



Introduction to Special Issue on “Frontiers in Industrial Microbiology and Biotechnology 2020”

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Published online: 30 October 2020
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In 2014, the Journal of Industrial Microbiology and Biotechnology began publishing yearly Special Issues devoted to advances in industrial microbiology and biotechnology, with emphasis on individual core areas of the Society for Industrial Microbiology and Biotechnology (SIMB), our sponsoring society. In 2019, we expanded the special issues concept with the inaugural special issue on “Frontiers of Industrial Microbiology and Biotechnology 2019” to highlight the work of select authors who presented their work in any of the core areas of SIMB at the 2018 Annual Meeting of SIMB in Chicago, Illinois. That special issue was very successful, and we have repeated the process for the current Special Issue on “Frontiers in Industrial Microbiology and Biotechnology 2020”, covering select topics and authors who presented at the 2019 Annual Meeting of SIMB in Washington, DC. The current Special Issue has 17 reviews, minireviews, or original articles that cover diverse topics in the SIMB core areas of Natural Products, Fermentation, Metabolic Engineering, Biocatalysis, and Environmental Microbiology.

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The Natural Products presentations encompassed a wide range of topics including biocatalysis and biosynthesis, natural product bioactivity, novel enzymology, and synthetic biology for natural product production and engineering. These topics are reflected in the three natural products contributions in this special issue. Kodani and Unno [6] review the field of lasso peptide gene clusters, including an authoritative look at heterologous expression technologies for the production of these peptide natural products. Rubin and Ding contributed a review on the biosynthesis of ribosomally synthesized and posttranslationally modified peptides (RiPPs) that include multiple core peptides within single precursors [14]. This review highlights the shared enzymatic logic of these systems as well as peculiarities for each RiPP class. Finally, Williams and colleagues contributed a review of metabolic engineering and synthetic biology strategies for the production of isoprenoids, covering both classical approaches in the field as well as new enabling technologies, such as the use of biosensors [9]. The Fermentation Section contains five articles covering diverse topics on microbial fermentation. It includes a review on solventogenic and acetogenic clostridia, contributed by Pflügl and colleagues [15], which focuses on system-level understanding of clostridia and continuous fermentation process, compared with the conventional one-step batch process. An original article by Agbogbo and colleagues describes the use of design of experiments (DoE) to improve fed-batch fermentation of *E. coli* at industrial level using the PhoA promoter system [1]. An original article by Takagi and colleagues [10] describes the identification and characterization of a genetic mutation in the *PRO1* gene in sake brewing yeast that overproduces proline and highlights the use of detailed molecular analysis in developing flavors in brewing yeasts. A review article by Cho and colleagues summarizes current state-of-the-art on transcriptome-level understanding of *Streptomyces* and how it relates to secondary metabolite production [7]. Finally, Jacinta Conrad contributed a review on biophysical methods for characterizing bacterial behavior at oil–water interfaces that are critical in large scale fermentations [3]. The range of topics covered illustrates

the breadth of the fermentation field. The Metabolic Engineering section has four review articles highlighting the recent microbial engineering efforts to synthesize value-added compounds, including aromatic molecules by Blenner and colleagues [17], plant-derived natural products by the Facchini group [12], steroids by Xu and Li [16], and oleochemicals, terpenes, polyketides by the Xu and colleagues [8], with much focus on yeast engineering. These articles provide a solid foundation for future applications of metabolic engineering to produce important chemicals for different industrial applications. One review article on Biocatalysis addresses saccharification of lignocellulosic biomass by Várnai and colleagues [11]. This work focuses on the development of recently discovered lytic polysaccharide monooxygenase (LPMO) enzymes, which have improved the process and decreased costs. The Environmental Microbiology section includes four articles that highlight science and technology needed to address the most pressing environmental issues. A review by Chandler and colleagues [5] focuses on the antibiotic resistance crisis, highlighting research on the structural ecology and evolution of secondary metabolites from environmental microorganisms. Popovic and Finneran discuss an electrochemical approach for the conversion of biomass sugars into value-added products [13]. The Environmental Microbiology program committee also organized a session, sponsored by the Department of Energy's Office for Biological and Environmental Research, to showcase the work and professional career path of women leading efforts in fields of applied and environmental microbiology where gender imbalance persists. This special issue follows up on these efforts with review articles from two women pioneering basic and applied science on electrically active microorganisms. Clark and Reguera [2] contributed a review on the biology and biotechnology of conductive protein appendages that electricity-producing bacteria used as nanowires to immobilize toxic metals and radionuclides. Arpita Bose and colleagues [4] review the physiology, ecology, and evolution of extracellular electron uptake in autotrophic microbes and their potential use as microbial chassis for the electrosynthesis of value-added chemical commodities from CO₂.

We hope that scientists interested in Industrial Microbiology and Biotechnology will benefit from reading articles from this Special Issue.

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