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# Preface

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# PREFACE

In recent years, methods for studying genomic nucleic acids have developed greatly both in sophistication and in ease of use. This has led to rapid advances in knowledge about gene structure and function. Already the complete nucleotide sequences in the genomes of numerous viruses, and the functions of their genes, are known. Within a few years the structure of the complete genome of the higher plant, *Arabidopsis thaliana*, should be established. How best can this rapidly expanding body of information be used for the benefit of science and society?

The discovery in 1983 of a method of inserting alien genes (transgenes) into the nuclear DNA of the tobacco plant with the aid of the *Agrobacterium* Ti-plasmid has provided one answer: the controlled modification of plant DNA to produce plants with novel genotypes. The papers in this volume provide a sample of what has been achieved after a further ten years: in techniques of genetic transformation, in the use of transformation in experiments to find answers to scientific questions, and in the application of genetic engineering to produce improved varieties of crop plants.

*Agrobacterium*-mediated transformation of nuclear DNA has been applied successfully to many dicotyledons but has proved to be largely ineffective for monocotyledons. However, integration of foreign DNA into the nuclear genome by direct DNA transfer is now working well with rice, and to some extent with most other widely grown cereals. In tobacco, the chloroplast genome has also been transformed. The scope for applying transformation-dependent approaches in research on plants has therefore broadened greatly. In addition, a series of regulatory elements has been identified that cause genes to be expressed in specific tissues or at different stages of growth, or in response to specific stimuli, such as light, heat or wounding.

Armed with this array of DNA elements, plant genetic engineers have started to devise ways of conferring resistance to pathogens, pests and herbicides, of modifying plant physiological and developmental processes, and of creating plants with previously unthought of uses. Indeed the major step, from establishing the potential effectiveness of a transgene to producing a transgenic cultivar suitable for farmers' fields and without hazard to man or the environment, seems close to achievement in a few instances. And many more advances are in prospect.

We hope that the trouble the contributors have taken to prepare this set of forward-looking papers will be rewarded by a wide readership, and that the volume will stimulate further thoughts and efforts. We thank the Royal Society for arranging the Discussion Meeting that was the origin of this publication and, particularly, Mary Manning for master-minding the meeting arrangments and Simon Gribbin for supervising the production of the printed record.

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