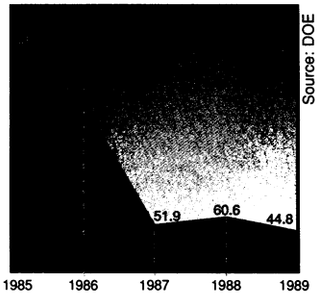
Briefings

edited by DAVID P. HAMILTON

Uncle Sam, the Energy Spendthrift

As you might expect, the federal government uses a lot of energy to heat, cool, and power buildings—830 trillion BTUs in 1989, to be exact. As you might also expect, quite a bit of that is wasted. According to a recent report* by the Alliance to Save Energy, a Washington advocacy group, the government wasted nearly $174 million in energy in 1989 alone when measured by its own 1985 efficiency standards.



Downhill slide. *Federal efficiency investments have languished since 1985.*

The biggest reason, according to the report, is the government's failure to invest in energy conservation during the latter half of the last decade. "As recently as 5 years ago, the federal government was spending over $250 million a year for conservation improvements, but its investment in conservation measures dropped to less than $45 million in 1989," says Mark Hopkins, the report's author. The government could save $864 million a year if it took advantage of existing energy-saving products, the report states.

To fix things, the report suggests a host of familiar-sounding recommendations that have typically enraged political conservatives: creating an energy efficiency investment fund at the Department of Energy, demonstrating new energy technologies in DOE pilot programs, and allowing federal facilities to retain two-thirds of any energy cost savings they implement.

* "Energy Use in Federal Facilities: Squandering Taxpayer Dollars and Needlessly Polluting the Environment," Alliance to Save Energy, January 1991.

Seeing the Future of Pharmaceuticals

A large pharmaceutical company sponsors a study to predict the benefits of new treatments for cardiovascular disease and several types of cancer in the next quarter century. Does it find that a new generation of biotech wonder drugs will wipe these scourges from the planet?

Not exactly. A new report* conducted for Schering-Plough does find that innovations in treatment of heart disease—the leading killer of the two—over the next 25 years will save 13 million American lives and more than $500 billion dollars of indirect costs (a strict extrapolation of current disease trends projects 31 million dead and $1.2 trillion in indirect costs). But the study predicts that fully half these benefits will result from changes in lifestyle, such as healthier diets and more exercise—not from new drugs. Similarly, drugs will account for only 24% of the predicted decline in lung cancer mortality, while a drop in the number of smokers accounts for most of the rest.

That's not to say that new drugs get slighted in this study. It predicts that 40% of the reduction in cardiovascular mortality should stem from new pharmaceuticals, particularly lipid-lowering agents and antihypertensive drugs. New chemotherapies also receive credit for half the predicted decline in colorectal cancer mortality (200,000 deaths) and 95% of the predicted decline in leukemia mortality (1.6 million deaths).

* "The Value of Pharmaceuticals: An Assessment of Future Cost for Selected Conditions," Battelle Medical Technology Assessment and Policy Research Center, BHARC-013/90/025, 1991.

Know Thy Reviewers

Every scientist knows instinctively that a journal's selection of peer reviewers may make or break a paper's chance of being immortalized in print. But how about some scientific evidence of the effect?

Johns Hopkins radiologist Stanley Siegelman, editor of the journal *Radiology*, decided to develop some documentation by comparing the scores and rejection rates of nearly 6800 papers submitted to his journal over a 4½-year period ending last summer. Using a computer-based manuscript tracking system, he calculated the mean ratings by reviewers who were sent 10 or more manuscripts.

On a scale of 1 to 9, he found the mean rating was 4.8. The reviewers whose ratings fell within 1.5 standard deviations of the mean he labeled "mainstreamers." Those who exceeded 2.5 standard deviations below the mean he dubbed "zealots" who think practically everything is worth publishing. At the other extreme he found "assassins."

