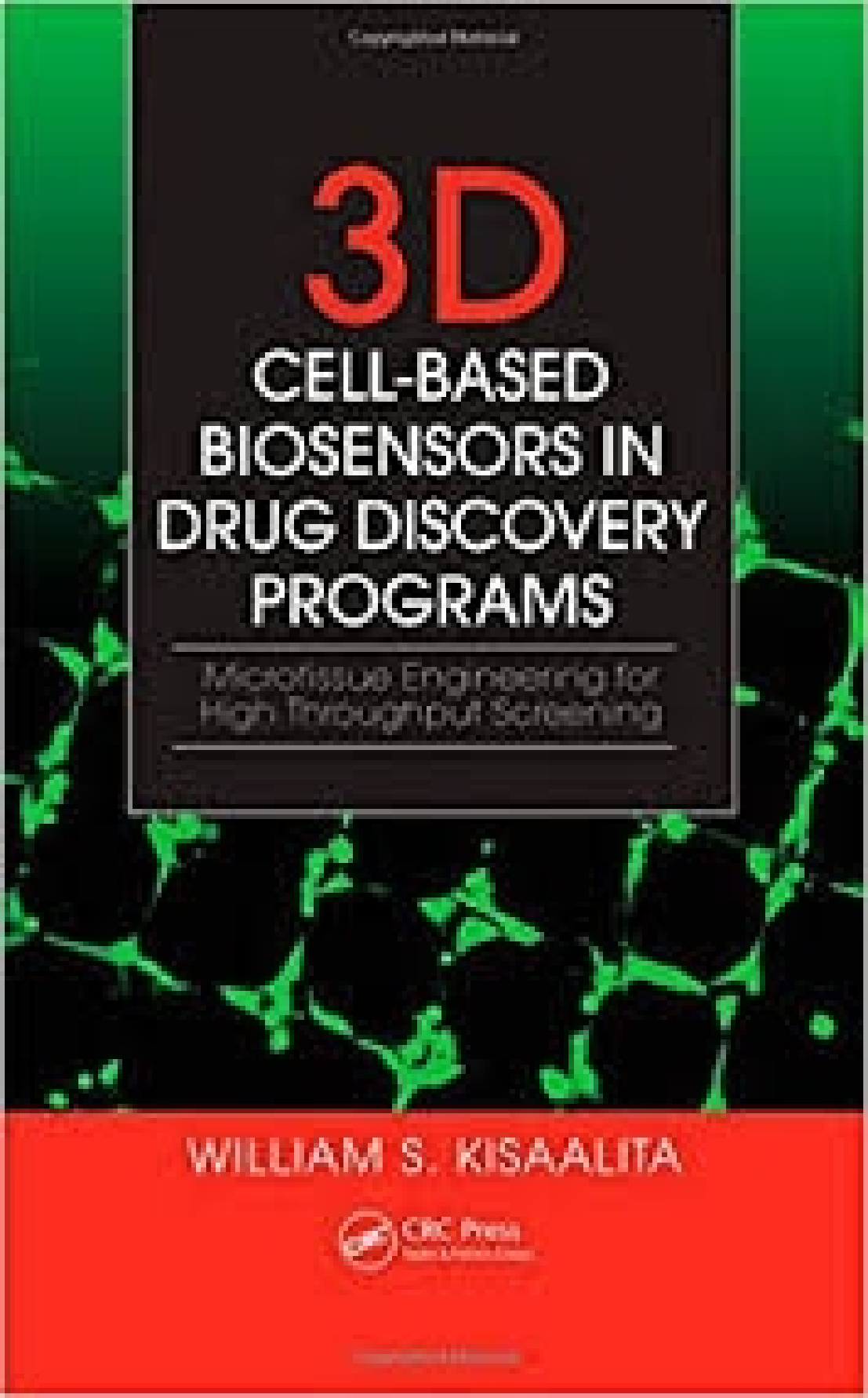
3D
CELL-BASED BIOSENSORS IN DRUG DISCOVERY PROGRAMS
Microtissue Engineering for High Throughput Screening
WILLIAM S. KISAALITA
CRC Press

