ARCHAEOLOGY

Evolution of a Valdivian town

The Valdivian culture of South America, which existed from 3550 B.C. to 1500 B.C., has recently generated a great deal of interest as the possible predecessor of the Maya civilization. Much of the interest has been due to Donald Lathrap and his associates at the University of Illinois who excavated an ancient Valdivian town near Real Alto, Ecuador, and found a surprisingly complex society with ritual and social organization similar to later pre-Columbian cultures (SN: 11/29/75, p. 346).

Now, Lathrap, Jorge Marcos and James Zeidler have reconstructed the evolution of the Valdivian town from its earliest, simple society to its later, more stratified stages, providing a clue to the development of the ceremonial cult which characterized Maya life. Reporting in the January ARCHAEOLOGY, the researchers found that in the earlier stages (3400 to 3300 B.C.), all the inhabitants lived around a central ceremonial plaza, resembling the "Gê" villages of northern Brazil. In this society, all members lived in roughly equivalent status, each sharing equal access to the village's center. Around 3100 B.C., however, the layout of the town changed markedly. The two large ceremonial mounds overlooking the plaza underwent increased rebuilding, and human sacrifice was practiced. The number of dwellings in the town decreased, while a number of satellite farming communities developed in the vicinity. This was the period, the researchers believe, that a priestly elite formed and assumed ceremonial duties, while a laboring, rural class was moved out near the fields to grow the necessary food for the town's support. Maya cities 2,500 years later took the same form of city and social organization.

Although the village at Real Alto is the oldest known center in the New World, it is not necessarily the oldest. The researchers posit that older centers probably exist in Colombia.

Frost-free Indian gardens

Anthropologists have never been able to determine the purpose of the long rows of ridges and furrows built up by Native Americans in southern Wisconsin and Michigan. Although everyone is content that the ridges served as gardens, no one has been able to understand why the furrows were so unusually deep and the ridges so wide. Ordinary gardens do not have furrows three feet deep and ridges three feet wide.

Tom Riley and Glenn Freimuth at the University of Illinois now contend that the odd shape served to drain cold air from the ground on top of the ridges to the deep furrows, enabling the planters to gain a few more frost-free growing days each year. To test their hypothesis, they duplicated the ridge and furrow in a garden on the Urbana campus. Using a number of temperature and humidity recording devices, they found that on cool, clear nights, which farmers call "moon frost" nights, the mounding dissipated the colder temperatures on the ridge and drained the cold air into the furrow.

There's still quite a leap from tests at a garden in Urbana to the actual practices of farmers in Wisconsin 500 to 1,000 years ago. The researchers point out that one distribution of known ridges coincides nicely with the 120-day frost-free line, while another runs along the 150-day frost-free line, indicating that the ridges do conform to at least present day climatological data. Riley also notes that the Enga tribe of New Guinea and other peoples in South America have constructed similar mounds to ward off the frost.

Riley is still cautious about the results. He now wants to perform tests on the actual ridges and establish more solid information about the local climate of the past. This may prove difficult since no agreement exists about the date and origin of the builders of the ridges and furrows.

PHYSICAL SCIENCES

Heavy leptons and new hadrons

Data continue to mount up that imply the existence of at least one and possibly more heavy subatomic particles of the class called leptons. The latest evidence comes from the collision and annihilation of oppositely directed beams of electrons in the SPEAR storage ring of the Stanford Linear Accelerator Center in California. It is reported in the Jan. 17 PHYSICAL REVIEW LETTERS by 36 physicists from SLAC and the Lawrence Berkeley Laboratory.

Confirmation of one or more heavy leptons is eagerly awaited by theorists, because the prediction of their existence is one of the important points of the newest comprehensive theories of subatomic physics. The present evidence applies to collisions in which the beam energy was above 4 billion electron-volts per particle and is indirect, depending on the study of particles coming off perpendicular to the beams after the collisions.

The particular observation is of events that produce pairs of muons. This is one of the expected modes of decay of a heavy lepton, and the experimenters say that these events appear at a rate compatible with expectation.

Study of results at beam energies between 5.8 billion and 7.8 billion electron-volts yields in addition numbers of events that produce a multiplicity of muons greater than two, which are far beyond the multiple-muon decay rates expected for heavy leptons. The experimenters attribute this to the decay of previously unknown particles of the hadron class.

High-power ion beams

Generation of very high power pulsed beams of ions is reported in the Jan. 17 PHYSICAL REVIEW LETTERS by scientists at the U.S. Naval Research Laboratory (J. Golden, C. A. Kapetanakos, S. J. Marsh and S. J. Stephanakis). The beam in this case consists of the simplest ions, hydrogen ions or protons, and the peak power is in excess of 200 billion watts.

The experimenters assess what they have accomplished by writing: "The results of the present experiment demonstrate unequivocally that existing pulsed-power technology can provide sufficient ions, in a single pulse, which, if converted into a ring or layer, could produce field reversal." Field reversal is important to experiments in controlled thermonuclear fusion in which a plasma of ions and electrons is to be confined in a magnetic field. With field reversal the particles, as it were, dig their own grave in the confining magnetic field, a condition that should lead to particularly stable confinement.

These proton beams are produced by a triode, a large, powerful and sophisticated version of a structure that used to be quite common when radios had vacuum tubes. The energy of the protons is between 0.6 million and 1.2 million electron-volts, but what counts far more is the density of the pulses, which is equivalent to a current of 200,000 amperes.

Still no LGM's at the water hole

Since 1973 the Ohio State University Radio Observatory has been engaged in a survey of the whole sky for possible radio signals produced by intelligent beings. The search is conducted around a wavelength of 21 centimeters, the characteristic emission of hydrogen atoms. (This is part of the so-called water hole, the spectral range dominated by the emissions of the hydrogen atom and the hydroxyl radical, the constituents of the water molecule.) In a forthcoming issue of ICARUS (30:267) Robert S. Dixon and Dennis M. Cole report that no apparent intelligent signals have been found in the sky region between $+48°$ and $+14°$ declination at strengths above the instrumental threshold of 1.5×10^{-21} watts per square meter.

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