RANDOM SAMPLES

edited by IVAN AMATO

Academic Departments Get Stay

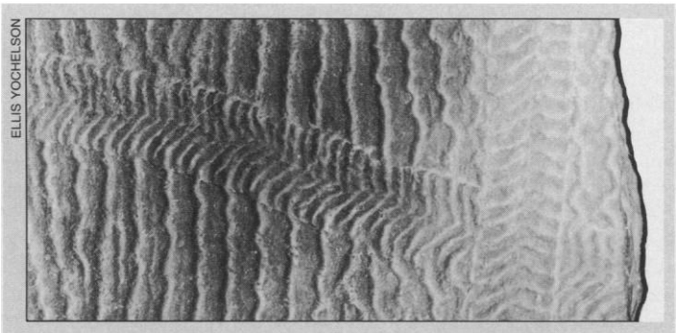
The 193 tenured and tenure-track faculty members at San Diego State University who were due to lose their jobs come September have gotten a one-semester reprieve. San Diego State president Thomas Day has postponed the layoffs until January, and he says he will instead dig deep into infrastructure funds to keep the faculty on the payroll and keep a full schedule of classes for students in the fall.

Day triggered an uproar last May when, in response to the impending state budget shortfall, he announced a plan for "deep and narrow" cuts that would eliminate nine departments, including anthropology and aerospace engineering, and severely shrink others, including chemistry (*Science*, 26 June 1992, p. 1757). Following his announcement, he received a vote of no confidence from the faculty senate and got word of an investigation of the layoffs by the American Association of University Professors. AAUP suspended its probe on 11 August when the layoffs were postponed.

Day says his "deep and narrow" approach was recommended by the faculty senate, but senate members argue that he decided where to cut without proper faculty consultation. Now some dialogue seems to be taking place. Indeed, Day says he took the advice of the senate to postpone the layoffs because it is the "humane" thing to do, although, he added, the delay requires a dangerously large dip into this year's funds for equipment, supplies, and library acquisitions, which will result in the loss of subscriptions to such standards as *Chemical Abstracts*. He also has asked the faculty senate to evaluate the academic consequences of the department eliminations he proposed and to come up with alternate proposals for him to consider.

Day adds grimly that the university's fiscal crunch is so severe that the extensive, nonhuman sacrifices will cover faculty salaries only for the fall semester. The layoff ax must fall eventually, he says, possibly as soon as January. And since Day remains committed to sparing most of the university by making deep cuts in certain areas, that means that some San Diego State departments will soon be history.

The faculty response to Day's latest move has been mixed, according to chemist Charles Stewart, outgoing chair of the faculty senate. That Day has agreed to consultation and postponement of layoffs has generally pleased many of his colleagues, he says. But, he adds, "there is still a segment out there that wants his hide."



ELLIS YOCHELSON

Beachcomber. *Climactichnites'* criss-crossed ripples on a 500-million-year-old sand flat.

Beach Buggy From the Cambrian

Just off the rotunda of the National Museum of Natural History in Washington, D.C. is a room-sized sandstone slab bearing an odd pattern. Says Smithsonian researcher Ellis Yochelson, it "looks for all the world like someone was running a dirt bike around on a damp beach." But the debut of bike technology was a long way off when these tracks were made: the late Cambrian, or some 500 million years ago. So if tires didn't pattern the Cambrian sand flats, what did?

Since 1860, when the tracks were first discovered in an Ontario quarry, no scientist has had a good answer to this question. The long-lost critters acquired a name, *Climactichnites*, or "ladder-like," for the form of the trails: two parallel ridges up to 6 inches apart, with chevron-like furrows and bars between them. But except for a few early investigators, one of whom speculated that the track-makers actually did move by rolling—an idea that never caught on—this Cambrian mystery has lain mostly fallow. But now, Yochelson thinks he has a picture of the culprit and how it made its mark—and it's like nothing paleontologists or biologists have ever seen.

Yochelson and his colleague Mikhail Fedonkin of the Paleontological Institute in Moscow have been working with museum artist Mary Parrish, and the resulting portrait displays a broad, low, soft-bodied creature that alternately clasped the surface with muscular side flaps—raising the two parallel ridges—and heaved itself along with flaps at the front, creating the chevrons. (The reconstruction will be published next year in a paper from Smithsonian Institution Press.)

