
Psychrophiles From Biodiversity To Biotechnology

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*Psychrophiles
From
Biodiversity To
Biotechnology* 2020-12-08

SKYLAR BALLARD

Comprehensive
Biotechnology Academic
Press

Extremophiles belong to members of all three domains of life, i.e., bacteria, archaea, and eukarya. However, a high proportion of extremophiles are archaea and bacteria. These microbes live under chemical and physical extremes that are usually lethal to cellular molecules, yet they not only manage to survive but even thrive in such

conditions. Extremophiles have important practical and industrial uses. They are a valuable source of industrially important enzymes also known as extremozymes. Recent research has revealed that extremozymes have unique structural features essential for biocatalysis under extreme conditions. Extremozymes have great commercial values and are known for their potential use in biotechnology, biomining, and bioremediation. Extremozymes and their Industrial Applications highlights the current and topical areas of research in this rapidly growing

field of extremophiles and their applications. Expert researchers from around the globe are trying to uncover the underlying mechanisms responsible for their specific adaptations under extreme environments. The topics covered include the ability of acidophiles to maintain a neutral intracellular pH, the way psychrophiles "loosen up" their proteins at low temperatures, and other equally ingenious adaptations and metabolic strategies that extremophiles use to survive and flourish under extreme conditions. Extremozymes and their

Industrial Applications also covers the established biotechnological uses of extremophiles and the most recent and novel applications, including their exploitation for enzyme production. Potential use of extremophiles and their enzymes in the generation of sustainable energy, biomass conversion, agro-waste processing, and biocontrol of phytopathogens is also covered. The book will be very useful for researchers and students working in the area of industrial microbiology and biotechnology, and microbial ecologists. It is also recommended reference text for those interested in the biochemistry and microbiology of extremophiles, as well as for those interested in bioprospecting, biomining, biofuels, and biodegradation. Presents information exclusively based on extremozymes and their application in industries Chapters have been collected from various experts and deals with contemporary issues related to extremozymes and their usability in various industries Enriched with suitable illustrations that assist in

increasing readership and broaden the reach of the book amongst scholars and academicians
Extremophilic Fungi
 Springer Nature
 Highly recommended by CHOICE, Oct 2018
 Extremophiles are nature's ultimate survivors, thriving in environments ranging from the frozen Antarctic to abyssal hot hydrothermal vents. Their lifeforms span bacteria to fishes, and are categorized as halophiles from hypersaline environments, acidophiles from acidic waters, psychrophiles from cold habitats, and thermophiles from warm waters. Extremophiles: From Biology to Biotechnology comprehensively covers the basic biology, physiology, habitats, secondary metabolites for bioprospecting, and biotechnology of these extreme survivors. The chapters focus on the novel genetic and biochemical traits that lend these organisms to biotechnological applications. Couples studies of marine extremophile biology/genomics and extremophile culture for biotechnological applications with the

latest advances in bioprospecting and bioproduct development
 Includes practical experiments that a laboratory can use to replicate extreme habitats for research purposes
 Presents latest advances in extremophile genomics to give the reader a better understanding of the regulatory mechanisms of extremophiles
 Offers insights into the production of commercially important extremozymes, carotenoids, bioactive compounds and secondary metabolites of medicinal value. This unique guide serves as a resource for biotechnologists who wish to explore extremophiles for their commercial potential, as well as a valuable reference for teaching undergraduate, graduate and postgraduate students.
Extremophiles Springer
 From arid deserts to icy poles, outer space to the depths of the sea, this exciting new work studies the remarkable life forms that have made these inhospitable environments their home. Covering not only micro-organisms, but also higher plants and animals such as worms, fish and polar plants, this book details the

ecological, biological and biogeochemical challenges these organisms face and unifying themes between environments. Equally useful for the expert, student and casual scientific reader, this book also explores the impact of climate change, rapid seasonal changes and pollution on these extraordinary creatures.

