

Advanced Biomedical and Clinical Diagnostic and Surgical Guidance Systems XII

**Tuan Vo-Dinh
Anita Mahadevan-Jansen
Warren S. Grundfest**
Editors

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Introduction

This year's conference continues to explore diagnostic and surgical applications of a broad range of optical techniques, including fluorescent imaging methods, reflectance spectroscopy, diffuse optical spectroscopy, optical coherence tomography, Raman spectroscopy, and other advanced photonic methods. These investigations represent the state-of-the-art in their respective fields, and provide the reader with a snapshot of the most recent developments in optical imaging sciences for diagnostics and surgical guidance. This volume is not meant to be comprehensive. Rather, it presents focused research studies that are necessary for technology development and translation to clinical application. The studies in this volume range from basic science and engineering and modeling efforts to clinical investigations using recently created novel devices. It is important for the reader to place these achievements in context. The goal of many of these studies is to establish the feasibility of a particular approach or device. Demonstration of success does not guarantee clinical adoption of the technology. However, this volume demonstrates the dramatic progress that has been made over the last several years in using optical methods to extract information from tissue, and provide intraoperative guidance for surgical procedures. This progress has been possible through collaborative efforts involving biomedical engineers, optical scientists from a range of disciplines, physicians, electrical and mechanical engineers, molecular biologists, and pharmacologists, among others. Government support, primarily through the NIH and the DOD, has been critical to the development and growth of these interdisciplinary teams. At the same time, several companies have been successful in developing optical-based technologies for diagnostic systems and surgical guidance. This has encouraged additional investment in this growing area of research, which facilitates translation to clinical practice. As noted in last year's Foreword, "These papers illustrate the need for increased support of translational activities and development of academic, industry, and government partnerships to facilitate translation from proof of principle into clinical practice."

At the same time, continued support of basic science and preliminary investigations is critical to continue the growth and development of optical sciences and engineering. These studies provide the foundation for device development and new methods of surgical guidance. Before any new technology can be adapted for clinical use, it is essential to determine both the safety and efficacy of the technology, and demonstrate its operation in models and in animal models (where appropriate). Productive capacity is necessary for the conduct of clinical trials, since clinical trials cannot occur with one device. Therefore, collaboration and technology transfer to industry is an essential part of the technology development process.

We hope that readers of this volume use the papers presented here to assess the state-of-the-art in biomedical optics for advanced biomedical and clinical diagnostic systems and surgical guidance systems. Further, we hope that these papers promote future investigations and serve as a guidepost to future studies.

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