

Systems Biology

Volume 3

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Immuno Systems Biology

A macroscopic approach
for immune cell signaling

 Springer

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Preface

Systems biology is an emerging field integrating traditional and modern biological techniques with systemic approaches adopted from physics, mathematics, engineering, and computer science. Immuno systems biology specifically aims to study the host immune system in a more integrated manner as to how different cells and molecules participate at system levels to invoke the global proinflammatory response to fight against intruders.

In this book, I focus on the dynamic analyses of mammalian innate immune response to bacterial and viral perturbations using computational models based on simple physical rules. The majority of the book is concerned with interpreting population-level immune cell-signaling response in wild-type and mutant cells. The last few chapters are devoted to highlighting the complexities observed from recent single-cell analyses and their potential implications.

Geared toward a researcher with limited immunological and computational analytical experience, the book provides a broad overview to the subject and some instruction in basic computational, theoretical, and experimental approaches. The text is written in a nontechnical manner as an introduction for physicists, chemists, computer scientists, biologists, and immunologists who are interested in understanding the mammalian immune system as an integrated process. The book is the first of its kind to link complex immunological processes with simple computational analysis that can be reproduced with relative ease by the reader, as ample materials and references are provided. Overall, the book provides insights for a comprehensive view of the immune system.

No book is possible without the help of others. In this respect, I thank my students and colleagues who have supported this project in one way or another. Specifically, I wish to thank Vincent Piras, Kentaro Hayashi, Masaru Tomita, Masa Tsuchiya, Sangdun Choi, Shizuo Akira, Koichi Matsuo, Jun-ichiro Inoue, and Alessandro Guilianì. Most importantly, my dear wife Krisvene Kumar and children Lucas Kumar and Davisha Kumar are deeply appreciated for their never-ending love.

Yamagata, Japan

Kumar Selvarajoo

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