Adaption of Microbial Life to Environmental Extremes

Wiley-Liss
Microbial Diversity in Hotspots provides an introduction to microbial diversity and microbes in different hotspots and threatened areas. The book gives insights on extremophiles, phyllosphere and rhizosphere, covers fungal diversity, conservation and microbial association, focuses on biodiversity acts and policies, and includes cases studies. Microbes explored are from the coldest to the hottest areas of the world. Although hotspots are zones with extremely high microbiology activities, the knowledge of microbial diversity from these areas is very limited, hence this is a welcome addition to existing resources. Provides an introduction to microbial biotechnology

Addresses novel approaches to the study of microbial diversity in hotspots Provides the basics, along with advanced information on microbial diversity Discusses the techniques used to examine microbial diversity with their applications and respective pros and cons for sustainability Explores the importance of microbial genomes studies in commercial applications

Recent Advancements in Microbial Diversity

Springer Nature
 This volume discusses recent advancements to the age old practice of using microbial enzymes in the preparation of food. Written by leading experts in the field, it discusses novel enzymes and their applications in the industrial preparation of food to improve taste and texture, while reducing cost and increasing consistency. This book will be of interest to both researchers and students working in food technology.

Molecular Diversity of Environmental Prokaryotes

Springer
 A detailed overview of the current state of knowledge about this special group of organisms. - Serves as an

essential volume for a variety of scientists, including microbiologists, biochemists, physiologists, biotechnology specialists, ecologists, and physical scientists such as chemists and astronomers.

Extremophiles in Eurasian Ecosystems: Ecology, Diversity, and Applications Academic Press

Environmental pollution emanating from rapid industrialization, population growth, and urbanization has been considered a major problem in recent years that affects biodiversity, ecosystems, and human health by contaminating soil and water. This book brings out a comprehensive collection of information on valuable insights into different cutting-edge omics technologies, such as metagenomics, metatranscriptomics, metaproteomics, and metabolomics, along with advanced next-generation sequencing technologies as well as bioinformatic tools, which led to a better understanding of microbial communities and their adaptability to a wide range of contaminants and underlying their

mechanisms in bioremediation and biodegradation of environmental pollutants. In addition, this edited volume provides critical insight into of potent microbial communities endowed with unique functional attributes through their unique metabolism catalyzed by 'signature' enzymes and degradation pathways. Step-by-step descriptions are provided of various microbial metabolic pathways of degradation and biotransformation of environmental contaminants by numerous illustrations which make the information easier to understand for the readers. Each chapter is devoted to selected examples of microbial bioremediation supported by tables, and an extensive list of references for readers interested in learning further details about the subject matter. This book is of interest to teachers, researchers to professionals, policymakers, stockholders, practitioners, environmental engineers, soil scientists, and policymakers. In addition, the book serves as additional comprehensive

material for undergraduate, graduate, and doctoral students who require a working knowledge and knowhow of 'Omics' involved in and required for environmental remediation of legacy and emerging contaminants, will also find this to be a useful read.

Trends of Applied Microbiology for Sustainable Economy

Springer Science & Business Media

Over the last decades, scientists have been intrigued by the fascinating organisms that inhabit extreme environments. These organisms, known as extremophiles, thrive in habitats which for other terrestrial life-forms are intolerably hostile or even lethal. Based on such technological advances, the study of extremophiles has provided, over the last few years, groundbreaking discoveries that challenge the paradigms of modern biology. In the new bioeconomy, fungi in general, play a very important role in addressing major global challenges, being instrumental for improved resource efficiency, making renewable substitutes for products

from fossil resources, upgrading waste streams to valuable food and feed ingredients, counteracting life-style diseases and antibiotic resistance through strengthening the gut biota, making crop plants more robust to survive climate change conditions, and functioning as host organisms for production of new biological drugs. This range of new uses of fungi all stand on the shoulders of the efforts of mycologists over generations. The book is organized in five parts: (I) Biodiversity, Ecology, Genetics and Physiology of Extremophilic Fungi, (II) Biosynthesis of Novel Biomolecules and Extremozymes (III) Bioenergy and Biofuel synthesis, and (IV) Wastewater and biosolids treatment, and (V) Bioremediation.

