

Report adds to gene map momentum

A special panel of the National Academy of Sciences last week released a report advocating the immediate initiation of a national effort to map the entire human genome. According to panelists attending the annual meeting in Boston of the American Association for the Advancement of Science, the report reflects a growing consensus among scientists that the controversial, multibillion-dollar project should get under way. Important details about the venture have yet to be decided, money has yet to be allocated and dissent can still be heard from parts of the scientific community. But the months of sometimes heated debate that preceded the report's release appear to have resulted in a clearer sense of the mission, and the mood among molecular biologists and geneticists at the meeting was remarkably upbeat.

"It's obvious that we're going to go ahead with this," said James Watson, director of the Cold Spring Harbor (N.Y.) Laboratory, a member of the Academy panel and codiscoverer in 1953 of DNA's molecular structure. "The real question now is how the program is going to be managed."

The report recommends that a federal agency should be funded at \$200 million per year for the next 15 years. Its charge would be to create a detailed map of all 50,000 to 100,000 genes that make up the human genetic blueprint (SN: 10/17/87, p. 245). Such a map is considered a critical first step in designing diagnostic tools and possibly cures for the estimated 3,000 inherited diseases in humans, and is expected to yield many technological benefits.

Notable for its absence from the report is a recommendation as to which government agency should take the leading role in organizing the project. The Department of Energy, which has been involved in some of the early gene mapping work, has expressed interest in spearheading the 15-year initiative. But several scientists who served on the Academy panel hinted that they'd prefer the National Institutes of Health (NIH) be in charge. The NIH has been hesitant to take a leading role, in part out of concern that the project would cut into its many other research missions.

The panel's proposal addresses these fears by specifying that the funding must be entirely new and not at the expense of other scientific research. But while that stipulation has quieted some opposition from the scientific community, it's not at all clear that a deficit-conscious Congress will be willing to allocate the money — especially without evidence of strong scientific leadership. Congress last year

Engineered microbes stay close to home

Scientists this week described preliminary results of a landmark experiment designed to track genetically engineered organisms released into the environment. The results, which suggest that genetically engineered microbes don't migrate very far from their release site, may have a major influence on regulatory acceptance of future experiments in agricultural biotechnology.

The experiment, conducted jointly by Clemson (S.C.) University and the St. Louis-based Monsanto Corp., involved the first government-approved release of a live, engineered bacterium containing genes from two different microbes. Although the current hybrid bacterium is designed only to serve as a tracking system, laboratory tests suggest that other strains of engineered bacteria might help to increase yields, add nutritional value or confer disease resistance in some crops, scientists say.

The current research makes use of a strain of soil bacteria, *Pseudomonas fluorescens*, into which scientists have spliced two "marker" genes from the common intestinal bacteria *E. coli*. Wheat seeds were coated with millions of the engineered bacteria and then planted in a South Carolina test plot in November. Since then, scientists have been taking soil samples at regular intervals to follow the bacteria as they multiply within the developing root masses and as they migrate through the soil.

"Where we've inoculated, it seems to be localized with very little movement," said Clemson microbiologist Ellis Kline in Boston at an American Association for the Advancement of Science (AAAS) session on genetic engineering and microbial ecology. He said that as of Feb. 1 only one sample had shown evidence of bacterial migration as far as 7 inches from the original site. Vertical movement through the soil was limited to 12 inches.

In addition to the migration studies, scientists are looking for any evidence that genetic material from the new bacterial strain is being transmitted to other soil bacteria. Although bacteria are capable of exchanging genetic material through processes known as conjugation or transformation, laboratory studies have suggested that the particular method of gene splicing used in this experiment would allow little if any

genetic exchange to occur. No results of those field tests were announced.

Researchers will also look for any presence of the bacteria in mature wheat after harvest, and will perform follow-up tests on two generations of noninoculated plantings of soybeans and wheat to calculate persistence of the bacteria in soil.

In related research presented by U.S. Department of Agriculture researcher David M. Weller, a genetically engineered strain of bacteria was credited with helping to increase wheat yields by as much as 15 percent in plants that would otherwise have been stunted by a root-damaging fungus. The bacterium had been altered to produce a fungus-killing antibiotic, and to sequester large amounts of iron needed by the fungus for its normal growth.

Other researchers at AAAS sessions gave updates on ongoing research in which genetic material from insecticidal bacteria was integrated into plant tissues. The poison thus produced in the leaves of these plants is deadly to insects but is believed to be nontoxic to humans and other animals. Scientists are also experimenting with gene-spliced bacteria that can help plant roots absorb nutrients more efficiently.

Many scientists profess that research in agricultural biotechnology may prove to be of more immediate value than related genetic research in biomedicine. Few field tests have been conducted, however, because of fears that newly introduced bacteria might upset microbial soil ecology. Contrary to those concerns, reports by Weller and others at the AAAS meeting indicated that genetically engineered bacteria do not seem to survive long when introduced into the environment. "Our problem is getting these things established," Weller said.

Nevertheless, scientists cautioned, more research is needed before widespread introduction of engineered organisms can be considered safe. Arthur Kelman of the University of Wisconsin in Madison said that ecological risk analyses can be difficult to calculate and interpret. A 1987 National Academy of Sciences panel chaired by Kelman concluded that gene-altered microbes are unlikely to cause significant ecological disruption, but that if such a disruption were to occur, the consequences could be extremely serious. — R. Weiss

allocated to NIH \$17 million to start a genome mapping project in the current fiscal year, none of which has yet been spent. With NIH director James Wynn-gaarden due to appear before Congress in

the next few weeks to present his request for next year's NIH funding, the agency must soon decide what role it wants to play in the genome project. In an effort to reach consensus on that important deci-

sion, Wyngaarden has asked the panel members to meet with him on Feb. 29.

