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Preface

It is hard to imagine that 10 years have already passed since the first edition of *Microbial Biofilms* was published. The success of the first edition of this book prompted the American Society for Microbiology to commission this second edition. Unlike the first edition, when the field was finding its way and gathering strength to become an area of intense interest that spurred a decade of breathtaking research, now we are in a period in which the fruits of this work are being harvested. While in the first monograph the majority of the research was discovery-based, which is the case in most research areas at their inception, the findings of the last decade have resulted in an in-depth understanding of the molecular mechanisms underlying the biology and antimicrobial resistance of biofilms and their pathogenesis. Furthermore, proteomic and genomic approaches identified targets that can be exploited in our discovery efforts of antibiofilm therapeutic approaches, as well as tools that will aid these efforts. We also witnessed efforts at expanding the findings from basic research into translational applications, aimed at preventing and treating biofilm-associated diseases.

In spite of tremendous scientific advances, significant hurdles remain. More research is needed to study mixed-species biofilms and link the complex environments of biofilms and the microbial (bacterial, fungal, and viral) biome. Although reductive analyses based on single genes and proteins, as well as systems biology approaches, have identified several key modulators of biofilm growth, a unified mechanistic model that encompasses the role of these modulators and explains the distinct biology and pathogenesis of biofilms is still lacking. Cross-network analyses of these findings should go a long way toward creating such a model. Moreover, systematic analyses of these interactions may allow us to exploit the novel features of microbial biofilms to discover potent antibiofilm agents. A prerequisite for attaining this goal is the development of standardized methods to evaluate biofilm growth and antibiofilm activity as well as a more thorough understanding of *in vivo* biofilms. Standardized methods will pave the way for the development of new therapeutic strategies that can be tested in relevant *in vivo* biofilm models. Our efforts to discover therapeutic approaches by translating the scientific findings of the last decade should be accelerated, together with discovery and development of devices that prevent or inhibit biofilm formation.

In this edition, some chapters are updated by established investigators based on recent findings, while others are by new contributors, providing unique and fresh insights into the field. This book will take the reader on an exciting journey of bacterial and fungal biofilms, ranging all the way from basic molecular interactions to innovative therapies, with stops along the way to examine the division
of labor in biofilms, new approaches to combat the threat of microbial biofilms, and how biofilms evade the host defense. We would like to extend our thanks to all contributors, without whom completion of this exciting monograph would not have been possible. We thank them for their patience during the publication process and for giving up their valuable time to meet our deadlines. It is our hope that this volume will be of interest to basic science researchers and clinicians, and that it may provide inspiration for graduates and postgraduates to be attracted to the field of microbial biofilms.

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Acknowledgments

First off, we would like to acknowledge the authors. Under the best of circumstances, writing a book chapter is a lot of work. The authors have produced a collection of chapters of great breadth and depth. We thank them for supporting this publication and for their patience and efforts bringing it to fruition.

Since the publication of the first ASM biofilms book in 2004, the field has lost two of its great leaders, Bill Costerton and Peter Gilbert. We would like to pay special tribute to these individuals. Both were founding figures in biofilm microbiology, carrying out innovative, pioneering research. Both laid the early groundwork that shaped the field and trained a generation of scientists. Both conducted research that brought together diverse scientific disciplines. Both were also colorful characters that are sorely missed.

J. William Costerton lost his battle with cancer in 2012. He carried out much of his ground-breaking research at the University of Calgary. In 1995, he took on the leadership of the Center for Biofilm Engineering in Bozeman, Montana. He is well known for his key recognition of the prevalence and importance of biofilms in the environment and disease. He will also be remembered as a powerful advocate for biofilm research at a time when microbiology was somewhat reluctant to embrace the importance of biofilms. Another key aspect of Bill’s legacy was the extraordinary efforts he made to promote young researchers.

Peter Gilbert passed away in 2008. He was recognized for his contributions toward understanding biofilm antimicrobial tolerance. He was also known for his provocative ideas that inspired new research directions. During the course of his 30-year career at Manchester University, he authored over 250 research papers and reviews. Underneath his famous gruff exterior were a quick wit and a sharp sense of humor. A very telling insight into Peter was how beloved he was by his former trainees.
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