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IMMUNOLOGY, PART I
Cell Interactions

Edited by
EDWARD S. GOLUB

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SERIES EDITOR'S FOREWORD

Microbiology has been the source of several related sciences that either took their origin in the concepts devised by microbiologists or in the methods developed by microbiologists. One may suppose this arose initially when procaryotes were regarded as the simplest cells, but continued long after it was clear that there were fundamental differences between procaryotic and eucaryotic cells. One such subject, immune reactions, while always dependent upon the eucaryotic cell for response, was part of microbiology at its start as a science, and indeed Jenner's cowpox vaccination even preceded scientific microbiology by almost a century. Its role in the development of treatment of infectious disease played a clearly beneficial part in the development of microbiology. In spite of the developing profession of immunology, the subject was always a somewhat minor part of the knowledge expected of a microbiologist. During the 1950s a change in concept began the present independent growth of the subject. This change in concept was the development of the clonal selection theory. During the next decade, the importance of "B" and "T" cells in the development of cell mediated response and in the development of circulating antibody became evident. In the past decade these developments have so broadened immunology that today it constitutes an independent science and, as Dr. Golub argues, is indeed entitled to its own series—Benchmark Papers in Immunology.

From another point of view, the function of this Benchmark series in microbiology is to provide the seminal and significant papers in a convenient form to persons engaged in the study of the science of microbiology, which has now become so broad that no person can be a real expert in all its areas. As such, it is to microbiologists who ought to know the fundamentals of immunology that these volumes are addressed, rather than to practicing immunologists who are presumably completely familiar with the papers included. While there is always a choice made among those available (and indeed some papers are simply not available due to copyright restrictions) we trust that professional immunologists will find these volumes convenient and useful. Eventually these might lead to a Benchmark Series in Immunology but at present we will retain them as part of microbiology just as are volumes on microbial genetics and molecular biology.

In the meantime, however, here are the important papers especially on cellular immunity and these provide the sound and solid basis upon which the present really important developments are based.

WAYNE W. UMBREIT

PREFACE

When I first agreed to edit a Benchmark volume on Immunology, I realized that the selection of papers would be difficult and that some would consider my choices at worst stupid and at best idiosyncratic. Economic constraints that I had not considered at the outset have played a greater role in making selections than I could have anticipated. The cost seems to rise exponentially as additional pages beyond 400 are added to a volume. The publisher allowed me to go to two volumes (I suggested three or four), but even so I have had to eliminate papers that I had originally selected. Furthermore, some journals charge near prohibitive fees for the right to reproduce papers. We tend to forget that it is the journals who hold the copyright to our work (which was financed with public funds) and have the legal right to charge what they choose for reproduction rights. This expense forced me to eliminate many articles that appeared in the most widely read journal in which immunology papers appear. Not being able to use the work of a scientist because of pecuniary constraints was odius to me and almost led me to abandon the entire enterprise, but I felt that the potential benefit to students, scholars, and scientists outweighed my chagrin. I therefore will stand by my choices of papers but plead extenuating circumstances. I hope the papers give a balanced, certainly not a thorough, view of the tide of cellular immunology over the past two decades.

I want to thank the authors of the papers for their cooperation. My special thanks to Mrs. Beth Brumit who took such care in organizing the correspondence required for this work and in typing the manuscript.

EDWARD S. GOLUB

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INTRODUCTION

Although immunology had its roots in the study of infectious diseases during the golden era of microbiology, it has long since become a discipline in its own right, a discipline that utilizes and contributes to advances in cell biology, biochemistry, pathology, and even molecular biology. Because of its origins and because of academic inertia, immunology has remained in the minds of many a subdiscipline of microbiology. Like most immunologists, I personally do not feel that immunology should be relegated to a subsection of even so honorable a discipline as microbiology, but until the decision is made to devote a full series of benchmark papers to immunology, the field and its important papers must continue in this historical niche.

Because immunology touches on so many fields, it has a wide array of subdisciplines and subspecialities. It would be impossible to choose the benchmark papers from each of these fields since no one person (and certainly not this one) is well enough versed in all the areas to make reasonable choices, and even if one were, the book would assume enormous proportions. Because of this I have used the editor's prerogative of not only selecting benchmark papers but of choosing the areas of immunology in which these benchmark papers appear. Because my own work deals with cellular immunology, I have selected papers in this area and the areas that cellular immunology draws upon. In fact, a more appropriate title for these volumes might be "Benchmark Papers in Cellular Immunology."

Cellular immunology deals with the nature of the cells involved in immune reactions, their interactions, the manner in which they make their products and carry out their reactions. Cellular immunology also draws heavily on studies that deal with the structure of the immunoglobulin molecule. It now appears that the exquisite specificity of the immune response is coded in the genes that code for immunoglobulin structures and are expressed

as receptors on the surface of lymphocytes. For this reason I have included a section of benchmark papers that have led to the elucidation of the structure of the antibody molecule.

Immunology can be viewed as a series of reasonably well-defined epochs, and the papers in this volume have accordingly been distributed into groups so that each group contains papers that were influential in initiating or sharpening the focus of the epic. In my book *The Cellular Basis of the Immune Response* (Golub 1977), I have gone into reasonable detail in linking many of these papers together to weave the cloth of cellular immunology and will therefore give only a very brief and broadly painted description of the linkages between the papers and epochs in this volume.

In selecting the papers and writing my commentaries, I have been guided by the notion of the changing paradigm as developed by Kuhn in *The Structure of Scientific Revolutions* (1970). I have tried to identify the paradigms and chose the papers that established them. Two Cold Spring Harbor Symposia (1967, 1976) and an ICN Symposium (Sercarz, Williamson, and Fox 1974) have been held at the ends of immunological epochs, and the reader is referred to these for greater detail.

I have tried in my selection of papers to keep a balance of theory and data to convey the flow of ideas from epoch to epoch.

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