While the leadership issue remains unresolved, other aspects of the report reflect a growing refinement of the project's strategies and goals. The panel recommends a gradual "scaling up" of the project, with initial emphasis on technological development of better tools to do the actual mapping. Indeed, much of the project is now being viewed as a technical rather than biological challenge, with biomedical benefits gradually accruing as the endeavor proceeds.

"This is not ordinary biological research," said Charles R. Cantor, of Columbia University, at a session of the Boston meeting. "It's much closer to engineering." A large part of the initial challenge will be to improve automated methods of analyzing DNA and to develop computers and software capable of dealing with the tremendous amount of information that will be generated.

Toward that end, experimental parallel processors and specialized computer chips developed for the Department of Defense are showing promise, said Leroy Hood, a researcher from the California Institute of Technology in Pasadena and a developer of some of the fastest DNA analyzers available. Hood revealed that a computer chip developed for spy satellites over the Soviet Union was being experimentally applied to the gene mapping problem. The chip was designed to filter out small amounts of useful information from large pools of extraneous data. He predicted that neural net research and experimental parallel processors capable of handling large amounts of information simultaneously would also be applied to the task of "teaching" machines how to recognize genes more accurately.

As foreseen by the panel, the gene mapping program would be coordinated by a single agency that would administer grants to individual laboratories at universities and research institutes. Addressing a major point of controversy, the report insists that all the results of genomic research be peer reviewed and remain in the public domain. In the past, some private companies doing gene mapping research have been slow to reveal their findings.

According to the panelists, laboratories outside the United States would be invited to join in the mapping effort, but only after the basic structure of the project had been decided. Some attendees at the session criticized the report for not encouraging other biotechnically advanced countries to share a larger part of the initial expense. Other critics said that despite the assurance that gene mapping would not cut into other scientific funding, it would almost certainly have an effect on funding for other pressing needs such as AIDS research.

— R. Weiss

AAAS

Growth hormone may boost immunity

A hormone important for normal growth may also enhance the body's ability to fight disease, according to findings presented in Boston last week at the annual meeting of the American Association for the Advancement of Science. The research reveals new details about the relationship between the neuroendocrine and immune systems, and suggests that brain hormones may be more important regulators of white blood cell activities than was previously believed.

It's no longer surprising to find feedback between the neuroendocrine system and the immune system, said Keith Kelley of the University of Illinois at Urbana-Champaign, who led the research effort. So far, however, such research has focused mostly on how certain hormones suppress, rather than enhance, the immune system. Glucocorticoids, for example, have been shown to suppress the activities of disease-fighting cells.

Kelley's research, which appears in the Feb. 12 SCIENCE, shows that the growth hormone somatotropin can stimulate white blood cells called macrophages to produce more than double the normal amount of the superoxide anion, O_2^- . Superoxide anion can in turn be converted into a variety of powerful oxidizing agents important to the cells' ability to kill bacteria after ingesting them.

The research, done on rats, does not prove that somatotropin exerts the same

influence on human macrophages. But the concentrations of somatotropin used in his experiments are equivalent to those found under normal physiological conditions.

If his findings are confirmed, he said, somatotropin may prove useful not only for its growth-stimulating qualities but also as an immune booster. The hormone has already been mass-produced through genetic engineering and is commercially available as a treatment for dwarfism.

— R. Weiss

AAAS

Killer bees on skis?

So-called "killer" Africanized bees may be able to survive longer, colder winters than was previously believed, new research suggests. If this is true, the bees might migrate as far north as Canada, causing widespread damage to the North American honey and crop-pollination industry (SN: 4/4/87, p.218).

Since their accidental release in South America 30 years ago, the bees have been migrating northward, gradually replacing "domesticated" European bees along the way. Scientists say they may reach Texas this year. They are too aggressive to be kept in hives and are poor honey producers. Hundreds of deaths have been attributed to their stings. Research presented in Boston last week at the annual meeting of the American Association for the Advancement of Science shows that the bees can survive six months at 0°C and don't seem to mind being buried in snow for a week or more. □

White House presents space policy

The new "national space policy" announced last week by the White House is concerned with issues far broader — and in many ways more difficult — than a lunar base or human exploration of Mars. "The policy," according to NASA Administrator James C. Fletcher, "clearly establishes that, for the first time, the United States has a long-range goal of expanding human presence and activity beyond earth orbit into the solar system." But the directive is a matter of more than just deciding to go ahead.

One major theme of the policy is increased involvement of the private sector. A 15-point "commercial space initiative" ranges from making available the huge external fuel tanks expended by the space shuttle, for use in space by commercial and nonprofit organizations, to having NASA lease space as the "anchor tenant" on an automated, research-and-manufacturing space station being proposed by a Houston-based industry partnership. The administration's plan is to award a contract to the group by midsummer, covering "space and related serv-

ices" to be available by the end of fiscal 1993.

Announcement of the space policy, in fact, originally to have taken place on Jan. 26, was held up largely by disagreements among several agencies including NASA, which fears for the funding of its own much costlier, manned station. Plans for the NASA station have already been modified and slowed in recent months, because of unexpectedly high cost estimates, but the space policy announcement included the fact that President Reagan would ask Congress this year not just for \$1 billion in fiscal year 1989 to keep the station going, but for a "three-year appropriation commitment" of \$6.1 billion.

Also in the area of "privatization," the policy reaffirms that NASA will not maintain its own fleet of "expendable launch vehicles" as an adjunct to the space shuttle except for reasons of national security. In the case of other civilian government agencies that want payloads of their own in space, such as weather and remote-sensing satellites, such agen-