
Preface

Optical imaging and sensing technologies played key roles in almost all fronts of fundamental biomedical investigations and clinical patient care. In the past two decades, the breadth and depth of technology development in biomedical optics have grown exponentially and unremittingly. New technologies enabled physicians to, for example, examine human retinas for better management of multiple blinding diseases, saving billions of dollars of the healthcare system. New technologies also allowed researchers to visualize complex biological processes at the most fundamental individual molecule scale, which were recognized by the 2014 Nobel Prize in Chemistry. As a result, more students are becoming interested in biophotonics careers and an increasing number of institutions are starting to offer biomedical optics courses. There are already many outstanding textbooks in biomedical optics authored by leading researchers around the world. However, almost all of them focus on theoretical foundations of tissue optics and principles of optical imaging. After teaching biomedical optics courses in our home institutions for over 10 years, we found that there still lacks a suitable textbook that covers the essential experimental skills to, for example, measure tissue optical properties and construct basic optical instruments. We observed that students can reach the best understandings of optical technologies after they finish both well-guided and exploratory hands-on laboratories. To serve this need, we developed this new book called *A Laboratory Manual for Biophotonics*. This book starts with brief descriptions of fundamental mathematics, biology, and basic optical components and electrical instruments. Then we introduce fundamental optical properties of tissues with a focus on light-tissue interactions. The following three chapters guide students through key microscopic imaging, macroscopic imaging, and spectroscopic analysis technologies. The last chapter explains computational tools either to facilitate imaging and sensing or to achieve comprehensive data analysis. This book is suitable for classes taken by senior undergraduate students and graduate students. It can also be used as a reference book for biophotonics researchers.

We sincerely acknowledge the prodigious contributions from all of our talented group members, without whom this book would be impossible. We also feel extremely grateful to our family members. They sacrificed tremendously in order to support our careers.

Vadim Backman, Adam Wax, and Hao F. Zhang

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The MathWorks, Inc.

3 Apple Hill Drive

Natick, MA 01760-2098 USA Tel: 508 647 7000

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