

PREFACE

Research in the field of molecular biology has progressed at a fascinating rate in recent years. Much of this progress results from the development of new laboratory techniques that allow very precise fractionation and analysis of nucleic acids and proteins, as well as the construction of recombinant DNA molecules that can then be cloned and expressed in host cells. Progress has been so rapid that there has been a shortfall in the training of appropriately qualified staff. Many existing laboratory workers require retraining, and many educational institutions have had difficulty incorporating the new molecular biology techniques into their teaching programs. Although there are several manuals currently available that describe laboratory techniques in molecular biology, they are principally written for the individual research worker and are not intended for use in the design of practical classes for students.

The aim of this book is to provide just such a series of protocols for the teaching of practical molecular biology. The idea arose following the success of several Workshops in Molecular Biology, organized and taught by staff in the Biology Department of the Hatfield Polytechnic. Gradually, the protocols used in the workshops have been incorporated into the Hatfield undergraduate and postgraduate teaching programs and have now been collected together to form a book. The lecturers and demonstrators in these workshops and courses, together with respected authorities from other institutions, have contributed their tried and tested protocols to this book so that others may more readily incorporate material central to modern molecular biology into their own

undergraduate and beginning graduate-level courses, or indeed even develop similar laboratory workshops in their own institutions.

The chapters following describe a range of the most important techniques in molecular biology research today. The book begins with chapters on the extraction and manipulation of DNA, continues with articles on RNA and protein techniques, and closes with some experiments on whole cells. In all but the first chapter, which is intended as an introductory experiment, the procedures described are those normally used in the research laboratory and have not been simplified. This was done because the objectives here are to teach participants in the experiments how the techniques are routinely used and to provide a source book of procedures that will be directly useful in their subsequent careers. Nevertheless, the level of detail given is such that every experiment should prove successful at the first attempt.

Each chapter describes an experiment based on a particular technique in molecular biology, and all are presented in the same format. The Introduction gives a brief summary of the techniques to be employed and describes the importance of such techniques to current research. The aims and objectives of the experiment are then described and an indication is given of the time required to complete the practical procedures. The Materials Provided section lists all those items that should be available before the practical work begins. This is not intended to give all the details concerning the equipment or buffers and solutions required, but is a checklist intended to help organization of the experiment and ensure that nothing has been forgotten. The Protocol section describes the practical procedure in detail, in numbered chronological steps. When an experiment involves a number of separate stages, perhaps involving more than one session, the Protocol is divided into discrete sections as appropriate. The Results and Discussion section describes the predicted results and gives details of any data manipulations that are required. In many cases, interesting discussion points are raised, or questions about data interpretation are posed.

This book contains two Appendices. The first of these, Appendix I, supplies general information relevant to many of the preceding chapters. Appendix II, on the other hand, is divided into sections related to individual chapters and is

concerned with the preparatory work required to set up each experiment. Appendix II is self-contained and describes in detail any procedures that must be completed prior to the practical class, lists the special equipment required, and the amounts of materials, solutions, and buffers needed for classes of 20 participants, who will be assumed to work in pairs unless otherwise indicated. Some experiments are best suited to smaller groups, whereas others can be expanded to teach much larger classes; this is indicated where appropriate. It is assumed that basic everyday laboratory equipment, such as pipets, bench-centrifuges, ice buckets, and waterbaths or incubators will be available; these are often not listed.

Each chapter in the book has been written in a style suitable for both teacher and student. If the reader is a teacher of molecular biology, he or she should first select the experiments of interest; the book can then be followed systematically to form a whole course on the techniques of molecular biology, or individual chapters can be chosen as required. The Introduction will give an indication of the time required to carry out the procedures, and Appendix II can be given to the laboratory technician to prepare for the practical class. The participants should first read the Introduction to become familiar with the experiment's purpose. Then, before commencing the practical work, they should read the Materials Provided section to be sure that all the necessary items have been supplied. The experiment may then proceed by following the steps described in the Protocol. Finally, when the course has been completed, we hope and expect that the participants will always feel able to refer to the Protocol section and Appendix II as a resource for future work in the field.

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