Electronic Books on the Horizon

Instead of trolling secondhand bookstores for your next read, you may one day be plugging *The Bridges of Madison County* into an outlet and reconfiguring it to, say, *Romeo and Juliet*. Can't wait? That prospect is a step closer now that scientists have developed a new type of electric display that retains its image even when the power is off.

In the 16 July issue of *Nature*, physicist Joseph Jacobson and his colleagues at the Massachusetts Institute of Technology describe what they are calling "electronic ink." The ink is actually a mixture of nanometer-sized, white titanium dioxide particles and a blue dye, encapsulated in clear polymer spheres, each just 50 micrometers across. The spheres are coated onto a thin array of metal electrodes that has been laid out on a surface such as paper. Finally, this skinny sandwich is topped with a transparent electrode.

The key to the ink is that the white nanoparticles move within the polymer capsules in response to jolts of electricity running between the front and back electrodes. When the particles move to the front, a viewer sees them as white; when they drift to the back, the dark dye shows. By simply controlling which electrodes are on and off, the researchers can write words or draw images that will last until the display is reprogrammed.

Jacobson says the new technology could initially be used to create power-saving information displays in places such as airports. But he believes it may help usher in the promised era of electronic books that could be reprogrammed over and over by plugging them into a computer. "It's very interesting stuff," says Robert Wisnieff, a display expert at IBM's T. J. Watson Research Center in Yorktown Heights, New York. But making electronic books, he notes, will be tricky. That would require arrays of thousands of electrodes, each with its own circuitry, such as those in laptop computers—an expensive and heavy proposition.

Jacobson's team is now working on a new low-tech version of the electrode array that can simply be printed on paper. If it works, bookshelves may become a whole lot smaller.

Indian Science Chiefs

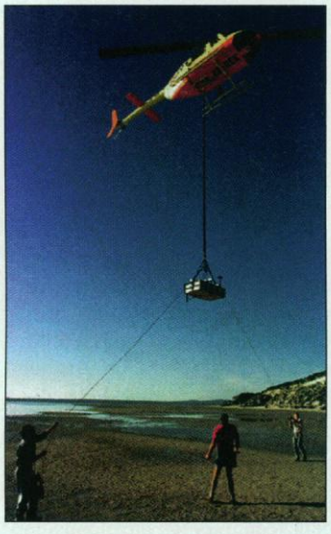
Two major Indian research centers have new leaders to take them into the next century. The International Center for Genetic Engineering and Biotechnology (ICGEB) in New Delhi, devoted to fostering biotechnology in the developing world, got a new director, malaria researcher Virander Singh Chauhan, on 15 July.

Observers hope that means a turnaround for ICGEB. Directorless for almost a year, the institute "suffered badly" from neglect in recent times, failing to cultivate industry collaborations, for example, asserts Manju Sharma, secretary of India's Department of Biotechnology. Chauhan says he hopes to spur modernization of ICGEB, which relies on dues from 52 member nations. "Today we don't even have a single automated gene sequencer," he says.

Also getting a new leader is India's premier research center, the Indian Institute of Science in Bangalore. On 1 August chemist Goverdhan Mehta, vice chancellor of the University of Hyderabad, will take over. This marks the first time in 30 years that an outsider has gotten the leadership job at the institute, whose $25 million annual budget supports 475 scientists.

Moving Eve's Footprints

Threatened by two wearing forces—the weather and tourists—a pair of 117,000-year-old footprints was airlifted to safety last month from South Africa's West Coast National Park, some 100 km north of Cape Town. The footprints, the oldest ever found from anatomically modern humans, are now on display at the South African Museum in Cape Town.



Dubbed Eve's footprints, the apparently feminine marks were discovered on the shore of Langebaan Lagoon in 1995 by geologist Dave Roberts of the government's Council for Geoscience in Cape Town. He says the prints had to go because they are vulnerable to erosion from wind and water and from tourists stepping in them. In an operation funded by the National Geographic Society, scientists carved a 500-kg block out of the sandstone surrounding the prints after first hardening it with injections of resin. The block, encased in aluminum, was then flown out to a truck. Plans are eventually to create a facility so the prints can be viewed in the park where they were found.

Chemistry's Top Guns

1994–1997

Rank (by citations)	Citations	Impact
1. Scripps Res. Inst.	1892	86.0
2. U. Calif., San Diego	1032	93.8
3. U. Calif., Berkeley	1024	68.3
4. Caltech	852	85.2
5. Swiss Fed. Inst. Tech.	845	76.8
6. DuPont Co.	829	118.4
7. U. Cambridge	784	71.3
8. Harvard U.	736	81.8
9. MIT	727	80.8
10. U. Washington	682	97.4

In the mid-1990s Scripps and DuPont led the chemistry pack in the high-impact sweepstakes, according to the Institute for Scientific Information in Philadelphia. Twenty-five institutions published at least six "high impact" papers (defined as the 600 most-cited papers in this period). Impact here is arrived at by dividing high-impact paper citations by the number of high-impact papers. The top-impact paper producers were Mark Gallop and Eric Gordon, who got 998 cites for five reports from their research on combinatorial chemistry at Affymax Research Institute. K. C. Nicolaou of Scripps got 707 citations for six reports on synthesizing the anticancer drug taxol.