
Preface to *DNA Replication*, Second Edition

The rapid accretion of knowledge after the publication of *DNA Replication* in 1980 was the reason in 1982 for a Supplement. Because of its bulk (230 pages) and the exponential rate of research progress since then, further supplements would have been unwieldy. In this second edition, we have tried to limit the size of the volume by deletions and revisions and by severe selection of new material. Even so, with new chapters (Primerases, Primosomes, and Priming; DNA-Binding Proteins; DNA Helicases; Topoisomerases; Genome Origins; Plasmids and Organelles) and expansion of the others, growth has been unavoidable.

The plan of this book is the same — descriptions of the individual replication enzymes are followed by the genetic, physiologic, and structural features of the systems they serve. Beyond the obvious need to know the protein players to understand their genes, we hope that the emphasis on enzymology will illustrate the strength of this approach to the understanding of cell biology. As before, we include brief treatments of transcription, repair, and recombination, processes interwoven with replication.

The references have generally been selected to provide the most recent reviews and papers in which citations of the earlier work can be found. For economy of space and attention, a topical reference may be favored over a more venerable one.

Even more than in the first edition, we have been aided by expert reviews of most sections. We gratefully acknowledge the contributions of: Bruce Alberts, Stephen Benkovic, Kenneth Berns, Michael Botchan, Neal Brown, Patrick Brown, Richard Burgess, Richard Calendar, Michael Chamberlin, Gilbert Chu, Nicholas Cozzarelli, Harrison Echols, Gertrude Elion, Robert Fuller, Adayapalam Ganesan, Martin Gellert, Carol Gross, Richard Gumport, Masaki Hayashi, Kensuke Horiuchi, Joel Huberman, Kenneth Johnson, Mary Ellen Jones, Catherine Joyce, Roger Kornberg, Kenneth Kreuzer, Robert Lehman, Tomas Lindahl, Stuart Linn, Timothy Lohman, Kenneth Mariani, Christopher Mathews, Steven Matson, Roger McMacken, Kiyoshi Mizuuchi, Mukund Modak, Peter Model, Paul Modrich, Gisela Mosig, Nancy Nossal, Leslie Orgel, Peter Reichard, Charles Richardson, Marjorie Russel, Margarita Salas, Robert Sauer, Kirsten Skarstad, Bruce Stillman, James Wang, Teresa Wang, Robert Webster, and Judith Zyskind.

It is with considerable guilt that we do not share coauthorship with Charlene Kornberg. The illustrations she designed are a major feature of the book. We also cannot adequately acknowledge our indebtedness to LeRoy Bertsch for his meticulous and insightful contributions to every aspect of the effort.

We are deeply grateful to Kelly Solis-Navarro for executing the complex illustrations, to Betty Bray for errorless typing, to Gloria Hamilton for extraordinary skill and concern in the editing and styling, and to Bob Ishi for his innovative book design. To Linda Chaput, President of W. H. Freeman, and to the staff, particularly Georgia Lee Hadler, we express our appreciation for their unstinting dedication to producing a book of high quality.

March 1991

Arthur Kornberg
Tania A. Baker

Preface to *DNA Replication*, First Edition

Arthur Kornberg
Louis A. Bickel

I wrote *DNA Synthesis* in 1974 to review and record some of the early discoveries, which were receding from fashionable attention, and to discuss the advances and their wider ramifications. I anticipated that the pace of progress would require a major revision of the book in a few years. I did not anticipate how little I would retain five years later and how much would have to be added. But writing this virtually new and more massive book has been a pleasure rather than a chore. Besides extensive new information, recent advances in DNA synthesis have produced a qualitative change and justify a larger scope and a new title, *DNA Replication*.

The term DNA replication embraces biochemical, genetic, and physiological aspects, and also the numerous DNA transactions that determine the structure and function of genetic material. My goal is an up-to-date account of DNA replication and metabolism with a strong biochemical emphasis that can be used for orientation and as an information resource. I hope the book will serve students with a beginning interest in DNA synthesis as well as those working directly on the subject.

In this reorganization, I have devoted the first half of the book to the greatly expanded field of enzymology of DNA. I have chosen again to treat *E. coli* DNA polymerase I in detail as a prototypical polymerase. I have added discussions of supercoiling, binding, and twisting proteins, and expanded the accounts of ligases, nucleases, and inhibitors of replication. For a grasp of the variety of replication mechanisms, I have surveyed the replicative life cycles of bacterial and animal viruses and of plasmids and organelles.

Proper acknowledgment for help in preparing this book could easily fill a chapter. I want to express my gratitude to the Rockefeller Foundation for their hospitality at the Bellagio Study Center, where I was able to start this book in October 1977. Specialists in many areas generously gave me their points of view and the most recent information, often unpublished. These people have read and influenced the contents and style of one or more of the chapters. I hope they will feel rewarded with a useful book and to them my gratitude is unbounded: Bruce Alberts, Paul Berg, Maurice Bessman, Douglas Brutlag, Michael Cham-

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I owe major debts to Charlene Levering who did the illustrations with artistic skill and unstinting devotion, to Patricia Brewer whose superb styling and editorial judgment smoothed a rough manuscript, and to LeRoy Bertsch, whose knowledgeable and meticulous final review reduced the errors to what I hope will be a forgivable level.

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Arthur Kornberg

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Preface to *DNA Synthesis*

The rapid flow of facts and ideas in biochemistry makes it difficult to write an article, let alone a book. But such turbulence submerges useful facts and ideas, which become too specialized for general textbooks and are lost sight of even in detailed annual reviews. That this was true of the biochemistry of DNA synthesis became clear during preparation of the Robbins Lectures, given at Pomona College in April 1972, and it prompted me to undertake this effort.

This book emphasizes biochemical rather than physiological aspects of DNA synthesis. The scope has been broadened beyond that of an earlier book (*Enzymatic Synthesis of DNA*, 1962) to include topics clearly pertinent to DNA synthesis: precursors, repair, recombination, restriction, and transcription. It is hoped that with an enlarged scope and simplified language the book will serve students with a beginning interest in DNA synthesis as well as those working directly on the subject. Citations of the literature favor reviews and recent papers, which will in turn give the interested reader more complete bibliographies.

At the conclusion of writing this book, I am surprised and embarrassed at the large number of people whom I have enlisted in the preparation of this relatively modest effort. I am most indebted to my wife, Sylvy, who helped me write this book and do the early work on DNA synthesis. I am also grateful to Fred Robbins for the initial stimulus, to Charlene Levering for the illustrations, to Inge Loper for the typing, to Stephanie Lee Rowen for a careful early reading of the text, to I. Robert Lehman, David S. Hogness, A. Dale Kaiser, and R. David Cole for a critical reading of the entire text, and to colleagues too numerous to mention who gave me information and advice in preparing many sections of the book. The best requital for all these contributions is a useful book, and this has been my primary goal.

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Arthur Kornberg