Anthropology

Calls in the wild

Wild chimpanzees seldom bunch together in a large congregation, preferring to intermingle in a number of smaller groups as they make their way through the jungle. Preliminary observations in Tanzania's Gombe Stream National Park suggest these groups frequently communicate with each other over long distances by exchanging distinctive calls, according to a report in the spring ANTHROQUEST.

Individual chimpanzees may travel toward a group emitting the calls, or one group may head toward another after an exchange, says anthropologist Christopher Boehm of Northern Kentucky University in Highland Heights, who works in collaboration with Jane Goodall of the Gombe Stream Research Center. Chimps often volley calls back and forth in succession between groups, Boehm notes, indicating "a two-way conversational aspect [with] some similarity to human language."

In the summer of 1986, Boehm and Tanzanian field assistants taped each end of two-way communications between chimp groups. The assistants made additional tapes after Boehm left and sent them to him for analysis.

Long-distance communications chiefly involve "pant-hoots," Boehm says, a type of call with many poorly understood variations. Pant-hoots are based on the rapid inhaling and exhaling of air, beginning in a low register and building toward a high-frequency climax.

Within a community, chimps know one another's voices and can locate another group after hearing a brief call, Boehm maintains. Thus, when groups take turns in vocalizing, they are doing more than announcing their location. Boehm and a colleague hope to conduct a four-year study in which they will look for rules governing turn-taking and attempt to identify specific pant-hoots given in response to preceding calls.

They also plan to videotape interactions between individual chimps and conduct a spectrographic analysis of the grunts and other calls emitted in various situations.

Tasmania's earliest settlers

Evidence from two rock shelters in Tasmania indicates humans colonized the island more than 30,000 years ago, at least 8,000 years earlier than previously thought.

It is possible humans reached Tasmania 36,000 years ago when a drop in sea level created a land bridge to Australia, 200 miles to the northwest, says archaeologist Richard Cosgrove of La Trobe University in Melbourne, Australia. Evidence indicates humans occupied Australia 40,000 years ago.

Cosgrove excavated the sites from December 1987 through February 1988. Sediment from a limestone cave nestled above a river valley contains stone flakes and animal bones and is radiocarbon-dated at 30,420 years of age, he reports in the March 31 SCIENCE. A sandstone shelter perched above another river valley yielded similar remains and an age of 30,840 years.

The location of the sites in flat, exposed highlands near where the largest Tasmanian ice sheet extended 18,000 years ago suggests early settlers weathered severe cold to hunt a variety of animals, including kangaroos, birds and wallabies, Cosgrove asserts. Fragments of emu eggs are also present at both rock shelters, he adds. Previously archaeologists argued that the earliest Tasmanian settlers made their living along the coast or near lakes.

There are no remains of now-extinct large mammals at the sites, Cosgrove says. These creatures were probably extinct before humans settled Tasmania, he contends, although separate kill and consumption sites some distance from the rock shelters cannot be ruled out. Other researchers have uncovered evidence that humans and the extinct mammals coexisted in Tasmania 20,000 years ago, with the latter group disappearing 11,000 years ago.

Space Sciences

A balloonful of Earth to help study Mars

U.S. and Soviet scientists are planning an unusual trek to dangle a ton of cold Antarctic soil from a balloon more than 13 miles above Earth's south polar cap. The project's aim: to learn more about the composition of Mars.

Cosmic rays striking the Martian surface can cause its varied materials to emit gamma rays with energies characteristic of the elements that spawned them, thus revealing their identities. The problem-plagued Soviet Phobos 2 spacecraft, now orbiting Mars, carried a gamma-ray spectrometer to "read" these emissions, and NASA plans a version with substantially higher spectral resolution for its Mars Observer in 1992.

The technique does not work on Earth's surface, however, where the thick atmosphere absorbs incoming cosmic rays. Therefore, scientists checking out their sensors on Earth for use on Mars, where the atmosphere is about 100 times thinner, must somehow get their surface samples above all or most of the terrestrial atmosphere.

For the test, the balloon will carry terrestrial samples resembling the Martian surface composition as planetary scientists now understand it. These samples need to be low in chlorine, since chlorine produces many strong spectral lines that could interfere with other gamma-ray lines. The U.S. and Soviet project directors, Jacob I. Trombka of the NASA Goddard Space Flight Center in Greenbelt, Md., and Yuri Surkov of the Vernadsky Institute in Moscow, met this month at Goddard to work out details. They plan to visit Antarctica next December with Steven W. Squyres of Cornell University to select promising sample sites.

Project leaders expect to begin the three-week flight in December 1991, during the Antarctic summer. At this time, the whole flight can be conducted in daylight, virtually eliminating day/night temperature changes so the balloon spends most of its time at roughly the same altitude.

The balloon's gondola will have two compartments, the upper one initially containing both the sample and gamma-ray detectors like those on the U.S. and Soviet spacecraft. Once the instruments have had enough time to study elements in the dirt – about half the flight time – the sample will drop into the lower compartment, leaving the detectors to take readings to determine the level of cosmic rays striking the sample.

Scientists tried the test once before to see if the technique would work. It did, but Larry G. Evans of Goddard notes it was less than successful at analyzing the sample. Launched from Palestine, Tex., in 1984, the balloon operated for about 12 hours at an altitude of 100,000 feet. Unfortunately, the combination of the thin atmosphere at that height and the thin layer of the sample did not allow enough cosmic rays to interact with the sample to generate gamma rays that would reveal the sample's detailed composition.

In addition, gamma-ray studies take time, so the 1984 test was not helped any by spending only half a day aloft. Trace elements such as titanium and aluminum produce only about 1 to 10 percent of the number of gamma rays associated with the abundant elements, such as silicon and iron, making the trace-element spectra difficult to read. For the new test, the payload will be equipped to operate for as long as 21 days, its lifetime limited primarily by the supply of liquid nitrogen provided to cool the U.S. gamma-ray detector.

The only other large balloon launched from Antarctica into the stratosphere went up in January 1988 to examine the newly discovered supernova 1987A. NASA plans to use the gamma-ray detector flown on that flight to measure the gamma rays emitted by the soil suspended high above Antarctica.

It is not yet clear whether the problems with Phobos 2 will affect Soviet participation, but Trombka says U.S. scientists are prepared, if necessary, to go it alone.