RANDOM SAMPLES

edited by CONSTANCE HOLDEN

Another Gene Therapy First

On 4 June, researchers at the University of Michigan Medical Center marked another milestone on the road to human gene therapy. They injected a gene into a tumor of a 67-year-old woman with malignant melanoma—the first time a new gene has been put directly into a human patient instead of being transferred first into the patient's cells in lab culture (*Science*, 17 April, p. 305).

"We have begun to use DNA as a drug," announced principal investigator Gary J. Nabel. The trial also represents the first time that researchers have used a nonviral vector—in this case liposomes—to deliver the modified gene.

Twelve patients with malignant melanoma, all with life expectancies of less than a year, will participate in the trial. Researchers are administering varying doses of genes for a transplantation antigen that is supposed to stimulate an immune attack on the patients' tumors.

Meanwhile, another Michigan team, led by James Wilson, has begun a gene therapy trial for patients with a hereditary form of high blood cholesterol (*Science*, 8 May, p.772). Using the more standard approach, the researchers introduce a virus carrying the gene needed to lower cholesterol levels into the patients' liver cells, which have been removed surgically. The cells with the new gene are then injected back into a vein that leads to the liver, in hopes that this will correct the patients' defect.

Higher Education Starving in Africa

A strong scientific and technical infrastructure is crucial to economic development, almost all social scientists agree. And no place on Earth needs economic development more than sub-Saharan Africa. But the prospect of that region creating its infrastructure seems further away than ever, according to Donald Ekong, secretary general of the Association of African Universities (AAU) in Accra, Ghana, who spoke last month at a symposium on African science held at the AAAS.

The main reason that southern Africa is losing ground is that the region's embryonic universities—most are less than 30 years old—have been taking a beating along with the rest of the continent in the ongoing, and deepening, economic crisis, said Ekong. Ironically, the hardest hit activities are those that have the most direct economic relevance. "Of all the aspects of university functions it is probably the research and graduate education that have been most damaged," Ekong said.

The dire state of university education in southern Africa showed up in a 1990 AAU survey of the graduate education at 10 universities in agriculture, food and nutrition sciences, health sciences, social sciences, and natural sciences.

Among other findings:

• "Most academic units could not indicate how much money [if any] was allocated to them for research from the university budget."

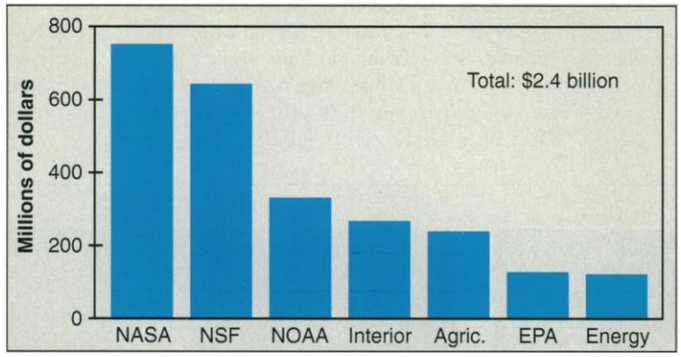
• "Several units indicated that no relevant current journal had been received in the library during the 3 years [87-88 and 89-90] covered by the study."

• "Enrollments are generally low and thinly spread over a large number of subject areas." For example, average enrollment per doctoral program ranged from 0.2 to 4.5—which means that researchers don't have graduate students to rely on, and students are starved for intellectual exchanges with peers. Making matters worse, said Ekong, is "the lack of communication that occurs in African universities. A chemistry department might not know what is happening in the department of physics next door."

Since sub-Saharan universities aren't likely to become fully comprehensive research establishments soon, Ekong said, part of the answer is regional and subregional integration aimed at providing high-quality institutions that serve a large area. He named several existing models: a "center of excellence" for economic and social research in the Ivory Coast; the African Regional Postgraduate Programme in Insect Science in Nairobi; and a southern African program for graduate training in agriculture research, in which each participating institution focuses on a different subfield.

But despite these models, Ekong said, there has been little progress in forming such regional endeavors or in weaning them from dependency on foreign donors.

U.S. Funding for Environmental Research, 1992



Environment institutes lobby. The Committee for the NIE has produced the above breakdown of government-funded environmental research. Defense research and research directed primarily towards human health were excluded. About 70% of the money is in physical environmental sciences, such as climate studies.

Late last month, while the world was focusing on the upcoming Earth Summit in Rio, a conference on a related—but slightly more manageable—set of issues was being held in Washington, D.C.: the first national conference on the proposed National Institutes for the Environment (NIE).

The Committee for the NIE was founded a little more than 2 years ago by two biologists, Henry Howe of the University of Illinois and Stephen Hubble of Princeton, who think it's time for the government to bring environmental research, training, and education under an NIH-type umbrella.

Howe claims that the meeting, held on 27-29 May, marked a "watershed" for the NIE concept. The 150 or so attendees represented a "much broader array of people than we have had before," he says. The number of contributors to the committee has grown to 4000, and its advisory council includes such figures as Stephen Schneider of the National Center for Atmospheric Research; anthropologist Sara Blaffer-Hrdy of the University of California, Davis, and former State Department environment chief Richard Benedick, now with the World Wildlife Fund.

But don't expect the NIE to blossom soon. The project is still in the germination stage, and supporters don't anticipate any major action from Congress until after the National Academy of Sciences comes out next spring with a report on the organization and conduct of federal environmental research.