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To Rose, my wife, and Christine and Christopher, my parents, without whom this book would not be possible

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Preface

The idea for this project was planted during the 2007 Annual Society of Biomaterials Meeting in Chicago by an individual who at that time was with an HTS lab for a major pharmaceutical company. This individual, after visiting three posters from my research group on 3D cell-based biosensors, mused that, "it would be very helpful if a book was available that would integrate the knowledge bases critical to serious consideration of 3D cell-based systems in a discovery program and especially if this book would provide evidence that such systems have the potential to lower the discovery cost." I thought deeply about what this individual said and the next day I ran the project idea by Michael Slaughter (an executive editor with Taylor & Francis) who was also at the meeting at the exhibitor stand. Michael suggested that I send him a proposal, which I did. To test the project idea, I offered a one-semester hour seminar at my institution that fall, which attracted nine graduate students with research interests in bioengineering, drug discovery, and bionanotechnology. At the end of the semester, the students were unanimous about developing a full 3-hour course on the subject, which I am currently teaching every fall of odd years.

This book is intended to serve as a catalyst for the widespread adoption of 3D cell-based systems. In addition to pharmaceutical and biopharmaceutical industry bioengineers and bioscientists involved in HTS, the book should be of value to those outside the industry with interest in tissue engineering and/or cell-based biosensors. It has been written to provide the latest—from theory to practice—on the challenges and opportunities for incorporating 3D cell-based biosensors or assays in drug discovery programs. Furthermore, the book provides evidence in support of embracing 3D cell-based systems. It goes to the root of the issue, first by comparing 2D and 3D culture from genomic to functional levels, establishing the 3D cell-based biosensor physiological relevance. Second, the bioengineering principles behind successful 3D cell-based biosensor systems are assembled in one place. Third, the challenges and opportunities for incorporating 3D cell-based biosensors or cultures in current discovery and preclinical development programs are addressed. The book will also be useful as a reference in graduate courses on biosensors and biotechnology. To maintain a broad appeal for the book, the advanced mathematical treatment I am using in my class in several chapters has been left out or kept to a minimum.

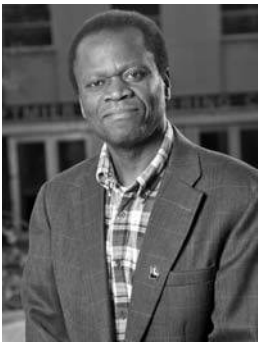
As in any book written for an audience from several disciplines, the coverage may be mundane in some areas while adequate in others, depending on the reader's background. For this I apologize in advance. I also apologize to authors whose works may not have been cited. It has been difficult to exhaustively cite all important works and at the same time meet the publisher's page limit for the project.

A number of individuals deserve acknowledging for their invaluable help. First, I express my gratitude to my college at the University of Georgia for unwavering support. Second, I thank the graduate students who enthusiastically participated in the class, offering to test the material contained herein. I am especially grateful to

the students in my research group: Yinzhe Lai, Ke Cheng, Lina Wang, Amish Asthena, and Angela Zachman who have contributed to this effort in more ways than I can thank them. Special thanks go to Yinzhi Lai, who in addition prepared/assembled the majority of the figures. Finally, I am grateful to my family for their patience and support of my seeming obsession with this project.

William S. Kisaalita

Author



William S. Kisaalita, PhD, is professor and former coordinator of graduate engineering programs at the University of Georgia, where he also directs the Cellular Bioengineering Laboratory. The main research focus of his laboratory is cell-surface interactions with applications in cell-based biosensing in drug discovery. He has published more than 80 peer reviewed and trade press papers and made more than 100 poster and podium presentations. He has received numerous instructional awards including membership in the University of Georgia Teaching Academy. He is a member of ACS, AAAS, ASEE, and SBS. Dr. Kisaalita serves on the editorial boards of *The Open Biotechnology Journal* and *The Journal of Community Engagement and Scholarship.*