Siegelman, whose findings appear in the March issue of the journal, says he was surprised to find that 87% of the reviewers fell in the mainstreamer category. Zealots and assassins were about equally divided.

Siegelman's point? Editors should take reviewer variation into account to avoid being unfair to authors. He himself assigns three reviewers to a manuscript, and if one doesn't like it,

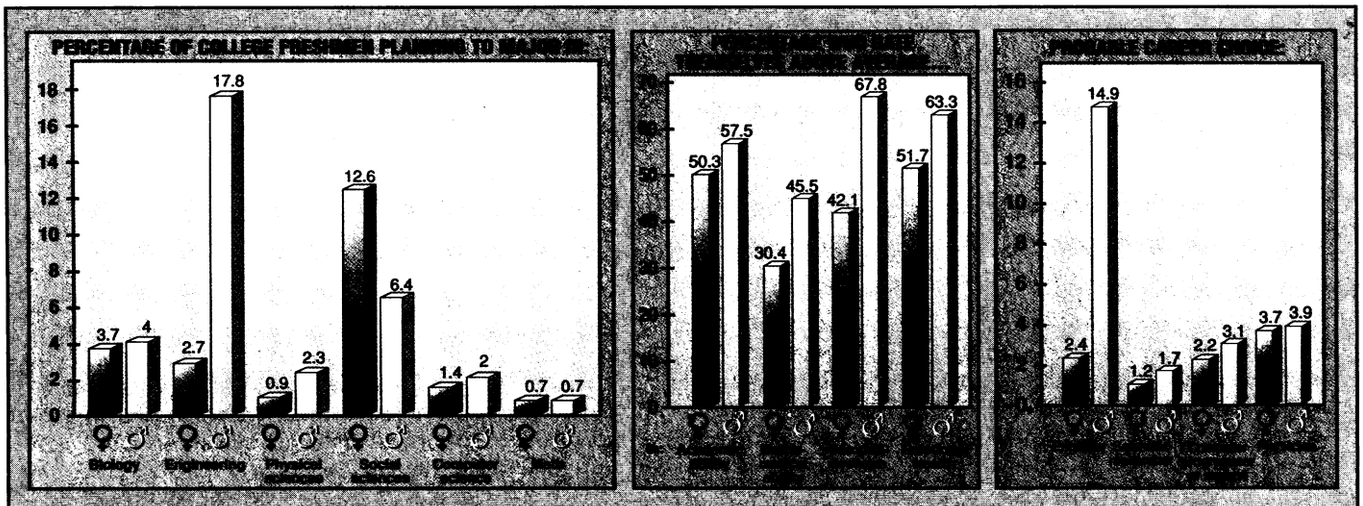
Stinging the "Killer" Bees

Short of comparing their mitochondrial DNA, there are only two ways bee specialists have been able to tell Africanized "killer" bees from milder domestic varieties: by measuring minute differences in physical characteristics such as wing size and leg length, or by tempting an angry hive to attack a piece of leather in which they can count the number of embedded stingers.

Now, U.S. Department of Agriculture researchers Hayward Spangler and Eric Erickson have come up with a better way. Using their "temper tester"—which their less serious colleagues call the "sting-o-meter"—they're able to identify hives of cranky bees quickly. Consisting of a motion sensor within a plastic tube, the temper tester allows entomologists to measure the number of stings a disturbed hive delivers after the researchers have enraged it with a blast of compressed air.

Temper, temper. *Spangler and Erickson with their sting-o-meter.*

Since Africanized bees sting more furiously than domestic bees—Spangler typically records about 24 stings a second from an Africanized colony, compared to four stings a second from a domestic colony—the temper tester should allow entomologists to target overly aggressive colonies quickly for destruction. Alternatively, they might replace an aggressive Africanized queen with a gentler domestic queen—a real bee "sting."



