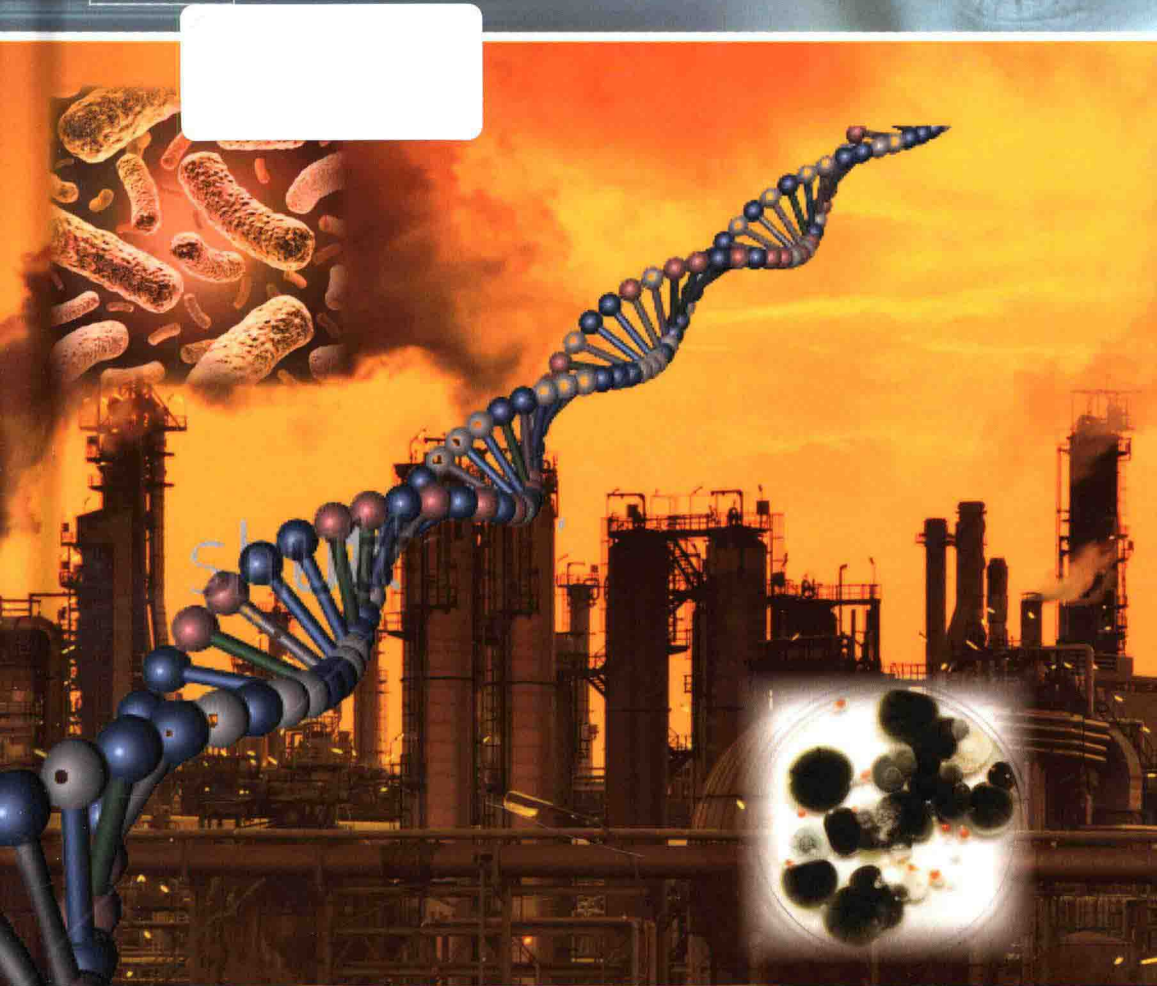


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MICROBIAL BIODEGRADATION AND BIOREMEDIATION

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SURAJIT DAS

Microbial Biodegradation and Bioremediation

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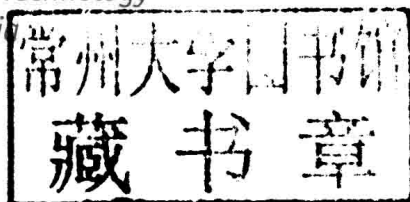
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Microbial Biodegradation and Bioremediation

