ARCHAEOLOGY

Neutron activation aids dating

Progress toward an accurate method of determining the age of hard-to-date petroglyphs — prehistoric rock engravings — has been reported by scientists at the University of California's Lawrence Berkeley Laboratory. The research, reported in the February ARCHAEOMETRY, was conducted on petroglyph and various other rock samples from the Carson Sink desert, near Fallon, Nev.

Archaeologist James Bard and nuclear chemist Frank Asaro examined the carvings that had been pecked out of rocks thousands of years ago by the Great Basin Indians. To create the designs, the Indians had to chip through the rocks' natural "desert varnish," a dark coating that derives its color from manganese and iron oxides. But over the years the carvings themselves became covered with newer varnish.

In a procedure uncommon to archaeology, the two scientists scraped off and crushed chips from the face of the petroglyphs and other rock fragments and exposed the samples to a stream of neutrons. The subsequently released gamma rays revealed trace amounts of various elements. Bard and Asaro found that 20 of the trace elements were more abundant in the varnish than in the rocks' interiors. The researchers suggest that such knowledge, combined with a growing understanding of the varnish formation process, could lead to a feasible dating technique for petroglyphs.

Despite its accuracy, however, neutron activation is "expensive, time-consuming" and necessitates some defacing of the engravings, say the researchers. But, they add, their results could lead to somewhat less precise but adequate, faster and more economical methods of analysis. "With portable X-ray fluorescence systems, for example," says Asaro, "it might eventually be possible to estimate the ages of petroglyphs quickly in the field without defacing their surfaces."

Eskimos meet Vikings

Evidence for "very early" contact between Europeans and Eskimo ancestors in the Canadian Arctic has been discovered on the sunken floor of an ancient pit house on Baffin Island in the Hudson Strait. The evidence is in the form of a two-and-one-eighth-inch-high wood carving of what is believed to be a 13th century Viking man. Though Eskimo carvings have been found on several sites in Greenland, the Baffin Island figurine is the first of its kind found in North America, according to Moreau S. Maxwell, professor of anthropology at Michigan State University.

MSU team members Deborah Sabo and George Sabo identified the relic last July, during an expedition supported by the National Science Foundation. The carving, of fine-grained wood (probably fir), depicts a figure wearing a long hood-robe pleated in the front, below the waist; a cross rests on the chest. That particular style was unique to Vikings at the time and differed identifiably from costumes worn by Norsemen in later centuries, according to Maxwell and several other independent experts.

The conclusion is further supported by the presence of other artifacts at the Baffin site almost identical to those found at other, confirmed 13th century sites of Canadian Thule (ancestors of present-day Eskimos) Eskimos. This evidence of early contact between Vikings and Baffin Eskimos "introduces new horizons to the study of the effects and influences of Europeans upon the aboriginal culture of the Canadian Thule Eskimos," Maxwell says.

SPACE SCIENCES

Moon still ringing from impact?

In 1976, Jack Hartung of the State University of New York at Stony Brook suggested that the 20-kilometer lunar crater Giordano Bruno may have been formed by a meteorite impact only 800 years ago (SN: 12/18/76, p. 390). He cited an account of some moon-watchers as reported in the medieval chronicles of Gervase of Canterbury, describing their naked-eye observations of a fiery event emanating from the upper horn of the crescent moon on June 18, 1178. Now two French researchers have found that the moon indeed seems to show residual motions consistent with such an impact at that time.

The deformation of the moon due to the impact would have damped out very quickly, according to Odile Calame and J. Derral Mulholland of the Center for Geodynamical and Astronomical Studies and Research in Grasse, France. However, they report in the Feb. 24 SCIENCE, the "free librations" — effects on the moon's overall motions — from an impact 800 years ago "would leave residual amplitudes nearly unchanged from their original values."

Based in part on the size of the crater and on the distance covered by material thrown out by the impact (some of it landed on or near the Luna 24 site about 1,200 km away), the researchers assume an impact velocity in the range of 20 kilometers per second. This, they report, suggests that the most conspicuous libration effect — a cyclic variation in the moon's rate of rotation — should fall between 0.2 and 4.6 seconds of arc. This means that a given point on the lunar equator would be out of position by between about 2 and 37 meters compared to where it would be if the moon's rotation rate was unperturbed.

The only observations capable of detecting such small differences, according to the authors, are the earth-based laser-ranging studies made with the reflectors left on the moon for that purpose by the Apollo astronauts. The data indicate a value, relatively constant over three years of observation, of 1.8 arc-seconds, well within the predicted range.

This does not prove the "Hartung hypothesis," the researchers point out, but it does provide support from what seems to be the only heretofore eligible source. Confirmation might be possible if material from the crater can be identified and dated in the sample returned to earth by Luna 24, although data from a gathering of Luna 24 investigators late last year suggested that the material may have just missed the spacecraft site.

Moonrocks for high schools

The lunar samples brought back by the Apollo astronauts began showing up regularly at school in 1975, when NASA started lending thin-section microscope slides of moonrocks to teachers of college and university geoscience courses. Now the program has been expanded to include high schools, where the science may be lighter but the excitement, perhaps, is closer to the surface.

The samples for high school use (also available to museums) are encased in six-by-one-inch clear plastic disks, including in each disk the following kinds of lunar material: breccia (a broken surface-soil type), basalt (solidified volcanic matter), anorthosite (an igneous rock including calcium, aluminum, silicon and oxygen), orange glass, mare soil and highland soil. Each disk in the high school program includes scientific analysis of the samples, and comes with a film on lunar science, workbook material, slides and an audio cassette. The museum disks come with a shorter sound-slide presentation.

Interested high schools or museums should contact NASA, Public Affairs Office, Code AP4, Johnson Space Center, Houston, Tex. 77058. The university-oriented thin-section samples (SN: 12/18/76, p. 390), meanwhile, continue to be available.