

Preface

Scope and Purposes of the Book

Although the study of the immune system began in the nineteenth century, immunology remained largely a descriptive science until the early 1960s. During the last 15 years, however, the tools of modern biochemistry, genetics, cell biology, and molecular biology have transformed immunology into a discipline with a dual nature, partly descriptive and partly molecular. Aspects such as the structure of antibody molecules and genes are understood at the molecular level, whereas others, including much of cellular immunology, are still in a descriptive stage. In this book we attempt to describe both aspects clearly and, where possible, to integrate phenomena with the detailed molecular picture that is now emerging. Indeed, since the publication of the first edition of *Immunology*, important insights into the molecular biology of antibody genes and genes of the major histocompatibility complex have been gained. One striking new feature of this edition is the detailed molecular description of these two systems in Chapters 4 and 6.

In this second edition, we have organized the subject matter of immunology into thirteen chapters. Chapter 1, The Immune System, provides a general introduction for this subject. Chapter 2, Antibodies, considers the structure and function of immunoglobulins. Chapter 3, Detection and Application of Antigen-Antibody Reactions, considers the discipline of immunochemistry, with emphasis on important techniques for immunoassay and immunodiagnosis. Chapter 4, Expression of Antibody Genes, analyzes the fascinating story of antibody gene structure, organization, rearrangements, and diversification. Chapter 5, Molecular Recognition at Cell Surfaces, deals with the general structure and function of the plasma membrane and the characteristics of some simple metazoan cellular recognition systems. Chapter 6, Genes and Proteins of the Major Histocompatibility Complex, deals with the general problem of self-nonspecific recognition, with particular emphasis on genes and proteins encoded by the major histocompatibility complex. Chapter 7, Development of the Immune System, moves into cellular immunology, with a consideration of the architecture and developmental biology of the immune system. Chapter 8, The Immune Response, surveys the cellular biology and cell-cell interactions of the vertebrate immune response. Chapter 9, Effector Mechanisms of the Immune System, deals with a variety of the effector mechanisms utilized by the vertebrate immune system, with special reference to their role in immunity to infection. Chapter 10, Tolerance and the Regulation of Immunity, analyzes the

regulation of immunity by suppressor T-cell circuits and by idiotype-antiidiotype networks and considers in detail the development of immunological tolerance. Chapter 11, Tissue Transplantation, considers the immunogenetics of transplantation antigens, the effector functions mediating transplantation rejection, and the current status of clinical transplantation. Chapter 12, Immunopathology, discusses the cellular and molecular basis of congenital and acquired immune deficiency diseases, the inappropriate responses of T cells and B cells in hypersensitivity diseases, and the relationships between specific major histocompatibility genes and specific diseases. Chapter 13, Cancer Biology and Immunology, describes cancer cells, our current knowledge of the mechanisms by which they arise, and the immune-related aspects of cancer, including future immunological approaches to cancer prevention, diagnosis, and therapy.

Using the Book

Each chapter in *Immunology* is comprised of four sections: Concepts, Selected Bibliographies, Problems, and Answers. The *Concepts* are text sections; they present the most important general principles of each subject first, followed by more detailed information in subparagraphs.

The *Selected Bibliographies* offer short "where to begin" sections that cite readable introductory materials, followed by references to longer reviews and specific journal articles. We have included seminal articles from the classical literature as well as many up-to-date references.

The *Problems* sections, we believe, contain much of the teaching value of the book. They provide from 4 to 21 problems each, and the problems are arranged in order of increasing difficulty. New concepts and techniques are presented in the introductions to the problems. Because many problems have been drawn from the contemporary literature, the reader is exposed to data analysis in many areas of modern immunology. All information required to work these problems is contained in the book.

The *Answers* sections provide readers with detailed feedback on their efforts to obtain solutions, often by describing the analytical process originally used to interpret data in the literature.

Audience

We have written *Immunology* with several audiences in mind: undergraduate, graduate, and medical students taking a first course in immunology; students of biological disciplines related to immunology, such as microbiology, cell biology, or molecular biology; and scientists and health professionals wishing a text suitable for self-instruction with which to review modern immunology. The organization of the text allows its use at several levels, from a quick scan of the Concepts and their opening statements as a review of principles in contemporary immunology, to detailed study of all the text and accompanying problems as a comprehensive introduction to the subject.

The immune system is complex, and immunologists have employed a complex terminology to describe it. We have taken pains to minimize the considerable problem that this terminology can pose for the nonimmunologist by defining all terms clearly when they are introduced and by avoiding jargon and unnecessary abbreviations.

For all readers, we feel that the emphasis on problem solving is a particularly valuable feature of the book. To gain an active working knowledge of immunology, we have found it essential for students to confront actual experimental data and solve concrete problems in addition to reading, listening to lectures, and learning factual material. Consequently, we have included both simple and challenging problems, with detailed answers, in each chapter of the book. Students in the immunology courses we have taught often report that they have learned more from solving these problems than from any other aspect of the course.

Acknowledgments

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