Developments to Watch

EDITED BY NEIL GROSS

FUEL CELLS FOR YOUR LAPTOP?

RUN-DOWN BATTERIES ARE the bane of our gadget-happy age. But users could get some relief when Neah Power Systems of Bothell, Wash., commercializes its diminutive, methanol-based fuel cells. The idea for such cells has been around for a while, but the prototypes have been discouragingly large—often bigger than the devices they're supposed to power.

Neah's breakthrough consists in replacing bulky carbon electrodes with silicon. Using standard chip-manufacturing techniques, the material is etched to create a honeycomb-like maze of tiny holes. This yields a huge surface area that can be coated with a catalyst. As the methanol and peroxide flow through the silicon, they react to produce electricity.

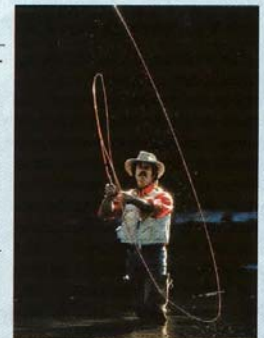
Neah says it can build a 150-watt-hour cell offering two to three times the power of a standard lithium ion laptop battery of roughly the same size. When the power is exhausted, the user "recharges" the cell by replacing the fuel tank, which now contains waste water and carbon dioxide, with a fresh unit. Because the waste products are fairly benign, disposing of the tanks should not be a problem. The batteries could be available as early as 2004—initially for use in military applications and as spares for laptops and other personal electronics gear. *Stephen H. Wildstrom*

A SENSOR RUNS THROUGH IT

FLY FISHERMEN CAN SPEND years perfecting the rhythmic motion needed to cast a fly far enough yet gently enough to convince a fish that dinner has just landed. Noel C. Perkins, a mechanical engineer at the University of Michigan, turned to science instead: He built a high-tech sensor to debug his casting technique.

Perkins' gizmo is both inexpensive and light and uses the same sort of chip-based motion sensor that triggers car air bags. These microelectromechanical systems, or MEMS, chips cost a few dollars each. And at under 1 ounce, the prototype device doesn't impair movement. Attached to a rod, the MEMS unit tracks casting speed and acceleration. Software running on a linked handheld computer then points out weaknesses by comparing the user's motion with that of an expert fly fisherman.

With his casting much improved and a patent pending, Perkins now hopes to develop a multisensor device capable of analyzing more complex movements. "Golf, tennis, baseball—they all demand finely tuned technique," he says. In the meantime, a consumer version of the casting aid is in the works. *Adam Aston*



BELL LABS: CATCHING UP TO THE CLAM

RESEARCHERS AT LUCENT Technologies' Bell Labs have succeeded at a task that shellfish perform effortlessly. Mimicking how mollusks build their shells, the team constructed a template of tiny posts, then grew single crystals of calcite—the stuff of shells and sea urchin spines—measuring one-twentieth of an inch across. Each crystal bears the intricate pattern of the posts. And the feat was accomplished at room temperature, without the expensive micropatterning equipment found in chipmakers' clean rooms.

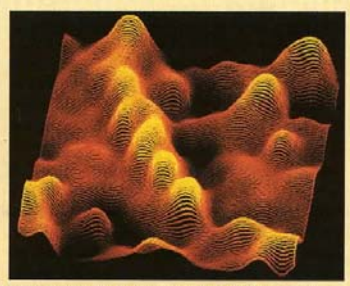
"The strategies we demonstrated with calcite are broadly applicable," says Bell Labs physicist David A. Muller. For example, to improve the performance of chips, semiconductor companies are looking for more reliable ways to deposit copper on silicon. Growing a single patterned, chip-size crystal might be preferable to today's techniques, which yield lots of tiny crystals instead.

The Lucent experiment, published in the Feb. 21 issue of *Science*, also helps explain why calcite structures like the sea urchin's spines are so porous. The tiny holes in the lattice keep the spines light, which benefits the whole organism, Muller notes. But the benefit isn't just a weight-to-mass tradeoff. "It's key to the actual growth of the crystal in the first place," he says. ■

DNA SOUPERCOMPUTING

KNOWLEDGE IS POWER—AND THE SAME IS TRUE for data. Researchers in Israel have devised a computer that draws power from the data it processes, so it doesn't need a battery or an electrical plug.

That's handy, since the computer is a vial of DNA molecules and enzymes. Some of the DNA functions as input data, the rest as software instructions. When the two types of molecules bond together, the software DNA directs an enzyme to cut out a section of the input molecule. Breaking the chemical bonds at each end of the slice releases heat, which provides enough energy to finish that calculation.



MOLECULAR MAINFRAME: *DNA can supply both instructions and power*

Although processing each instruction is slow, taking about 20 seconds, team leader Ehud Shapiro, a biological chemistry researcher at Weizmann Institute of Science, says a spoonful of this "computer soup" contains enough DNA to crunch 330 trillion instructions per second. That's about 10 times more than today's fastest supercomputer, which occupies almost as much room as a football field. No wonder scientists expect big things from DNA computers. Just don't look to buy one any time soon. *Otis Port*