

# Preface

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"Progress in science is made by observation and experiment. This is particularly evident in biochemistry, where the remarkable advances of the past two decades have been made possible largely by the introduction of new methods and techniques." These words, which began the Preface of the Second Edition of *Experimental Biochemistry* (1977), by John M. Clark, Jr., and Robert L. Switzer, are equally appropriate as we complete the Third Edition.

**Goals of the Third Edition.** Although the foundations laid by twentieth century biochemists have proven to be quite solid, the more than twenty years since the previous edition was published have seen so many advances in both the fundamental understanding and the technology of biochemical research that extensive and continuous revision of the content of general biochemistry laboratory instruction is imperative. This edition has grown out of our efforts, and the efforts of our colleagues at the University of Illinois at Urbana-Champaign, to introduce useful new experimental techniques, tools, and materials into our own biochemistry laboratory instruction. The new and revised experimental exercises in this edition were developed in the Department of Biochemistry at the University of Illinois and have been extensively tested in typical instructional settings in our biochemistry laboratory course for advanced undergraduates and beginning graduate students. We are confident that the new edition can be used in a wide variety of settings for instruction in the most important techniques of modern biochemistry. Students without previous biochemical laboratory experience can develop mastery of the theory and practice necessary for advanced laboratory work or for their first ex-

periences in biochemical research. Such education in biochemical techniques is even more important today than in the past. Developments in modern chemistry and biology have shown that biochemistry must today be regarded as a "root science." As science moves toward more integrated forms of investigation, virtually every student of biology and chemistry requires substantial formal training in modern biochemical laboratory techniques to be adequately prepared for a scientific career in the twenty-first century. It is our hope that *Experimental Biochemistry* Third Edition will provide a valuable tool for educators seeking to meet that goal.

**Features of the Third Edition.** As was true of previous editions of *Experimental Biochemistry*, this book attempts to provide a broad range of hands-on experiences with the most important and commonly used techniques of contemporary biochemistry. We have included exposure to all the major classes of biological molecules and topics of current biochemical and molecular biological research: proteins and enzymes, nucleic acids, lipids and membranes, carbohydrates, as well as metabolic systems, regulation, and the newly emerging field of biochemical information science. In no area of research have advances since 1977 been more extensive and revolutionary than in molecular biology. The section on nucleic acids and molecular biology has therefore been extensively revised. This book cannot be regarded as a comprehensive laboratory text for a molecular biology or molecular genetics course, however. This specialty is well served by a number of other texts.

**Traditional Strengths Were Retained.** In preparing this revision, we have attempted to strike

a balance between experiments using entirely new techniques and materials and revisions of more classical experiments from previous editions of *Experimental Biochemistry* that we find valuable for teaching and strengthening the fundamental principles of the discipline. Thus, experiments such as those in Section I, Experiments 5, 6, 7, 8, 12, 14, 19, and 20 present experimental exercises in "classical" biochemistry, which we believe still form an important part of a thorough training. These experiments have all been significantly revised to incorporate improvements in methods or materials, where applicable, and to improve clarity of presentation. Other experiments, which we felt were less useful or were outdated, have been omitted from the Third Edition.

**Extensive New Material Has Been Incorporated.** Many sections and experiments are entirely new in the Third Edition. These include Experiments 10, 15, and 16, an entirely new section on Immunochemical Techniques, which includes Experiments 17 and 18, Experiments 21, 22, 23, and 24 in the Nucleic Acids and Molecular Biology section, as well as Section VI on biochemical information science. All of these new experiments have been performed many times in our own laboratory classes. We are confident that they will provide reliable and stimulating educational experiences in all instructional settings.

**Use of Radioisotopes in Experimental Biochemistry.** Some reviewers have expressed concerns about the use of radioisotopes in some of the experiments in this text. Although it is true that alternative techniques are being developed that lessen the dependence of biochemical research on the use of radioisotopes, we firmly believe that radioisotopes will continue to be important in the foreseeable future, and that an adequately trained biochemist must be aware of these techniques and the power of radioisotopic techniques in biochemical research. The experiments in this text are designed to minimize the levels and exposure of students and staff to radioisotopes. They are completely safe for students and present no contamination hazards if the students are adequately supervised. Handling of significant amounts of radioisotopes is restricted to the teaching staff in the preparation of the experiments. In the same vein, we have attempted to identify clearly and forcefully

in the text all instances where good laboratory practice requires special precautions and safety considerations.

**Flexible Organization and Uses of the Contents.** This book is intended as a text and laboratory manual for a one-semester laboratory course, but it is not realistic for the students in such a course to complete all 25 experiments. Rather, we expect that instructors will choose those portions of the text that suit their schedules, interests, and laboratory facilities. Some further thoughts about optimal and individualized uses of *Experimental Biochemistry* in the teaching laboratory are presented in the section entitled "To the Instructor" in the introductory chapter to Section I. Each of the six Sections is preceded by an extensive Introductory Chapter that reviews relevant background and fundamental biochemistry of a particular class of biological molecules, with a strong emphasis on experimental methodology. It has been our experience with previous Editions of *Experimental Biochemistry* that many instructors and students find these introductory chapters valuable even when they are performing lab exercises other than those in the text. Also, many students continue to use *Experimental Biochemistry* as a reference text long after completing their formal lab course. We certainly hope that the new edition will be even more valuable in these auxiliary uses.

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