Environmental and Agricultural Microbiology
CRC Press

Extremophiles have unique physiological properties, thus considered to be ideal candidates for industrial development. This book present concepts on cold-adapted microorganisms, centered on four different aspects - (i) diversity of cold adapted microbes (ii) their ecology, physiology

and metabolism (iii) omics research in the field and (iv) their potential applications. This volume collates the recent developments and innovations with respect to these microorganisms. This book is meant for researchers, biochemists, industries, and government agencies interested in cold active microbes and their products. Also, would be of interest to NGOs and progressive farmers which are working for higher altitude ecosystems throughout the globe.

Topics in Ecological and Environmental Microbiology Springer Science & Business Media

The past decade has seen the field of proteomics expand from a highly technical endeavor to a widely utilized technique. The objective of this book is to highlight the ways in which proteomics is currently being employed to address issues in the biological sciences. Although there have been significant advances in techniques involving the utilization of proteomics in biology, fundamental approaches involving basic sample visualization and protein identification still represent the principle techniques used by the vast majority of

researchers to solve problems in biology. The work presented in this book extends from overviews of proteomics in specific biological subject areas to novel studies that have employed a proteomics-based approach. Collectively they demonstrate the power of established and developing proteomic techniques to characterize complex biological systems.

Microbial Diversity and Ecology in Hotspots

Academic Press

This book focuses on cold habitat microbes as a potential source of elite enzymes and secondary metabolites to meet the growing demands of the pharmaceutical, food and biotechnological industries. Microbes living in such extremely cold conditions are reported to produce various biomolecules with potential biotechnological applications. The book overviews recent research trends to discover such important biomolecules and also suggests future research directions to discover such elite novel biomolecules. Salient features: Covers studies on various biotic communities and abiotic components of the soil of

terrestrial habitats with a focus on cold habitats

Discusses various 'Omic' approaches: metagenomics and meta-transcriptomics

Lists adaptation strategies adopted by cold-adapted microbes

Highlights various biotechnological and industrially important biomolecules produced by cold-adapted microbes

Explores the role of microbial biofilm in the degradation of microplastics in cold habitats

Soil Microbiome of the Cold Habitats Bentham

Science Publishers

Highly recommended by

CHOICE, Oct 2018

Extremophiles are nature's ultimate survivors, thriving in environments ranging from the frozen Antarctic to abyssal hot hydrothermal vents. Their lifeforms span bacteria to fishes, and are categorized as halophiles from hypersaline environments, acidophiles from acidic waters, psychrophiles from cold habitats, and thermophiles from warm waters. Extremophiles: From Biology to Biotechnology comprehensively covers the basic biology, physiology, habitats, secondary metabolites for

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postgraduate students. **Polar Microbiology** CABI This book provides a comprehensive overview of different agriculturally important microorganisms and their role as plant biostimulants. Arbuscular Mycorrhizal Fungi, Trichoderma, Cyanobacteria, Endophytes, and Plant growth promoting rhizobacteria have the potential to promote plant growth, disease management, nutrient acquisition, stress alleviation, and soil health management. Presenting an all-inclusive collection of information, this book will be important for students, academicians, researchers working in the field of sustainable agriculture, microbial technology, and biochemical engineers. It will also be of use for policymakers in the area of food security and sustainable agriculture. Introduces new microorganisms as plant biostimulants. Describes potential mechanisms of plant-microbe interaction for stress alleviation and crop improvement. Provides information about different microbial formulations (consortium) and their application to the alleviation of different abiotic stresses (salt,

drought, nutrient deficiency, heavy metal, etc.) in plants. Discusses about psychrophilic microbes, endophytic microbes, and total plant microbiome and their uses as biostimulants for improving plant health. *Proteomic Applications in Biology* Elsevier This book brings together experts from different fields, who used a broad spectrum of methods to investigate the physiological and cellular adaptation of alpine plants from the tree line to the upper limits. Some articles link alpine plant physiology with physiological adaptations observed in polar plants. Tolerance against often high light intensities (including UV), cold or freezing temperatures, in addition to the need for fast tissue development, flowering, and propagation that is managed by alpine plants are to some extent underrepresented in recent research. This volume considers ice formation and winter conditions in alpine plants; the fate of cryophilic algae and microorganisms; cell structural adaptations; sexual reproduction in high altitudes; the physiology of

photosynthesis, antioxidants, metabolites, carbon and nitrogen; and the influences of microclimate (temperatures at the plant level, heat tolerance), UV light, weather and ozone. Further information on life processes in alpine extreme environments may additionally yield new insights into the range of adaptation processes in lowland plants.

