Preface

More than a century has passed since the first attempts were made to culture isolated plant cells in the laboratory, the number of publications confirming the substantial progress achieved in this area of research, especially during the last four decades. In many ways, plant cell culture *per se* has been overshadowed by the recent, phenomenal progress achieved in recombinant DNA technology. Nevertheless, the ability to culture cells and tissues in the laboratory through to the regeneration of fertile plants provides an important base for several technologies. For example, the mass production of elite plants is exploited extensively in present-day commercial enterprises, while techniques such as the generation of haploid plants, *in vitro* fertilization, embryo rescue and somatic hybridization are available to assist the plant breeder in generating hybrid plants. Similarly, the transfer into plants of specific genes by transformation also provides an important underpin to well established techniques of plant breeding, emphasizing the requirement for close liaison between breeders and cell technologists. Many of the approaches associated with the culture of plant cells in the laboratory demand an experienced eye, particularly in the selection of cultures that are most likely to retain and express their totipotency. Consequently, cell culture is, in many respects, as much an art as a science. However, what is remarkable is the ability of individual cells to multiply and to differentiate into intact plants when given the correct environmental conditions in the laboratory. Although cell-to-plant systems have been described for many plants, including some of our most important crops, there are dicotyledons and, in particular, monocotyledons, that are still recalcitrant to regeneration under *in vitro* conditions. These remain a challenge to researchers involved in plant cell culture.

We have had to be selective in the topics that are included in this volume. Consequently, we have focused on aspects of micropropagation, pathways of plant regeneration, mutagenesis, cryopreservation, secondary products, and the technologies associated with hybrid plant production and genetic manipulation. The chapters each provide a general background to the specific areas with appropriate methodology. Whilst the protocols are presented with reference to specific examples, the procedures can be modified accordingly for new material. Our contributors have been asked to provide precise details, however seemingly trivial, of the methods presented, to focus in the 'Troubleshooting' sections on some of the common problems often encountered, and to give detailed advice for the avoidance of such difficulties.

In general, such information is not included in research papers in learned journals. We thank all of the contributors for their patience and understanding during the preparation and extensive editing of the manuscripts. We hope they have also benefited from the experience of providing the detailed protocols that are in routine use in their laboratories.

Michael R. Davey and **Paul Anthony**
University of Nottingham