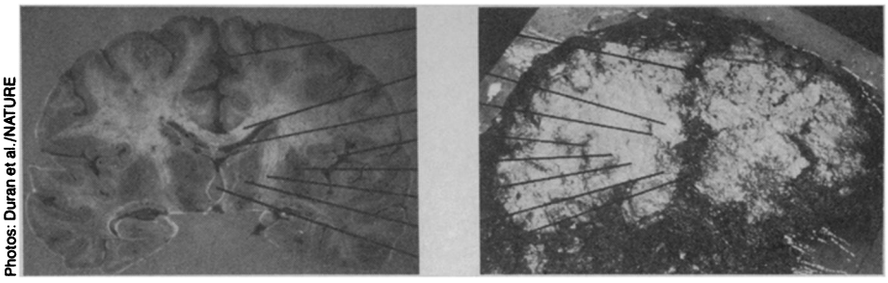
Human DNA intact after 8,000 years



Photos: Duran et al./NATURE

Cross-sections of modern (left) and 8,000-year-old (right) brains. Despite damage, many anatomical structures survive in the prehistoric gray matter.

For nearly three years, scientists working at a central Florida peat bog have been dredging up 8,000-year-old human skeletons with skulls that contain shriveled, remarkably preserved brains (SN: 12/22 & 29/84, p. 388). They now report that four of the brains have yielded the oldest-known examples of human DNA and cellular structure.

Molecular biologists are now attempting to clone genes or gene fragments from the prehistoric pieces of DNA so that they can be compared to corresponding modern genes. The charting of clear-cut evolutionary "mutations" or changes in specific genes will likely require the examination of much older specimens, however.

Preservation of soft tissue in the soggy bog, say anthropologist Glen H. Doran of Florida State University in Tallahassee and his colleagues, demonstrates that "intact DNA can survive in other than extremely arid conditions, which greatly widens the sites where ancient genetic material may be found."

Previous DNA recoveries from archaeological remains have involved dried tissue. One researcher detected human-like fragments of DNA in 3 of 23 Egyptian mummies (SN: 4/27/85, p. 262) and cloned some of the 2,400-year-old DNA segments in bacteria. Bits of DNA from a quagga, an extinct horselike animal, have also been cloned (SN: 6/9/84, p. 356).

The yield of DNA from the Florida specimens was about 1 percent of the amount normally obtained from fresh tissue. DNA analysis is being conducted by Philip J. Laipis and William W. Hauswirth of the University of Florida College of Medicine in Gainesville.

It is difficult to isolate clean samples of the ancient genes, says Laipis, because of considerable damage to the DNA and the intrusion of plant residue and other impurities picked up from the soil. But rapid advances in genetic analysis are being made at several laboratories, he adds.

"The average size of the DNA strands we've isolated is small, only a few hundred base pairs per strand," notes Laipis. "We're attempting to clone pieces with *Alu* fragments." *Alu* repeated sequences are regions of DNA that are characteristic of human DNA.

It is not probable that genetic mutations have occurred in the short evolutionary time span of 8,000 years, says Laipis. But as cloning methods for damaged DNA improve, he and other investigators plan to compare genetic material from much older specimens to that of their modern counterparts. For example, Laipis suggests that gene fragments from a frozen, 36,000-year-old steppe bison uncovered in Alaska could be matched with corresponding fragments from a modern buffalo.

In addition to the DNA findings, which are reported in the Oct. 30 NATURE, microscopic examination of samples taken from the cerebral hemispheres, cerebellum and brain stem revealed, according to the researchers, "limited but definite" remains of cell structure and patterning similar to that found in modern brains.

While the prehistoric brains keep molecular biologists busy, the peat bog where the specimens were preserved — located in a suburban housing development that is now building around the site — is also proving to be an important resource for archaeologists. In October, a piece of fabric with a sophisticated weave was found wrapped around a skeleton, suggesting that these early Americans were able to develop skilled crafts. They also seem to have cared for severely handicapped individuals, as indicated by the skeleton of an adolescent boy with bone deformities that probably crippled him from birth.

In addition, says Doran, it is clear from the more than 40 skeletons found so far that the site was a burial ground. The skeletons represent both sexes and a wide range of ages and now lie under about 7 feet of peat, which is covered by 2 to 3 feet of water. *— B. Bower*

U.S./Soviet space science pact drafted

In 1982, a decade-old U.S.-Soviet agreement permitting cooperation in peaceful space-science research was allowed by President Reagan to lapse, as part of U.S. response to Soviet activities in Poland. Reagan had announced his intention months in advance, and strong opposition among some U.S. scientists was already evident as the May 24 deadline approached (SN: 3/27/82, p. 214). Two years later, both houses of Congress unanimously passed — and the President signed — a joint resolution urging him to "endeavor, at the earliest possible date," to renew the arrangement (SN: 11/10/84, p. 295).

Last week, U.S. and Soviet negotiators met in Washington and settled on the wording for a new agreement. The document was not signed or initialed — it must first be reviewed by officials from both sides, as well as survive any unforeseen changes in the political climate. But, says a U.S. official, the teams did "reach substantive agreement on the text of a new general agreement on civil space science."

As for the pact's likelihood of reaching fruition, officials from both the U.S. Department of State and NASA declined to speculate on the record. "I think there's a good chance the agreement will be signed," said one; although, cautioned another observer, "there could always be another Poland" that might set back the negotiations.

The document, which evolved from discussions in Moscow in September and then at the Reykjavik summit meeting, identified five areas of space science: planetary exploration; astronomy and astrophysics; solar-terrestrial physics; earth science; and biology and medicine. There is no mention of any manned space projects, including joint U.S.-Soviet exploration of Mars, a topic which has received much discussion in the last couple of years. In unmanned space missions, however, 16 candidate projects are included, though officials again decline to list specific examples from the document.

In a different cooperative arena, members of a U.S./Soviet/European/Japanese organization called the Inter-Agency Consultative Group (IACG) met in Padua (Padova), Italy, this week and concluded that solar-terrestrial physics would be what one U.S. official describes as "the next focal point" for the group's efforts. The IACG plans no missions of its own, but was established a few years ago to coordinate research plans and spacecraft operations for the appearance of Comet Halley. All of the IACG member-states' space organizations are planning activities to study details of the sun's interaction with the Earth during the 1990s, although U.S. goals of developing space probes to participate have yet to show up in NASA's budget.

The IACG established two working groups to aid in the project — one for matters of science, and the other to deal with questions of coordinating data. In addition, it set up two panels to consider possible future studies in planetary and primitive bodies, and in very-long-baseline interferometry. *— J. Eberhart*