BIO/TECHNOLOGY

RESEARCHERS AS EDUCATORS: NEW LEGISLATION COMPELS A STRONGER ROLE

The first permanent body to oversee commercialization of an aspect of biotechnology was proposed by U.S. Congressman Albert Gore in late April. The bill, a relatively tame piece of legislation which authorizes the establishment of a President's Commission on the Human Applications of Genetic Engineering, will result in no immediate regulation of recombinant DNA technology (see BIO/TECHNOLOGY, June 1983). Restricted to a comprehensive review of developments which have implications for human genetic engineering, the proposed commission would examine medical, legal, and ethical issues under the guidance of a panel composed of both scientists and non-scientists.

This proposed legislation is only the first of a number of Congressional actions which will determine the direction of biotechnology's development in the United States. If other countries continue to follow the trend of the U.S. government in regulating biotechnology, these actions will also set international precedents. The implications of Gore's legislation are clear: biotechnology will play an increasingly active part in the arena of political democracy. Given the unstable nature of modern politics, industrial biotechnology has cause to view its increased prominence with uneasiness. In a nation such as the United States, for example, where the President supports "Creation Science," public ignorance of biotechnology subjects industrial development to the reflexes of political rhetoric.

The solution to the problem of public lack of awareness of biotechnology cannot be left to politicians, executives, or school teachers. The educators in biotechnology have always been the researchers; their influence must be greatly expanded on a public level for biotechnology to follow a socially useful path of development. The current system for teaching future citizens about new technologies will continue to founder without participation by researchers. The sad state of secondary school education in U.S. science and engineering is characterized by a largely verbal method of learning. At its worst, students learn and memorize scientific concepts from textbooks in order to write the correct key words onto their test papers. All too often, the teacher has followed a similar course of study in his or her preparation; the heavy demands and poor rewards of secondary school teaching rapidly discourage most researchers from considering careers in this area. The process of observation, the linking of scientific concepts to visual experience, the formation and testing of hypotheses, the process of thinking about technical applications and implications—these factors require exposure to scientists and engineers, preferably in the laboratory. Researchers who have made their place in the world of biotechnology realize this when reflecting upon their early education. In order for citizens to keep pace with technological innovation and support civic leaders who favor its intelligent development, the direct exposure to researchers and their tools must become the rule rather than the exception.

If the current educational system cannot be depended upon to educate students about science and technology, researchers must take it upon themselves to work through their professional organizations and corporations and involve themselves more directly with students. These options are available for researchers who wish to participate. The New York Academy of Sciences, for example, deserves mention for two programs which its members use to improve scientific education at a secondary school level. The "Scientists in the Schools" program matches scientists from the Academy to the requests of school science supervisors in the New York metropolitan area. The program is based purely upon the needs of the students; it is not restricted to the training of the gifted. Another program, the "Science Research Training Program", places highly motivated and talented high school students in industrial and medical research laboratories during the school year and over the summer recess. BIO/TECHNOLOGY, in an effort to promote this type of direct exposure in the fields of biotechnology, will publicize similar programs in future issues under its Announcements section. Submission of information about existing programs of this type in any country is strongly

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Tn*5* TRANSPOSON REVIEW: CAUSE FOR A CHANGE IN FORMAT

This month BIO/TECHNOLOGY has departed from its usual policy of publishing both a review article and a group of original research papers. Instead we are presenting a very comprehensive review article on the transposable element Tn5. Our decision to devote the entire research section of the magazine to this article was based on the importance of Tn5 as a tool for genetic engineering, the extraordinary quality and depth of the review, and the fact that no other review of Tn5 exists in the scientific literature. We shall resume our normal format of including both original research and review papers next month.

Transposable elements are natural gene vectors that are frequently used for the genetic engineering of bacteria, yeast, and plants. Tn5, which contains genes for antibiotic resistance, is particularly useful because it is very versatile and very mobile: it can move genes easily and efficiently to a number of sites and alter expression of genes near their insertion sites. Tn5 has been utilized for genetic manipulation of many important organisms, including the Ti plasmid of *Agrobacterium tumefaciens*, nitrogen-fixing bacteria, and many pathogenic bacteria. It will become an increasingly important tool for R&D in the agricultural, pharmaceutical, energy, environmental management, and other industries where gene cloning is a key to future success. The review article covers the molecular biology, specific applications, and evolutionary development of this important genetic element.