RANDOM SAMPLES

edited by RICHARD STONE

Liquids Do the Quasicrystal Twist

Ethyl alcohol has caused a trio of Danish physicists to see some strange things. Instead of drinking the fire water, they set it vibrating and found that surface ripples can form mesmerizing patterns that include "the first quasicrystal [pattern] observed in a fluid," they report in the 6 April *Physical Review Letters*.

Physicist Preben Alstrøm of the H.C. Ørsted Institute in Copenhagen says his group's aim was to study how orderly fluid motions can give way to chaotic ones. Fundamental as that might sound, it is a concern for, say, chemical engineers shunting fluids through labyrinthine pipeways, or submarine designers who want water to flow more smoothly and quietly over a sub's hull. Now it turns out that the trio's work could shed light on the formation of quasicrystals, which have baffled researchers ever since their discovery nearly 10 years ago. Normal crystals contain three-dimensional packings of identical molecular units; in quasicrystals, the units are more complicated and not obviously interchangeable.

In their experiments, the Danish researchers shine light up through a container of ethyl alcohol, which they vibrate at a variety of frequencies and intensities. A video camera records a shadow pattern of the ripples. At specific combinations of vibration frequency and amplitude, the surface ripples fall into honeycomb, triangular, square, or—the shocker—quasicrystalline patterns.

Long Odds Against Landing a Math Job

Budding mathematicians should have no trouble counting the number of jobs at U.S. colleges listed in the April issue of the *Notices of the American Mathematical Society* (AMS). How many are there? Exactly one.

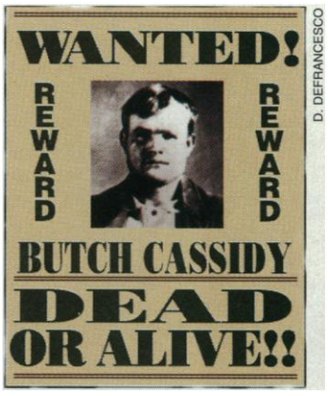
Mathematicians have told *Science* that people with new or recent doctorates are having a harder time finding employment this year than in 1991, which was the leanest year in recent memory. "It's almost certain that [this year's] final picture is going to be worse [than last year's]," says James Maxwell, associate executive director of the AMS. In better times, the April issue of *Notices* carried 10 to 20 job ads; this year's offered two overseas positions besides the sole U.S. opening. And Maxwell foresees no miracle recoveries for the sickly job market.

Young mathematicians are in a "holding pattern," he says, either putting off graduation or taking temporary positions. So, even if some of the hiring freezes begin to thaw, the number of job applicants will be enormous. Says Maxwell glumly: "Those kinds of pressures in the system aren't going to go away quickly."

Wanted: Digital or Analog

Butch Cassidy and the Sundance Kid, who were once "Wanted: Dead or Alive," are still wanted: dead. The pair's skeletons have never been positively identified, nor have all historians accepted the favored cause of death—a Bolivian shoot-out—but now a team of researchers are trying to make a case that they have unearthed the outlaws. And to nail down their claim, they are relying on the latest in forensic science, namely computer visualization and DNA fingerprinting.

The modern-day posse includes



D. DEFRANCESCO

Chicago-based forensic anthropologist Clyde Snow, best known for identifying the skull of Josef Mengele, and Lewis Sadler, head of the biomedical visualization department at the University of Illinois, who has helped find missing children by aging their faces with computer software. Snow gave Sadler a shotgun-ripped skull he'd helped dig up from the purported gravesite in San Vicente, Bolivia, along with some photos of the outlaws. Sadler digitized the photos, then superimposed the faces over a video image of the skull.

Concludes Sadler: "The skull was definitely not Butch Cassidy's. The face was too narrow, and Butch had a fairly square face." Another great escape for the gringos? Not necessarily, Sadler says. "The skull could be that of the Sundance Kid." If Snow can track down any of the outlaw's relatives, he'll compare their DNA to that in the bones. And, perhaps, claim the bounty for science.

Out of Adversity, New Clues to Prairie Diversity


D. TILMAN

Hardy flowers. Blazing stars abloom on one of Tilman's prairie plots.

University of Minnesota ecologist David Tilman won't forget the summer of 1988, when the worst drought to hit the northern U.S. plains states in half a century scorched his laboratory. Tilman's bench consists of 5000 acres of grassland north of Minneapolis, where he's conducting a long-term experiment on prairie diversity. Although many plants withered, he's willing to forgive the deadly rays because they've forged a unique record of drought's effect on prairie plant diversity. Now Tilman knows just how quickly prairie ecosystems rebound.

All told, about 20 species—including such beauties as sky-blue aster, bushy goldenrod, and blazing star—one-third of the usual number of species growing there, vanished from his plots, Tilman reports in a recent issue of *Oecologia*. Species have begun to return, but he predicts the plots will take 3 more years to get back to full strength. That comes as a relief: "I had some serious fears for the diversity of prairies with drought," he says.

Tilman's 11-year-old grassland experiment—long-running by ecology standards—provides the background for understanding the drought's effects, says ecologist Stephen Pacala of the University of Connecticut. And that, says Pacala, might be "the only way we'll ever get good predictions of the effect of global climate change on plant diversity."

Fusion Reactor Infusion at Princeton

Never count fusion scientists out. First, they received a major setback—the cancellation of the proposed $1.6 billion Burning Plasma Experiment (BPX), which was to be the flagship of the U.S. fusion program. But last month, the Department of Energy's (DOE) fusion advisory committee recommended building a small reactor at the Princeton Plasma Physics Laboratory that will confine heated plasmas for up to 1000 seconds—a

major step toward building a machine that will confine plasmas indefinitely. (Existing confinement times are near 2 seconds.)

