

Briefings

edited by RICHARD STONE

Gene Zapping

A developing organism relies on the actions of hundreds of genes, all performing as precisely as musicians in an orchestra. For years, scientists have known that this genetic symphony is controlled by chemical “conductors”—hormones and growth factors that regulate the genes’ activities. Now scientists have identified a new regulating agent: nerve-cell electricity.

Researchers at the National Institute of Child Health and Human Development (NICHD) have found that spontaneous, naturally occurring electricity in embryonic spinal cord cells can switch on the gene that codes for the production of vasoactive intestinal peptide (VIP), a substance thought to help certain nerve cells survive during development of the nervous system.

In the 15 February *Proceedings of the National Academy of Sciences*, a group of NICHD researchers led by Andres Buonanno reported that two muscle genes that normally switch off during nerve-cell growth in rat muscle were switched off after the researchers applied an electrical jolt to rat muscle tissue. Now another NICHD group, headed by neurobiologist Douglas Brenne- man, has reported electrical switching of genes in vitro. Using isolated fetal spinal cord cells, the group detected VIP messenger RNA only in cells that had spontaneous bursts of electricity. The VIP gene was inactive in cells in which the electrical currents were blocked.

Because electricity doesn’t interact directly with DNA, the researchers are at a loss to explain exactly how it affects the genes. Possible explanations so far include changes in the intracellular calcium concentration or activation of the signaling system cells used to transport chemical messages from the membrane to the nucleus.

The Case of the Missing Milkweed

Most people—especially gardeners—wouldn’t mind if there were a few less weeds in the world. But at Illinois’ Shawnee National Forest, the disappearance in June of several rare Mead’s milkweed plants has conservationists worried. Somebody apparently discovered a secret stash of the plants and made off with them.

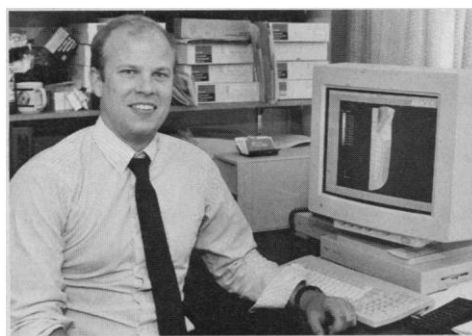
Once abundant on the Midwest’s tallgrass prairies, in recent years Mead’s milkweed has nearly vanished—only a few isolated populations now exist. After the plant earned threatened-species status in the late 1980s, the U.S. Department of Agriculture’s Forest Service, the U.S. Fish and Wildlife Service, and other conservation groups launched the “Recovery 2000” project, in which they’re trying to regenerate patches of tallgrass prairie and reintroduce milkweed plants into their original habitats, including the Shawnee. “The plant’s an important indicator of the health of the tallgrass prairie,” says Chris Topik, an endangered plant program manager with the Forest Service.

Botanists say they can start over and replant milkweed sprigs that are now being cultivated in an arboretum. But Forest Service officials are concerned about how anybody could find the secret area in the first place. “What really worries me—especially about future projects—is the data security problem,” Topik says. “Very few people should have known the exact location of the plants.” Equally baffling is what the thieves plan to do with a bunch of milkweed.



Searching for the Perfect Fit

Rarely do artificial legs feel comfortable on the first fitting. Even with the help of artists trained in biomechanics who model the suction cups of artificial legs, frustrated physicians often waste two or three custom-made prostheses—at costs ranging from \$1500 to \$5000 a limb—before they find one that fits a patient’s stump snugly and pain-free, says Tufts University bioengineer William Vannah.



Vannah’s computer does the legwork.

But a computer program Vannah is developing may help amputees find their “glass slipper” sooner. On a CAT-scan image of a stump, Vannah maps a grid of about 200 cubes, with each cube estimating the amount of pressure the soft tissue will sustain when pressed against the prosthesis. Using the mathematical modeling, Vannah and Dudley S. Childress of Northwestern University have found that the soft tissue behaves like a fluid that, instead of compressing, “squeezes up out of the socket like a balloon,” Vannah says. He says his computer model minimizes the soft tissue displaced by a prosthesis.

Vannah plans to market his software to an industry that, he predicts, will latch on to machines being devel-

oped at several universities that manufacture better-fitting artificial limbs. Meanwhile, most amputees can hardly wait for the next generation of prostheses: A recent study in the *Journal of Prosthetics and Orthotics* found that 57% of amputees experience moderate to severe pain most of the time they are wearing their artificial limbs.

African Research Waning

Research output at African universities has declined drastically over the past quarter-century, according to a news report datelined from Accra, Ghana, in the 7 August *Chronicle of Higher Education*. Throughout the continent, research money has been drying up largely because of chronic—and worsening—economic crises, and politics has been hampering much-needed social science research.

An official of the Council for the Development of Economic and Social Research in Africa, a group supported by the United States, Sweden, and Canada, told the *Chronicle* that total research output has declined by 35% since the mid-’60s. A number of African scholarly journals have ceased publishing. Faculty salaries are so low that most teachers have to supplement wages by driving taxis or raising chickens. And many African countries are being drained of their best brains as students go abroad for graduate study and don’t come back.

In the mid-’70s, a number of African governments issued a statement in which they pledged to try to increase their R&D spending to 1% of their Gross National Products. But the current proportion is reportedly only 0.4%, compared with about 2.5% in many industrialized countries. With their governments providing scant support, many African researchers have been seeking aid abroad: The research council says that most African research is now supported by foreign governments and philanthropic groups.