That kind of labored locomotion seems to have died out with the mystery creature, which left no known descendants. But in one respect *Climactichnites* was a trend setter: It may have been one of the first animals to crawl about on land. Yochelson and Fedonkin's reconstruction of the creature's locomotion implies that it could move only on firm, damp sand, where its flaps would have had some purchase, and not underwater. Coming more than 100 million years before the first clear-cut land animals, that was an early start for life's beach party.

Vapor Lock Linked to NASA's Tether Trouble

NASA had billed its tethered satellite trick as risky from day one, but that didn't mitigate the disappointment when, earlier this month, space shuttle astronauts failed to reel out fully the 12-mile long, satellite-tipped tether. The stunt, a U.S.-Italian collaboration, was supposed to simultaneously study a scheme to generate electricity and the motions of orbiting spacecraft linked by a flexible tether. Since then, the challenge has been for a group of investigators to unravel the cause of the failure before a 28 August deadline set by NASA administrators. But as the date approached, project scientist Roger Williamson of Stanford University has told *Science* that he suspects the culprit was some unwelcome moisture.

In the cold of space, Williamson says, a little moisture picked up from the sultry air in Florida could have frozen parts of the tether together, creating snags in the line. While the company that built the satellite and tether, Martin Marietta, performed extensive tests before launch, Williamson speculates that "they may not have taken account of the humidity in Florida."

Project scientist David Hardy of the Air Force's Phillips Laboratory prefers another theory. The hundreds of layers of coiled tether might have been jerked, probably during take-off, burying some of the outer loops deep in the reel. "This happens with fishing lines," says Hardy. "If you try to unreel it [the buried loop], it has to get loose from all the other wire."

No matter which theory—or some other—proves correct, NASA will have to deal with another problem if it is to pursue this mission on a future shuttle flight: Even if the tether had reached its full 12-mile length, Hardy and other project scientists note that the tethered arrangement was not going to fulfill its electricity generating promise without a price. Moving the tether through Earth's magnetic field

would generate an electric current that might power a spacecraft, but only by sapping some of the craft's kinetic energy sending it into lower orbit, says Hardy. To maintain higher orbits, the spacecraft would have to burn another kind of energy—fuel. Says Hardy: "There's no free ride."

1-800-AIDS-NIH

Ever since the Amsterdam AIDS conference last month, those 30 AIDS look-alike cases—the people with severely damaged immune systems, but whose blood shows no evidence of infection with the viruses generally thought to cause AIDS (HIV-1 or HIV-2)—have been making news. But what do they really mean? The National Institutes of Health (NIH)and the Centers for Disease Control (CDC) would like to get to the bottom of the mystery quickly and are pooling their resources to investigate it. To help collect clinical information and blood samples from similar patients, NIH and CDC have set up a toll-free number (1-800-AIDS-NIH) for physicians who may have encountered such cases. These reports "are not cause for panic," Anthony Fauci, director of AIDS research at NIH, emphasized in a written statement. "But it is important that we investigate the cases thoroughly and expeditiously," he added.

Russian Mathematician Decries Academy

Russian mathematician and U.S. National Academy of Sciences (NAS) foreign member Igor Shafarevich—accused by the NAS of "anti-Semitic writings" and "discriminatory" hiring practices at the Steklov Institute in Moscow (*Science*, 7 August, p. 743)—has sent a resounding *nyet* to the academy's request that he resign.

In a 4 August letter to NAS president Frank Press and foreign secretary James B. Wyngaarden, Shafarevich called the academy's accusations "absurd and scandalous." His criticisms of Jews in *Russophobia*, a 1982 book he wrote, were limited to "radical Jewish groups," he says, adding that the algebra department he heads in the Moscow institute "only fired people, but never hired anyone."

In a statement released last week, the academy said that it stands by its request, but adds that its bylaws contain no provision to force Shafarevich to resign. So what's the next move? "The ball's in his court," says an academy spokeswoman. Shafarevich disagrees. "I feel that the question of my continued membership in the National Academy is the academy's own problem," he writes. No doubt.

