

Preface

There have been many books on the topics of optical microscopy and applications ranging from beginners' guide to advanced treatment of optics and photonics theories. Since the first Asia-Pacific Conference on Multi-Dimensional Microscopy (MDM1999) held in Singapore (jointly sponsored by the Institute of Materials Research and Engineering (IMRE) and the National University Medical Institutes (NUMI) of Singapore), there has been an interest to gather together prominent researchers in modern optical microscopy and advanced users in both materials and biomedical research disciplines. The second conference in Kao-Hsiung germinated the idea of a book contributed by the combined strength of all these distant and yet potentially related disciplines. The third conference in Guangzhou was a joint event between MDM and cell/tissue engineering, which finally sets the tone for this book project. We hope to allow researchers from diverse backgrounds to be exposed to different disciplines, and to brainstorm new ideas for discoveries and innovations at the boundaries. Modern optical imaging technologies can serve as a meeting point for researchers from such diverse backgrounds and this book should serve to facilitate in breaking down the barriers.

This book covers important aspects of modern optical microscopy and image restoration technologies. Instead of pure optical treatment, this book is organized by taking into consideration the scientists who utilize optical microscopy in their daily research. However, enough details are provided in basic imaging principles, optics and instrumentation in microscopy, spherical aberrations, deconvolution and image restoration. A number of microscopic technologies such as polarization, confocal and multi-photon microscopy are highlighted with their applications in biological and materials sciences/engineering. Therefore, the book is intended for advanced undergraduate to graduate researchers especially those in non-optics disciplines, who have acquired basic knowledge and

some hands-on experiences but desire additional help in enhancing their research capabilities with modern optical microscopy. Chapters can be treated independently but they are arranged in such a way that basic to more tricky optical imaging principles, issues and problems are followed by specialized imaging modality implementation, and applications in materials research to finally the biological applications. Appendix A contains diagrams of 2-photon spectra for commonly used fluorescence dyes.

Contributors include the who-is-who in modern optical microscopy such as M. Gu (Swinburn), T. Holmes (New York), Y. Kawata (Shizuoka), A. Kriete (New Jersey), J. Pawley (Madison), C. Sheppard (NUS), T. Watson (London), and T. Wilson (Oxford) etc. who are instrumental to the coherent treatment of optical principles, instrumentations, and applications in microscopy; as well as enabling a multi-disciplinary cross-talk between biology, tissue engineering, physics and imaging science. We would also like to thank Fong Shih (NUS), Bob Nerem (GIT), Paul Matsudaira (MIT), Mike Sheetz (Columbia), Ben Peng (HKUST), Qing-Ming Luo (HUST) and Hui Ma (Hsinghua), Joji Osama (Beijing), Arthur Hsieh (Taipei), Yao-Xiong Huang (Guangzhou) who have contributed to organizing the related conferences, discussions and encouragements throughout the course of completing this book. We are indebted to our families and graduate students whose support and tolerance of us have been critical.

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Hanry Yu
Ping-Chin Cheng
Pao-Chun Lin
Fu-Jen Kao