Biology

Ron Cowen reports from Tempe, Ariz., at the annual conference of the Society of Ethnobiology

Amaizing gastronomy: Sup on smut?

Many U.S. farmers would echo the sentiments of the corn grower who recently sought advice from a gardening magazine. "It's the ugliest-looking blight I've ever seen," he wrote, describing a fungus infecting his crop. "Ears swell and burst forth in a disgusting array of huge, sickly white kernels filled with black powder."

But one man's disgust is another's degustation. And if ethnobotanist Kevin Dahl has his way, this much-maligned fungus – known as corn smut – will soon become part of American *nouvelle cuisine.*

The mushroom-like fungus has long played a part in Native American cultures, notes Dahl, a graduate student at Prescott (Ariz.) College. A Mexican folk tale tells of four women grinding corn for a harvest meal who were visited by an apparition as they began to discard "sooted" corn – ears infected with smut. The spirit, known as Corn Soot Woman, promised the grinders that if they would keep the infected corn, all new ears would grow fat and plentiful. And so, according to legend, began the practice of retaining sooted corn.

Dahl observes that many indigenous groups in Mexico and the U.S. Southwest regard it as a delicacy. Members of the Hopi tribe fry the fungus, and the Western Apaches have been reported to eat smut raw off the ear or to boil it and sprinkle it with acorn meal. Food writer Diana Kennedy noted in 1986 that the fungus is sold in food markets near Mexico City. Corn smut is "perfectly delicious, with an inky, mushroomy flavor that is almost impossible to describe," she writes in *The Cuisines of Mexico.* "I quite imagine that [it] may have been the ambrosia of the Aztec gods."

Dahl says most people in the United States view corn smut with revulsion because they question the safety of fungal foods in general. Historically, corn smut has been rumored to cause a variety of human ailments, but Dahl says studies by others suggest it is safe aside from a potential to trigger skin allergies.

The fungus frustrates farmers because it damages some 3 to 5 percent of the U.S. corn crop annually, Dahl says, noting that fungicide sprays reduce the blight but also reduce overall crop yields. Small-scale gardeners often simply destroy infected plants. Instead, suggests Dahl, growers might consider taking a cue from the Mexicans and marketing the fungus. "For elegant restaurants, the serving of smut fresh in season, when it is known to be at its best, could be a selling point," he says.

Dahl, whose main research interest lies in conserving seed strains cultivated by Native Americans, says he plans to set up a mail-order business to sell smut – the edible type, that is.

Redbud: Rethinking plant conservation

In the film "Citizen Kane," the word "rosebud" sums up a life gone astray. For biologist M. Kat Anderson of the University of California, Berkeley, the word "redbud" sums up a broadened concept of plant conservation.

Working in California's Sierra National Forest, Anderson has mimicked the efforts of the Southern Sierra Miwok, a native tribe, to cultivate a flowering shrub so that its branches can easily be woven into red-hued baskets. She found that the tribal practices of burning, pruning and drastically chopping back redbud plants not only stimulate the growth of younger, more pliant branches for basket weaving but also boost shrub survival. Fire, for example, can crack the tough redbud seed coat and provide the heat needed for germination, she notes.

These findings may explain the abundance of redbud growing near Miwok archaeological sites, Anderson says. She concludes that the Miwok approach exemplifies a mutually beneficial interplay between cultural practices and botanical conservation, suggesting conservationists could broaden their notion of species preservation to include such interplay.

Physics

Ivars Peterson reports from Anaheim, Calif., at an American Physical Society meeting

The shocked state of superconductors

Blasting crystals of a high-temperature, oxide superconductor with a shock wave can substantially increase the material's capacity to carry electrical current, reports a research team led by William J. Nellis of the Lawrence Livermore (Calif.) National Laboratory.

The team uses a gas-powered gun to fire lightweight, plastic projectiles at small samples of bismuth strontium calcium copper oxide in powder form. The resulting shock wave deforms the material, apparently creating tiny defects in its crystal structure. Those defects help anchor lines of magnetic flux, which penetrate the material when it's immersed in a magnetic field. Normally, even a modest electric current can shunt the flux lines aside, and the material loses its superconducting properties (SN: 2/10/90, p.95). Measurements of the magnetic characteristics of the shocked crystals confirm they can carry larger superconducting currents than unshocked samples. The researchers are also trying the technique on yttrium barium copper oxide.

Shock-wave processing has several advantages over other recently investigated techniques for creating defects to pin flux lines and increase the current superconductors can carry, Nellis says. Irradiating materials with neutrons, for instance, is impractical on an industrial scale, whereas the use of shock-wave techniques based on relatively simple, conventional explosives for the large-scale processing of high-temperature superconductors seems feasible.

Avalanches in a magnetic froth

Thin films of synthetic garnet, an iron-oxide compound, have long played an important role as magnetic bubble memories, in which bits of digital data are stored as compact, circular regions, or domains, magnetized in the opposite direction of the thin magnetic film through which they move. The magnetic garnet films also prove useful for studying the evolution of magnetization patterns, says Kenneth L. Babcock of the University of California, Santa Barbara.

Babcock, working with Robert M. Westervelt of Harvard University, investigated the behavior of thin-film magnetic domains having a disordered cellular pattern resembling a two-dimensional soap froth. They discovered that under the influence of an increasing external magnetic field, magnetized "cells" having fewer than six sides tend to contract and sometimes collapse, while other cells grow to fill the vacated space. That behavior bears a striking resemblance to the evolution of soap froths over time (SN: 7/29/89, p.72).

The researchers have also observed a dramatic "melting" transition, in which a front sweeps through an orderly lattice of magnetized cells, leaving behind a disordered magnetic froth. "These transitions are analogous to the melting of solids induced by changing the pressure while holding the temperature fixed," Babcock says.

Magnetic avalanches can also produce striking patterns, the researchers say. In such avalanches, the elimination of a given cell caused by a small increase in the external magnetic field alters the local pattern sufficiently to trigger the collapse of neighboring cells, producing a wave of destruction.

The researchers find that for certain ranges of external magnetic-field strengths, the magnetic froth shifts into a barely stable state readily susceptible to additional avalanches, even for very small increases in the external magnetic field. In other words, the magnetic froth apparently organizes itself into a precarious state prone to avalanches. That type of behavior seems to meet the requirements of self-organized criticality, a recently introduced theoretical notion proposed as the source of erratic behavior in a variety of computer models and physical systems (SN: 7/15/89, p.40).