AAAS

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 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 Wyngaarden 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-

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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*