

## Plumbing the deep ocean for ice age answers

Marine scientists report that they have found important clues for understanding the ice ages that have repeatedly gripped Earth over the last million years. Evidence from the South Atlantic suggests that a radical shift in deep-ocean currents more than 12,000 years ago helped thaw the planet from its latest deep freeze.

Geoscientists have suspected for more than 150 years that slight changes in Earth's orbit set the rhythm for the ice age cycle. But these variations are too weak to actually push the planet from the long glacial periods to warm intervals and back into glacial conditions, so researchers have sought other factors on Earth that amplify the orbital shifts.

Christopher D. Charles and Richard G. Fairbanks of Columbia University's Lamont-Doherty Geological Observatory in Palisades, N.Y., say they now have strong evidence supporting the idea that shifts in deep-ocean currents helped power the radical warming that ended the last ice age. Details of their findings appear in the Jan. 30 *NATURE*.

Charles and Fairbanks took an unusual tack by studying evidence from the South Atlantic — a region far removed from the major ice age action occurring in North America and Europe, which were largely covered with thick glacial sheets. They examined a core of ocean sediments pulled up from a depth of 4,700 meters at a site located southwest of Africa.

By analyzing the shells of single-celled marine animals called foraminifera, the researchers sought to trace the history of an important current called the North Atlantic Deep Water (NADW), which flows south from Greenland and around the tip of Africa. Because water in this current contains more carbon-13 than does deep water from the Pacific and Indian oceans, Charles and Fairbanks were able to track the current's strength through time by measuring the relative amounts of carbon-13 in foraminifera shells from the South Atlantic site. During periods of weak current, the shells had little carbon-13; the opposite held true for periods of strong current.

The NADW plays a critical role in today's climate, keeping the environment of Western Europe relatively mild. The current forms when dense, salty water from the south cools near Greenland, growing heavy enough to sink to the ocean bottom.

Oceanographers knew that the NADW either shut off or weakened during the last ice age, but they wondered when the current renewed itself. Charles and Fairbanks used carbon-14 dating to assign an age to the reinitiation of the NADW as determined by carbon-13 changes in the foraminifera. They found that the current turned on abruptly between 12,600 and 12,200 years ago. That date is critical, says

Charles, because it closely matches the time when the northern ice sheets began rapidly melting (between 12,200 and 12,000 years ago).

"What we've done is document a temporal connection between those two basic phenomena. That doesn't necessarily constitute proof that ocean circulation changes are what melted the glaciers. But it does provide a really strong suggestion in that direction," Charles says.

Lloyd D. Keigwin of the Woods Hole (Mass.) Oceanographic Institution questions that interpretation, saying scien-

tists cannot yet sort cause from effect. Because of problems inherent in carbon-14 dating and limitations in sediment-core analysis, it is impossible to tell whether the ocean changes preceded melting, Keigwin says. It may be that some previous melting initiated the shifts in ocean circulation, and not the other way around, he suggests.

Another player must also fit somewhere in the game, notes Charles, because concentrations of greenhouse gases increased at the end of the ice age. But scientists do not yet know how rapidly these gases accumulated or whether they caused much of the climate warming.

— R. Monastersky

## Alcoholism: Nurture may often outdo nature

Many scientists involved in the widely publicized search for genes that predispose people to alcoholism frankly acknowledge the tremendous power exerted by environmental influences on uncontrolled imbibing (SN: 9/21/91, p.190). A new study of 356 pairs of identical and fraternal twins supports their position, finding a minimal role for genetic factors in alcoholism among women of all ages and among men whose drinking problems surface during adulthood.

Family influences — such as expectations about alcohol's mood-altering effects based on a parent's alcoholic behavior — may importantly predispose members of these groups to alcoholism, report psychologist Matt McGue of the University of Minnesota in Minneapolis and his colleagues. However, genes apparently assume a predominant role among men whose alcoholism emerges during adolescence, usually along with illicit drug abuse and delinquent behavior, McGue's team asserts.

"Researchers may be ignoring the significant influence that the environment has in the origins of alcoholism," the group concludes in the February *JOURNAL OF ABNORMAL PSYCHOLOGY*. The data weaken claims that alcoholism usually represents a "biologically determined medical disease," McGue argues.

The researchers studied 85 pairs of male identical twins (sharing the same genes), 96 pairs of male fraternal twins (sharing half of their genes), 44 pairs of female identical twins, 43 pairs of female fraternal twins and 88 pairs of opposite-sex fraternal twins. The team chose one twin who had undergone treatment for alcohol dependence or abuse, then sought out the sibling. Alcohol dependence involves persistent, uncontrolled consumption, a need for increasing amounts of alcohol, and marked withdrawal symptoms. Alcohol abuse, although slightly milder, causes recurrent social, job or physical problems.

Alcohol abuse and dependence, as well as illicit drug abuse and behavior prob-

lems, occurred much more often among both male identical twins than among both male fraternal twins, but only when the treated twin had suffered "early-onset" symptoms. Female identical and fraternal twins showed no such discrepancy in their rates of alcohol problems. For opposite-sex twins, alcohol problems appeared most often among the brothers of treated women.

Females in the twin study reported more prior treatment for depression and greater illegal use of prescription drugs than males. This suggests that depression plays a greater role in female alcoholism, the researchers contend.

Although the data emphasize environmental influences on alcoholism, they also indicate that consistent delinquent and cruel behavior derives from important genetic effects, McGue says.

McGue currently directs a prospective study of nearly 650 pairs of twin children, half of whom have an alcoholic parent, aimed at teasing out genetic and environmental influences on the development of alcoholism. He suspects that early-onset males possess an inherited inability to inhibit a spectrum of behaviors involving substance abuse and aggression.

McGue's findings replicate a twin study conducted in the 1970s, notes psychologist Henri Begleiter of the State University of New York Downstate Medical Center in Brooklyn. Begleiter, director of a nationwide study on the genetics of alcoholism, believes environment accounts for most of the disorder. But scientists lack valid ways to measure family environment, he says (SN: 12/7/91, p.376).

An inherited lack of behavioral inhibition may afflict women as well as men, adds psychiatrist Ernest P. Noble of the University of California, Los Angeles. In McGue's study, women exhibited this tendency through depression and prescription drug use, Noble says, but future female samples may show more alcoholism and behavior problems as cultural conventions regarding women change.

— B. Bower