The new machine—called the SSAT, for steady-state advanced tokamak—would serve two major purposes. Not only would the SSAT fill the gap in the U.S. program left by the BPX cancellation, it would provide data on the physics of steady-state fusion reactor operation that could benefit a proposed international fusion experiment known as ITER (*Science*, 6 March, p. 1203). For several months now, DOE officials have been describing a machine such as the SSAT as one of their priorities.

According to the advisory panel, the SSAT could be built at Princeton for $400 million in constant 1992 dollars. Under this plan, the SSAT would scavenge equipment and test facilities now in use at the lab's Tokamak Fusion Test Reactor, which is scheduled to shut down in 1995. This would leave Princeton fusion researchers with a 4-year hiatus until the SSAT begins operation in 1999.

Academy Weighs in on EOS Data System

U.S. spy agencies command the world's finest electronic gadgetry, but their data systems soon may be outclassed—in one respect, at least, and not by a foreign power. Beginning later this year, NASA scientists will start building the Earth Observing System Data Information System (EOSDIS), a network of data storage centers meant to facilitate studies of global environmental change. Says former MITRE president Charles Zraket, now a scholar in residence at Harvard and chairman of a National Academy of Sciences (NAS) advisory panel studying EOSDIS, the system will be unprecedented in size and in the variety of users and information bases it will include.

If it's really that important, why is NASA giving an outside contractor so much discretion to manage EOSDIS? Zraket and his colleagues have told the agency to give EOSDIS more clout within the bureaucracy by elevating the project chief to a level just below the director of the Goddard Space Flight Center in Maryland. This advice appeared last week in a report issued by Zraket's NAS panel, which rushed to get its preliminary thoughts into NASA's hands before the agency chooses a contractor in June to run EOSDIS.

While the panel was offering advice, it also recommended that NASA get scientists involved now in helping to design the system; immediately start to establish data formats; avoid specialized designs that could make it hard to change the system later; allow for as much autonomy as possible at the seven individual data centers that EOSDIS will embrace; and take a more active role in leading the collaboration with other agencies.

According to NASA's Dixon Butler, who oversees earth sciences, this report "basically takes people who are already working flat out and says, 'Now, let's really move.'"

NEW WORDS FROM THE WISE

You've felt it before–an urge to coin a word to describe the indescribable. For example: What would you call a morbid fear of butterflies? According to British mathematician Ian Stewart, such a fear, confined largely to meteorologists, "can be traced to a quotation attributed to Edward Lorenz: 'The flapping of a butterfly's wings in Japan can cause a hurricane in Brazil a month later.'" His word: "lepidophobia."

"Lepidophobia" is one of many neologisms coined by some of the world's most famous professionals–including scientists, artists, journalists, and musicians. The neologisms appear in "In a word,"* edited by Jack Hitt, a former editor at *Harper's* magazine, who wrote an article on word-coining a few years ago and since has expanded it into a veritable Franklin Mint.

Other gems: "Physics envy." The belief that employing the mathematical methodology of the physical sciences will enhance the reputation of one's own field–Paul Bickart, an environmental chemist at the Environmental Protection Agency. "Higgledy-piggledyology." The serious study of muddle and the science of lawless events–John D. Barrow, an astronomer at the University of Sussex. "Big Chill." The ending of the universe if the present expansion continues unabated and the entire universe dilutes itself to zero density and zero temperature. According to David Schramm, an astrophysicist at the University of Chicago, "If the average density of the universe is sufficiently small, the end will not be with another bang but with the whimper of the Big Chill."

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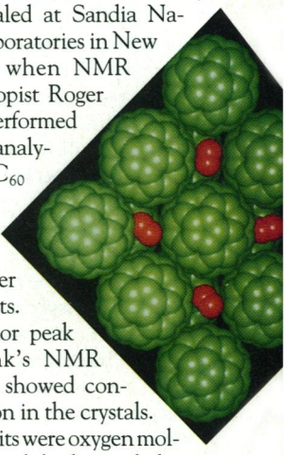
*Laurel Trade Paperback, Intrepid Linquist Library, 212-492-8672, $10.

Researchers Give Fullerenes Gas

The Buckminsterfullerene talent show seems destined for a long run. The material's latest trick, a remarkable ability to sop up and store lots of gas molecules selectively, was revealed at Sandia National Laboratories in New Mexico, when NMR spectroscopist Roger Assink performed a routine analysis on C_{60} crystals earmarked as polymer ingredients.



SANDIA

A minor peak in Assink's NMR spectrum showed contamination in the crystals. The culprits were oxygen molecules, which had snuggled into about 1% of the octahedral voids that form between C_{60} molecules when they pack into crystals.

That was interesting, but Assink and his colleagues became more intrigued when they pressurized more gas into the six octahedral sites per C_{60} (or C_{70}) molecule: Oxygen molecules occupied about half of the sites. What's more, half of these sites remained filled 25 days after pressure was removed.

Fullerenes apparently won't perform this trick with just any gas. Hydrogen molecules, which are smaller than oxygen molecules, go in and out of the crystals quite readily. Bulkier methane molecules find no entry into the crystals. This selectivity might lead to fullerene membranes permeable to only selected gases, Assink and his colleagues suggest in a paper to appear in the *Journal of Materials Research*. "We were not looking for this [potential spinoff]," Assink remarks. Now, however, they're filing for patents on fullerene membranes and gas storage inventions.