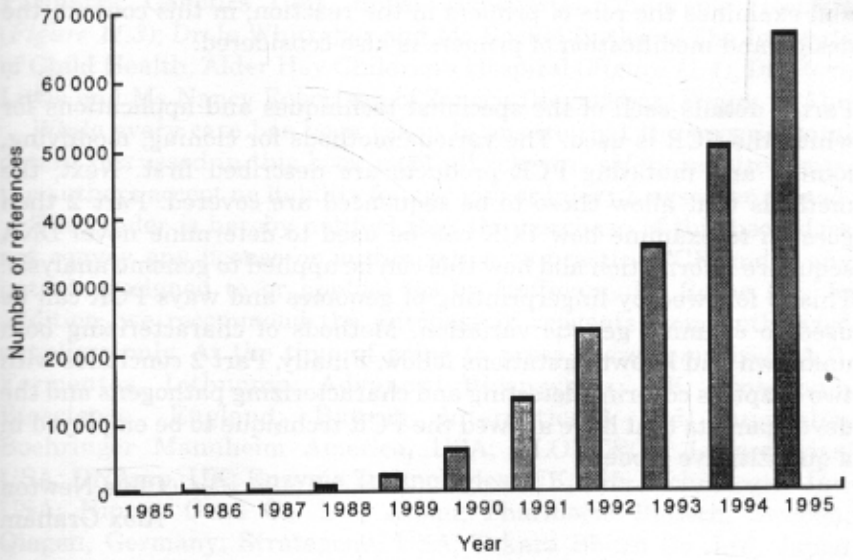
Preface

In the 10 years since its introduction the polymerase chain reaction (PCR) has become a basic and essential tool in both research and analytical laboratories. Indeed, a computer search of a bioscience literature database performed during the preparation of this book revealed that in 1985 and 1986 there were just 38 and 61 PCR citations, respectively. The number of references has increased annually in an exponential manner akin to the product in a PCR. At the time of writing this, the second edition, there were more than 6×10^4 PCR references.



Cumulative citations of the polymerase chain reaction during its first decade.

The fundamental PCR has been adapted for a range of specialist applications ranging from the characterization of genes, their cloning and expression to DNA diagnostics where PCR is used in the detection of pathogens, identifying mutations responsible for inherited diseases and DNA fingerprinting for medical and forensic reasons. By virtue of the speed, sensitivity, specificity and inherent simplicity of the PCR, it has become the method of choice for the above

applications in most laboratories. Although several texts exist that are devoted solely to the PCR, these are fundamentally dedicated to the practical aspects of the technique, containing detailed protocols for each specialist PCR application. This book, although intended as a practical guide, also concentrates on the fundamentals and capabilities of the reaction and explains the attributes of the reaction in the context of each application.

This book is aimed at those new to PCR but we hope that it will also prove a useful text to those more experienced in applying the PCR and that the information provided is useful as further guidance on familiar techniques and as a source of reference for less commonly used applications. Part 1 describes the basic PCR in detail and continues to examine the equipment and thermophilic enzymes available to carry out the PCR. Part 1 then proceeds to give the essential information needed to perform successful and specific PCRs and examines the role of primers in the reaction; in this context, the design and modification of primers is also considered.

Part 2 details each of the specialist techniques and applications for which the PCR is used. The various methods for cloning, modifying, joining and mutating PCR products are described first. Next, the methods that allow these to be sequenced are covered. Part 2 then goes on to examine how PCR can be used to determine novel DNA sequence information and how this can be applied to genome analysis. This is followed by fingerprinting of genomes and ways PCR can be used to examine genetic variation. Methods of characterizing both unknown and known mutations follow. Finally, Part 2 concludes with two chapters covering detecting and characterizing pathogens and the developments that have allowed the PCR technique to be employed in a quantitative mode.

Clive Newton
Alex Graham