SCIENCE NEWS of the week

Genetic Engineering Takes Root

The genetic manipulation of plant cells has been slower to blossom than has engineering of bacterial and animal cells. Scientists have found fewer vehicles capable of carrying genes into plants and have had less success with making transplanted genes work. However, last week at the Miami Winter Symposium two research teams announced a major advance in the field. Scientists from each group reported that in independent work they had successfully transferred a gene from bacteria into plant cells and have made the plant cells produce the appropriate foreign protein. This achievement is a fundamental step toward using molecular biology to alter plants for agricultural use.

The gene that was transplanted produces an enzyme that defends bacteria against the antibiotic called kanamycin, or methotrexate. To make the foreign gene acceptable to a plant cell's protein-making machinery, the biologists attached the gene to segments of DNA containing signals the plant cells recognize. This hybrid gene was carried into plant cells by a ring of DNA, a plasmid, from *Agrobacterium tumefaciens* (SN: 7/15/78, p. 45), the bacterium that in nature causes crown gall disease.

So far, cells from petunias, sunflowers, tobacco and carrots have incorporated the foreign gene. With their new DNA they can successfully survive on a medium that contains enough antibiotic to kill normal plant cells. The petunia cells, for example, become more than eight times more tolerant of the antibiotic after they have incorporated the foreign gene, says Ernest G. Jaworski, director of Monsanto's Molecular Biology Group. The foreign gene, and the resistance to antibiotic, is passed on to daughter cells as the plant cell divides.

The scientists at Monsanto who worked on this project are Robert Horsch, Robert T. Fraley and Stephen G. Rogers. The other group that simultaneously announced a similar achievement includes Josef Schell and Marc Van Montagu from the University of Ghent in Belgium. Previous suggestions of foreign gene expression in genetically engineered plant cells have generally not been upheld.

"Using the methods we have developed, it will now be possible to introduce virtually any gene into plant cells with the ultimate goal of improving crop productivity," Jaworski says. He told SCIENCE NEWS that the Monsanto scientists already have some thoughts on what sort of gene to try; "any single gene that does something useful for the plant," he says. High on their list are genes that may confer resistance against diseases, insects and herbicides.

Plant cells containing the foreign, antibiotic resistance gene have not yet been grown into adult plants. "That work is going on right now," Jaworski says. It should take several months. If it succeeds, as expected, the next question will be whether the foreign gene will function in cells of intact plants.

Recently Schell's group reported regeneration of normal, fertile tobacco plants from cells receiving the *Agrobacterium* plasmid. The plants retained only one gene, that for the enzyme called octopine synthase, of the plasmid DNA carried into the plant cells. The plants had lost the bacterial genes that cause crown gall tumor development. The regenerated plants produced octopine synthase in all their tissues, and this characteristic was inherited by offspring of sexual reproduction as a dominant trait. In the December 23/30, 1982, NATURE, Schell and colleagues conclude, "This study proves that normal and fertile plants which still contain and express [a gene of a segment of the bacterial plasmid], can be regenerated from tobacco crown gall tumor cells." These regenerated plants are able to incorporate plasmid genes again, so it may be possible to successively insert genes into a plant for sequential genetic engineering.

—J. A. Miller

Shrinking the insanity defense

"We've been asked the wrong questions, and when we've answered them, we've been kicked for it." So said psychiatrist Loren Roth last week upon release of the American Psychiatric Association's formal position on the insanity defense—the first such position taken by organized psychiatry in its 138-year history. While recommending that the insanity defense not be discarded wholesale, the group concluded that insanity and criminal responsibility are legal and moral concepts on which psychiatrists are unqualified to comment. The courts should not ask psychiatrists to make such judgments, and psychiatrists should not make them.

The APA statement is one of myriad analyses of the insanity defense to come in the wake of John W. Hinckley Jr.'s acquittal last summer. But it is of special interest because it has been endorsed by those who provide most of the expert testimony in insanity cases. The contradictory testimony by psychiatrists in the Hinckley trial was a source of embarrassment for APA, and it was the impetus for the recent study directed by Roth.

In future trials, the report says, psychiatrists should recognize the limitations of their expertise and "do psychiatry"—that is, testify only about a defendant's mental state and motivation. What psychiatrists should not do is make the leap from medical opinion to opinion regarding "ultimate issues"—whether a defendant was able to distinguish right from wrong, appreciate the criminality of his behavior, or control his behavior. Such questions cannot be answered by behavioral science, the report says, and must therefore be left to a jury.

The APA statement also urges that any revision of the insanity defense restrict its use to those with "serious" mental disturbances—conditions that psychiatrists generally diagnose as psychoses. Particularly inappropriate, the psychiatrists argue, is the use of the insanity plea by people with "personality disorders"—antisocial personality, for example. According to current psychiatric knowledge, the report states, such "sociopaths" should be held responsible for their behavior. A point of contention in the Hinckley trial was whether Hinckley suffered from a personality disorder or from schizophrenia, a debilitating psychotic disorder.

The psychiatrists also expressed concern about current procedures for release of the criminally insane—especially violent patients—once they are hospitalized. Advances in treatment of serious mental illness have made it possible to reduce the overt signs and symptoms of mental illness, the report notes, but such improvement does not guarantee that a patient has been cured; nor, in cases of violent crime, does such improvement guarantee that the patient is no longer dangerous to society. Currently insanity acquittees who have committed violent crimes must be treated like non-criminal mental patients — that is, they must be released unless periodically certified as dangerous by a psychiatrist. But because psychiatrists lack the scientific expertise to make predictions of future dangerousness, the APA report states, release should not be determined by psychiatrists alone. Instead, the report concludes, the decision to release a potentially violent patient should be viewed as a social rather than a medical decision and should therefore be made by a parole board, which must weigh not only medical opinion but also the competing rights of patient and society.

Leonard S. Rubenstein of the Washington-based Mental Health Law Project, while concurring with much of the APA position, criticized the idea of tightened release procedures. Such a change, he said, would shift the burden of proof to the patient and, in effect, abolish the insanity defense.

—W. Herbert