Critical Technologies Institute Takes Shape

The RAND corporation will soon be deep-thinking the nation's future again—but this time the topic is industrial competitiveness rather than nuclear war. Earlier this month, the National Science Foundation (NSF) announced it had selected RAND, a nonprofit research institute, to run the Critical Technologies Institute (CTI), a think tank that will focus on industrial competitiveness. RAND vice president for research Stephen Drezner will serve as the institute's first director.

The CTI has been a long time in coming. Congress originally appropriated funds for it back in 1990, but the Bush Administration balked, in part because it saw Congress's original aim—to provide analytic support to the chronically understaffed White House Office of Science and Technology Policy in its efforts to propose a national technology policy—as an intrusion on executive privilege. In the end, Congress compromised by giving the institute to NSF. Its first study will be a congressionally mandated analysis of the machine tool industry, an industrial sector where U.S. firms badly trail their foreign competitors.

Landing the CTI contract was a lucky break for RAND, which laid off 50 members of its research staff last year as a result of post-cold war cutbacks in the three defense-related think tanks it runs for the U.S. government. RAND's new role also carries a tinge of irony: Unlike many other elements of the threatened military-industrial complex, it has been slow to jump on the competitiveness bandwagon as a way to justify its existence. A glossy 1991 RAND brochure touts its nondefense work in education, health policy, and civil justice, but fails to make any mention of industrial competitiveness.

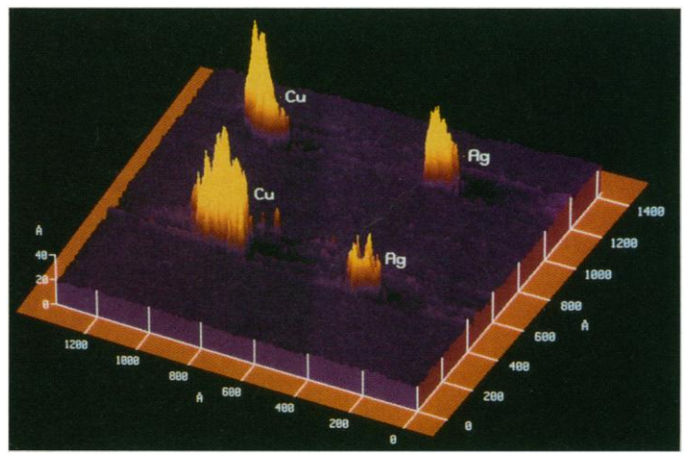
Getting a Charge From Nanobatteries

Adding yet another page to nanotechnology's Believe It or Not, chemist Reginald Penner and co-workers at the University of California, Irvine, have constructed the world's smallest battery: At 70 nanometers across, the silver-copper device is about the size of a common cold virus.

No, it won't run your Walkman—Penner's nanobattery generates about 20 thousandths of a volt for 45 minutes before dying out. But improved versions might one day power molecule-sized motors, muses Penner. While you're waiting, even the crude version the researchers now can make "will allow you to look at very early stages of a corrosion process" and study how molecules polymerize when they are aligned in the battery's potential gradient.

All this arises from classic scientific serendipity: The Irvine researchers had no thought to make a bittier battery as they used a scanning tunneling microscope (STM) to build ultratiny metallic structures. Rather, they wanted to prove that you could deposit two different metals as closely spaced nanodots on the same graphite surface where they might pull off concerted chemical reactions. To make the silver pillar, the researchers bathed the graphite in a silver fluoride solution and positioned the STM over the spot of graphite where they wanted to place a pillar. A 6-volt jolt for 50 microseconds from the STM proved enough to coerce metal atoms out of the electrolyte and deposit them onto the underlying graphite. Then they turned to the copper pillar, using a copper sulfate solution in place of the silver fluoride.

"Both pillars should have been stable in the copper sulfate," Penner recalls. Curiously though, the copper pillar eroded and its atoms plated onto the silver pillar about 70 nanometers away. Instead of dashing their hopes, the glitch provided an entirely new idea: A slight potential energy difference between the two metals' electrons was behaving like a battery, in this case generating a small voltage that could drive the flow of copper atoms. After about 80,000 copper atoms defect to the silver pillar, the battery dies. Still, the Irvine team had a nanobattery and published their findings in the 6 August *Journal of Chemical Physics*.



PENNER *ET AL.*

Bittiest battery. STM reveals live (bottom pillars) and spent nanobattery.