of nature and natural selection instead of against them."

Examples of cultural approaches that are putting humans at risk include "everything from the economic incentives, industrial technologies and growth mentality that cause climate change, pollution and loss of biodiversity, to the religious polarization and political ideologies that generate devastating conflict around the globe," Rogers said. "If the leadership necessary to undertake critically needed cultural evolution in

these areas can't be found, our civilization may find itself weeded out by natural selection, just like a bad canoe design."

Source: Stanford University