

Preface

Biomedical optics is a rapidly growing area of research that has passed the “tipping point” for technology transfer, with significant momentum toward commercialization. Designing an imaging technique to meet the specific application requirements is one of the keys in the development and commercialization of new imaging technologies. It requires a solid understanding of imaging technologies and special requirements for imaging applications; it also encompasses the selection of optical configurations, light sources, optical components, detectors, illumination and imaging system designs, and testing.

This book will provide an introduction to principles, designs, and applications of a number of imaging technologies, including spectroscopy, photoacoustic, fluorescence, hyperspectral, optical coherence tomography, confocal, multiphoton, endomicroscopy, multimodal imaging, and multimodal tomography. Each chapter covers (1) principles and limitations of optical imaging technology; (2) system design and practical implementation for one or two specific applications, including design guidelines, system configuration, optical design, component requirements and selection, system optimization, and design examples; and (3) recent advances and applications in biomedical researches and clinical imaging.

There are many books on principles and applications of biomedical optical imaging technologies; however, there is no book covering the topics of detailed design and implementation for different biomedical optical imaging modalities. This book is intended to fill this gap by giving interested readers the fundamental knowledge necessary for planning and designing successful biomedical imaging techniques for their specific application. This book can be used as a reference book for students and professionals in optics and biomedical engineering. The reader can learn the fundamentals, design principles, and implementations of biomedical optical imaging technologies.

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