A cross-section of the science manpower "pipeline." The latest statistics on last fall's entering college freshmen show that large gender differences persist in the physical and social sciences, as well as in engineering, where males predominate by more than 6 to 1. Males are also much more likely to rank themselves favorably on mathematical ability—as well as on competitiveness and emotional fitness. Source: "The American Freshman: National Norms for Fall 1990," by the Cooperative Institutional Research Program of the American Council on Education and the Higher Education Research Center, UCLA.

he usually rejects it. But he'll think twice if the third reviewer is an "assassin."

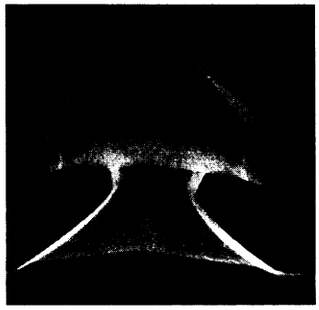
Then why send papers to assassins at all? They're "very careful," says Siegelman. "In a sense they're my best reviewers." And the zealots are helpful too: They'll point up the merit in a paper and often have good suggestions for revisions.

The World's Greatest Invention Goes Micro

When Michael Reed began talking to people in the medical community about his idea for miniature flow sensors that could fit inside blood vessels, he learned that what surgeons really wanted was a better way to connect the vessels themselves, reducing the formation of scar tissue and shortening a patient's time under general anesthesia.

That started Reed thinking, and soon he and Hongtao Han, both electrical engineers at Carnegie-Mellon University, began developing what they came to call "microvelcro." With help from the National Nanofabrication Facility at Cornell University, they used lithographic and etching techniques to carve dense arrays of minuscule mushroom- or barb-shaped structures into the surface of silicon wafers.

Each micromushroom is about the size of a grain of flour—about 17 microns wide and 12 microns tall. When a pair of micromushroom-studded silicon surfaces are pushed together, the mushrooms' edges deform, pass each other, and then spring back, interlocking the surfaces. Unfortunately for doctors, the barb structures designed to stick the "microvelcro" onto blood vessel walls soon came undone when tested on a piece of human vena cava—a problem Reed is working to overcome.



Magic mushroom. *One of 180,000 silicon barbs on a square centimeter of microvelcro.*

Until then, he is planning other uses for his new substance. He thinks micromushroom-covered surfaces might provide just the sort of micromechanical adhesion needed to bond chips to circuit boards or to each other. And applications in other less likely arenas are coming up. One manufacturer of resealable bags, intended to hold deer urine for hunters to use as a lure, wrote to Reed for information about the new product. Reed had to turn him away, explaining that micromachined silicon strips "would be an awfully expensive way to close a bag."

Deforestation Slows

The Brazilian government is spreading the word that tropical deforestation in the Amazon basin has slowed over the last few years. The good news is attributed chiefly to the elimination of government subsidies to cattle ranchers, who routinely cut back forests for grazing land.

The size of the decline, however, seems to depend on who's talking. Brazilian environmental secretary José Lutzenberger, speaking last month at the New York Botanical Garden, said the amount of cleared forest land may have dropped more than 90%—from 90,000 square kilometers in 1987 to between 5,000 and 10,000 square kilometers in 1990. But a few days later, Brazilian secretary of state for science and technology José Goldemberg told a session at the annual meeting of the AAAS that deforestation had slowed by 30% over the past 2 years. A third figure comes from the Brazilian space agency INPE, which recently estimated that 19,000 square kilometers of land were cleared in 1989—an impressive decline over the 1987 figures.

Much of the confusion arises from the fact that good figures on deforestation are hard to come by. According to the World Resources Institute, most estimates are probably on the high side because they were calculated from activities not specifically designed to measure deforestation rates. The recent INPE study, based on Landsat images, is more precise, but has only compiled data since 1988.

Whatever the true facts, even Lutzenberger admits that Brazil hasn't turned the corner yet, saying that 5,000 square kilometers is still far too much forested land to lose.