Technology

Ivars Peterson reports from the Smithsonian Institution in Washington, D.C., at the 1984 Archaeometry Symposium

Pigment processing for cave paintings

Some 17,000 years ago, Stone Age artists filled the walls and ceilings of the Lascaux cave in France with about 600 magnificent, lifelike drawings of horses, bulls, deer and other animals. Studies since the cave was accidentally discovered 40 years ago have revealed a great deal about how these artists worked. Researchers have found the stone lamps that provided light for the artists, the scaffolding that allowed them to work on rock faces normally out of reach and the palettes that held the painters' pigments. Recent research has focused on the minerals that were ground up to produce the fine, powdered pigments used for the cave drawings. The results show that the artists were remarkably sophisticated in their use of local minerals, grinding and mixing them to produce a wide range of colors, especially yellows, reds and blacks.

French Government Office of Tourism

Pamela B. Vandiver and William D. Kingery of the Ceramics and Glass Laboratory at the Massachusetts Institute of Technology used a variety of materials science techniques, such as scanning electron microscopy and several X-ray methods, to characterize the microstructure and composition of the pigments used. Kingery says, "Prior to our work, there had not been any work on examining the microstructure of the pigment materials in terms of their mineral sources nor of the manganese- and iron-containing natural minerals that might have been used as pigments."

Vandiver and Kingery found that the artists could have obtained a full range of colors from mineral deposits within 15 kilometers of the cave. "I was surprised at the wide variety of natural pigment colors that were immediately accessible to the painters at Lascaux," says Kingery. Moreover, the pigment particles displayed a finer particle size and more diverse composition than found in the mineral deposits. This means that the artists probably milled and mixed the various minerals, says Vandiver. Hematite (iron oxide) for red pigments and manganese oxide minerals for black pigments were particularly important source materials.

Vandiver also discovered significant microscopic differences between the red and black pigment minerals. The hematite crystals were platelike, while the manganese oxide crystals were needlelike. These different crystal forms affected how the pigments were used and the type of drawings created. Sticks of the black color, for instance, could be used to draw long, dark lines to outline large objects on wet limestone walls. The cave's 17-foot drawings of bulls are done in this manner. The red color, on the other hand, had to be applied as a thick slurry of water, clay and hematite. Because this color had to be "scrubbed" into the rock to build up a vivid, bright red, only smaller areas could be covered. "You really can't draw a line that's 17 feet long with a clay-hematite mixture," says Vandiver. The red color is a striking feature of the smaller drawings of horses. Kingery summarizes: "I think the natural pigments available had some influence on some characteristics of the drawing techniques."

Biomedicine

Hot dogs hazardous for toothless tots

You wouldn't give your toddler a marble or cork to chew, for fear the child would choke. But hot dogs, grapes, carrots and peanuts can be just as deadly for the tots, say researchers who conducted a nationwide study of 103 childhood deaths through asphyxiation. About as many children die from food-related suffocation — about 70 each year — as from poisoning, say the authors of a three-year study published in the May 4 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION. Rounded, slippery bits of unchewed food pose a special threat to very young children whose lack of molars and narrow airways make otherwise safe foods hazardous, they report.

The researchers, primarily from Johns Hopkins University, suggest that brightly colored warning labels might curb the problem, but George Wilson of the American Meat Institute told SCIENCE NEWS that such labeling of "adult foods" is unlikely. (Gerber, a company that manufactures meat sticks specifically for toddlers, has already voluntarily relabeled their product as "intended for children with teeth.") Instead of warning labels, the manufacturers are developing educational films and brochures aimed at pediatricians and parents, Wilson says, to highlight the risks of inappropriate feeding and foods.

Pre-birth CO linked to learning defects

Premature birth, low birth weight and an increased risk of miscarriage were identified several years ago as physical risks pregnant women pass on to their children with every puff of a cigarette. Now work in rats shows that a major component in smoke — carbon monoxide or CO — may also cause learning and memory deficits in a developing fetus.

The problem arises, says Laurence D. Fechter of Johns Hopkins University in Baltimore, when CO competes with oxygen for linkups to hemoglobin, the transporter molecule in blood that the body uses to ferry oxygen from lung to limb. As blood levels of the CO/hemoglobin complex, called HbCO, rise, the amount of oxygen getting to tissues drops.

Fechter and Charles F. Mactutus, now at the National Institute of Environmental Health Science, in Research Triangle Park, N.C., exposed pregnant rats to CO levels comparable to those a heavy smoker inhales. The offspring were provided normal air. Five weeks later, the rat pups were taught how to avoid an electric shock, and were significantly slower both in learning the task and in remembering it once learned. Early results indicate the rats continue to have memory deficits into adulthood, Fechter said at a recent Johns Hopkins symposium for science writers. The findings can't be directly applied to human learning, Fechter says, but should serve as a red flag for researchers that chronic exposure to some chemicals before birth may cause behavioral deficits even when no physical birth defects are evident.

Banking (on) DNA for disease diagnosis

Indiana University researchers in Indianapolis have collected an initial 90 samples for the world's first "DNA bank." The bank is to serve as a reference library of genetic material, a resource for persons with certain genetic diseases and for scientists who study the illnesses. Although fewer than 50 of the approximately 50,000 human genes have been sequenced so far, the number identified is increasing by the minute, says M. E. Hodes, the geneticist who will direct the bank. By banking samples of DNA from patients with any of the 3,000 known genetic illnesses and their disease-free family members, Hodes and colleagues hope to aid researchers in locating exactly which genetic defects cause illness. A $25 fee for processing and storage permits the donor or a family member access to deposited DNA, Hodes says, enabling current and future diagnostic tests.