Preface

The evolution of environment into its components of atmosphere, hydrosphere, and troposphere took place 600 million years ago. Due to rapid urbanization and emerging anthropogenic activities, the natural biodiversity of our environment is becoming disturbed. The introduction of contaminants into an environment causing disorder, unsteadiness, and distress to the physical and chemical systems, including living organisms, is called pollution. The intrusion of humans and their activities has placed a major pressure on our environment, possibly threatening the dynamics of nature, by producing certain xenobiotics. These compounds have a detrimental effect on the existing flora and fauna, alarming the natural ecosystem throughout our biosphere. Therefore, there is an immediate global demand for diminution of environmental pollution produced by local, national, and global processes. We should have a wide awareness and knowledge of the detrimental effects of these xenobiotic compounds and approaches to their remediation. Advanced techniques for the disposal and treatment of these xenobiotic compounds are the major concern but the recently developed treatment strategies are very costly and lead to production of toxic intermediates which can adversely affect the living organisms.

Over time, microbial remediation processes have been accelerated to produce better, more eco-friendly, safer, and more biodegradable measures for complete dissemination of these toxic xenobiotic compounds. Bioremediation is the process of the usage of living organisms such as plants (phytoremediation) and microbes such as bacteria, algae, and fungi (microbial remediation) and their enzymes to detoxify toxic xenobiotic compounds. Some toxic xenobiotics include synthetic organochlorides, such as plastics and pesticides, and naturally occurring organic chemicals, such as polyaromatic hydrocarbons (PAHs), and some fractions of crude oil and coal. The evolution of new metabolic pathways from natural metabolic cycles has enabled the microorganisms to degrade almost all the different complex and resistant xenobiotics found on Earth. This is an imperative, efficient, green, and economical new alternative to conventional treatment technologies.

The present book, *Microbial Biodegradation and Bioremediation*, comprises chapters dealing with various bioremediation strategies with the help of different groups of microorganisms, along with detailed diagrammatic representations. This book will be useful both for novices and experts in the field of microbial bioremediation. We hope to instill the present status, practicality, and implications of microbial bioremediation to academicians, students, teachers, researchers, environmentalists, agriculturalists, industrialists, and professional engineers, as well as

to other enthusiastic people who are wholeheartedly devoted to conserving nature. I thank all the contributors who have expertise in this field of research for their advanced, timely chapters and their help in making this a successful endeavor.

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Biography



Dr. Surajit Das is an Assistant Professor at the Department of Life Science, National Institute of Technology, Rourkela, Odisha, India, where he has been on the faculty since 2009. Earlier he served at Amity Institute of Biotechnology, Amity University Uttar Pradesh, Noida, India as Lecturer. He received his PhD in Marine Biology (Microbiology) from the Centre of Advanced Study in Marine Biology, Annamalai University, Tamil Nadu, India. He is the recipient of the Australian Government's Endeavour Research Award

for postdoctoral research on marine microbial technology at the University of Tasmania. This research paved the way for using marine actinobacteria as the biocontrol agent in aquaculture.

He has multiple research interests with the core research program on marine microbiology and is currently conducting research as the group leader of the Laboratory of Environmental Microbiology and Ecology (LEnME) on biofilm-based bioremediation of heavy metals and PAHs by marine bacteria; nanoparticle-based drug delivery and bioremediation; and the metagenomic approach for exploring the diversity of catabolic gene and immunoglobulins in the Indian Major Carps, with the help of research grants from the Ministry of Science and Technology and the Indian Council of Agricultural Research, Government of India.

In recognition of his work, the National Environmental Science Academy, New Delhi presented him with the 2007 Junior Scientist of the Year Award for his research on marine microbial diversity. He is also the recipient of the 2002–2003 Ramasamy Padayatchiar Endowment Merit Award, given by the Government of Tamil Nadu from Annamalai University, Tamil Nadu, India. He is a member of the IUCN Commission on Ecosystem Management (CEM), South Asia and a life member of the Association of Microbiologists of India, the Indian Science Congress Association, the National Academy of Biological Sciences, and the National Environmental Science Academy, New Delhi. He is also a member of the International Association for Ecology.

In addition to his research, Dr. Das is the reviewer of many scientific journals published by reputed publishers. He has written and edited three books, and authored more than 50 research publications in leading national and international journals as well as 11 book chapters and several popular articles on different aspects of microbiology.

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