ried out in a single laboratory and make little or no attempt to provide a perspective on the field as a whole. This will nevertheless be a valuable reference book, for the essays continue the tradition of excellence established in the first two volumes, which were published in 1970 and 1972.

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Changes in Plant Genomes

Genetic Manipulations with Plant Material. Papers from a NATO Advanced Study Institute, Liège, Belgium, 1974. LUCIEN LEDOUX, Ed. Published in cooperation with NATO Scientific Affairs Division by Plenum, New York, 1975. xiv, 602 pp., illus. $48. NATO Advanced Study Institutes Series A, vol. 3.

In the last two decades, considerable excitement has been generated among experimental botanists by the prospect that important transformations in plant genomes might be accomplished through the combined use of recently developed techniques of molecular biology and plant cell culture. Consider the following facts: In some plants, a single cell, or even a single naked protoplast, can be aseptically cultivated on a chemically defined medium, where it will divide to form a multicellular mass and ultimately an entire normal plant. Naked protoplasts, easily preparable in bulk, can be induced to fuse with one another, sometimes giving rise to parasexual hybrids. Protoplasts can also take up, by pinocytosis, organelles and informational macromolecules in the form of viruses, plasmids, and DNA extracts, and, in some instances, the exogenous information seems to be expressed. Even microspores or pollen grains can be successfully cultivated to give rise to entire haploid plants. Cells of such haploids can be exposed to mutagens, the variants selected by modifications of established microbiological techniques, the chromosome number doubled by colchicine treatment, and a new, stable plant type regenerated.

The implications of this kind of work have stimulated many fertile imaginations. Do you want a carrot high in tryptophan? Simply isolate carrot cells, expose them to a chemical mutagen, select for variants in the presence of a tryptophan analog, and regenerate the new type of plant from the resulting cell mass. Do you want a nitrogen-fixing cereal? Simply transfer the nitrogen-fixing genes of bacteria to other microbes in which they become parts of rapidly replicating plasmids, isolate the plasmids, feed them to cereal protoplasts, and screen the protoplasts on nitrogen-free media. Do you want to cure a biochemical lesion in a higher plant? Simply introduce the desired gene via a transducing phage or even an extract of wild-type *Escherichia coli* DNA. For a while it seemed that no experiment was too bizarre to be successful.

This book summarizes one of many recent conferences convened to evaluate the sometimes conflicting evidence of investigators from different laboratories. The convener of the conference and editor of this volume, Lucien Ledoux of Liège, has included contributions from his own laboratory on the fate of exogenous DNA in plants and on DNA-mediated correction of the thiamineless state in *Arabidopsis*. Several Belgian compatriots have written on such subjects as the analysis of microbial genome structure and sex factors (Mojica-A), plasmids and crown gall (Schell), genetic regulation and interallelic complementation (Matagne and Loppes), molecular biology of *Agrobacterium* (De Ley), the use of isozymes in genetic analysis (Jacobs), the structure of chromatin and chromosomes (Fredericq), the isolation and gradient analysis of DNA (Charles), applications of molecular sieving on agarose gels (Lurquin and Behki), and applications of molecular hybridization (Janowski). Their contributions constitute 15 of the 32 full papers included. Other contributions concern competence for DNA uptake and transformation (Tomasz), nitrogen fixation (Postgate), plant cell culture (Street), plant protoplasts (Cocking), microspore culture (Nitsch), regeneration and chromosome stability in plant tissue cultures (Sheridan), auxotrophic mutations (Redei), mutant selection and heterogeneous cell associations in vitro (Carlson and Chaleff), and the uptake and fate of DNA in plant cells (Hess, Gresshoff, Smith and colleagues, and Kleinhofs).

This volume conveys much of the current excitement and uncertainty in the field, and some of the continuing disagreements and disputes. Unfortunately, the editing is inadequate. Clumsily typed manuscripts have been reproduced without alteration, and inelegant English constructions have been put into print, especially in the chapters by authors whose native language is not English. The pages devoted to 19 short, varied abstracts of about one page each would have been better used for a thoughtful summary by a senior scientist.

Although these defects, as well as the forbidding price and the availability of other, similar books, will deter some prospective purchasers, the volume is timely, authoritative, and useful to teachers and advanced students.

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Calcium Transport in Contraction and Secre-

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