Space Plane Engine Tested at Lots of Machs

For 4 weeks in March and April, aerospace engineers from the Johns Hopkins Applied Physics Laboratory (APL) and NASA's Ames Research Center in Moffett Field, California, conducted the lengthiest tests ever of an exotic engine known as a scramjet—the motor for an aerospace plane that one day may take travelers from New York to Tokyo in about 2

hours or instead into orbit.

The tests were conducted in the Direct Connection Arc Facility at Ames, a high-power wind tunnel completed in March, which simulated the pressures and temperatures the engine would encounter at speeds of Mach 12.8, or almost 10,000 mph. Previous tests of scramjets at comparable Mach numbers have lasted only milliseconds; some in this latest round lasted up to 10 seconds.

The project is part of a shakily funded NASA/Defense Department/industry project to design and build a National Aerospace Plane (NASP). If it ever flies according to the specs, the NASP will take off from a standard airport and accelerate to 25 times the speed of sound (Mach 25, or 17,000 mph). At that velocity, it will be able to escape Earth's gravitational pull. It can then tool around in low orbit—or just get to the other side of the globe before the movie finishes.

That's not possible with today's turbojet engines, and the gargantuan rocket engines now used for human space trips are too expensive and cumbersome. So NASP engineers are looking to supersonic combustion ramjets, or scramjets, which will kick in at Mach 5 or so after less exotic engines bring the plane to about 4000 mph. Instead of turbines, which compress air into a turbojet's combustion chamber, scramjets will rely on NASP's supersonic forward momentum to ram air into the chamber, where the high-pressure combustion of hydrogen fuel will send exhaust screaming out the back while propelling the NASP forward.

NASA

Artist's rendering of aerospace plane in flight.

Big problem: No one has ever made a plane that can get anywhere near Mach 25—the famous X-15 rocket plane dawdled at a mere Mach 6. So potential NASP components, such as engines, have to be tested on the ground, in places like the Direct Connect Arc Facility, says Michael White, NASP program manager for APL. Key questions engine designers hope to address in the current tests: how efficient is combustion in the teeth of a high Mach air flow, and how well can engine materials stand up to the extreme conditions such speeds entail. Based on the results, White says, NASP designers will modify their scramjets to operate at even higher Mach numbers. The goal, he says, is to reduce the number of unknowns when—and if—a prototype, dubbed X-30, actually gets off the ground.

Monsters From the Guts

Bacteria are sometimes pathogenic, sometimes benign, but almost always so small that they are invisible to the naked eye. Now comes an exception to that rule: a bacterium so large that a million ordinary bacteria would fit inside it—and clearly visible without the aid of a microscope. The novel find was discovered in the intestines of a surgeonfish caught off the Great Barrier Reef in Australia. Esther Angert, a graduate student at Indiana University who was part of the team that made the new find, described the discovery at the recent New Orleans meeting of the American Society for Microbiology. "The largest specimen we have measured was 0.57 mm long and 0.06 mm thick—easily visible to the naked eye," says Angert.

ESTHER ANGERT

Big bug. Surgeonfish symbiont—about .4 mm long—mixed with *paramecium* cells to show scale.

Because of its immense size, researchers originally thought the organism was a protozoan—single-celled organisms that are typically much larger than bacteria. But the new find has some features—including the absence of a membrane around the cell nucleus—that make it a very unlikely protozoan, and a molecular study based on ribosomal RNA (rRNA) gene sequences proved that the organisms are bacteria. Specifically, Angert says, the rRNA sequence data suggest that the creature is related to the bacterial genus *Clostridium*. Studies to characterize the novel bacterium more specifically are in progress.

Angert, who worked with Norman Pace at Indiana University and Kendall Clements, now at the University of Sydney but formerly at Australia's James Cook University, says that the new bacteria are symbionts that live only within the intestines of surgeonfish (*Acanthurus nigrofuscus*) and probably digest the algae the fish graze on. "I hope that they will be assigned to the genus *Epulopiscium*, which means 'guest at a banquet of a fish,'" says Angert. That name was first used in 1988 for symbionts found in Red Sea surgeonfish.

Genetic Survey Plans Move Ahead

An ambitious scheme to survey humanity's genetic diversity took a modest step forward on 5 June with the award of a $150,000, 2-year grant to help figure out how to tackle the enormous job. Stanford population geneticist Luigi Luca Cavalli-Sforza and Berkeley evolutionary anthropologist Allan Wilson started the ball rolling about a year ago, when they warned that irreplaceable clues to the human past are being lost as indigenous populations—and their unique gene pools—disappear across the globe (*Science*, 21 June 1991, p. 1614).

They and several colleagues called for an urgent effort to collect DNA from individuals in perhaps 200 to 500 such populations and store it for future study. Their plea captured the attention not only of population geneticists and anthropologists worldwide, who have deluged Cavalli-Sforza (Wilson died last year) with offers of help, but also of U.S. funding agencies and international agencies.

Now three agencies—the National Science Foundation (NSF), the National Institutes of Health, and the Department of Energy—have come up with money to support three planning workshops. The first, to be held at Stanford in mid-July, will hash out how best to sample genetic diversity—an issue that divided Wilson and Cavalli-Sforza. A second meeting, to be held at Penn State in October, will bring in anthropologists to figure out which populations to sample, and in what order. A third workshop, tentatively set for the spring of 1993, will examine a number of broad issues, from methodology to ethics.

This recent grant, made to principal investigator Marcus Feldman, director of Stanford's Morrison Institute for Population and Resource Studies, is a pittance compared with the $10 million or $20 million the survey could ultimately cost, but the funders see it as seed money. Says Mark Weiss of NSF's anthropology program: "We view ourselves as catalysts. Clearly, this is a global issue and should be undertaken with global support."