New and Future Developments in Microbial Biotechnology and Bioengineering Springer Nature

As the Arctic perennial sea ice continues to disappear at an alarming rate, a full understanding of sea ice as a crucial global ecosystem, and the effects of its loss is vital for all those working with and studying global climate change. Building on the success of the previous edition, the second edition of Sea Ice, now much expanded and in full colour throughout, includes six completely new chapters with complete revisions of all the chapters included from the first edition. The Editors, Professor David Thomas and Dr Gerhard Dieckmann have once again drawn together an

extremely impressive group of internationally respected contributing authors, ensuring a comprehensive worldwide coverage of this incredibly important topic. Sea Ice, second edition, is an essential purchase for oceanographers and marine scientists, environmental scientists, biologists, geochemists and geologists. All those involved in the study of global climate change will find this book to contain a wealth of important information. All libraries in universities and research establishments where these subjects are studied and taught will need multiple copies of this book on their shelves. truly multidisciplinary approach world leading authors and editors international in scope, covering both Arctic and Antarctic work of vital interest to all those involved in global warming and climate change research highly illustrated full colour book with colour images throughout

Extremophiles Springer This book provides an overview of ecological aspects of the metabolism and behavior of microbes, microbial habitats, biogeochemical cycles, and biotechnology. It was

designed by selecting relevant chapters from the comprehensive Encyclopedia of Microbiology, 3rd edn., and inviting the original authors to update their material to include key developments and advances in the field.

Microbial Communities and their Interactions in the Extreme Environment Springer Nature

The second edition of Comprehensive Biotechnology, Six Volume Set continues the tradition of the first inclusive work on this dynamic field with up-to-date and essential entries on the principles and practice of biotechnology. The integration of the latest relevant science and industry practice with fundamental biotechnology concepts is presented with entries from internationally recognized world leaders in their given fields. With two volumes covering basic fundamentals, and four volumes of applications, from environmental biotechnology and safety to medical biotechnology and healthcare, this work serves the needs of newcomers as well as established experts combining the latest

relevant science and industry practice in a manageable format. It is a multi-authored work, written by experts and vetted by a prestigious advisory board and group of volume editors who are biotechnology innovators and educators with international influence. All six volumes are published at the same time, not as a series; this is not a conventional encyclopedia but a symbiotic integration of brief articles on established topics and longer chapters on new emerging areas. Hyperlinks provide sources of extensive additional related information; material authored and edited by world-renown experts in all aspects of the broad multidisciplinary field of biotechnology. Scope and nature of the work are vetted by a prestigious International Advisory Board including three Nobel laureates. Each article carries a glossary and a professional summary of the authors indicating their appropriate credentials. An extensive index for the entire publication gives a complete list of the many topics treated in the increasingly expanding field.

Biotechnological

Applications of Extremophilic

Microorganisms CRC Press
This contributory volume is a comprehensive account of recent research on extremophilic fungi. It brings to the readers, latest information on all categories of extremophilic fungi, their isolation, culture, and potential applications. The book aims at providing the audience in-depth and updated theoretical concepts, also application on the field. It will serve as a supplementary reading material in addition to basic mycology textbooks. The book fills the gap in literature and will be useful to the postgraduate students and researchers in the field of mycology, agriculture, biotechnology and Microbiology.

Encyclopedia of Snow, Ice and Glaciers CRC Press

Extremophiles are organisms that are able to live in extreme conditions due to their unique physiological and genetic adaptations. Extremophiles are harnessed for their extremozymes that have wide applications in biotechnology, pharmaceuticals, and industry. Recent

developments in genomics and proteomics have helped unravel the mechanism of survival, physiological adaptation, and genomics structure of extremophiles.

Physiology, Genomics, and Biotechnological Applications of Extremophiles covers innovative developments in understanding the physiology and biochemistry of extremophiles using the -omics perspective, focuses on the advancement in mechanisms of the extremophiles that makes them able to survive under extreme conditions, and discusses the applications of extremophiles in astrobiology. Covering topics such as genomics and the history and identification of extremophiles, it is ideal for students, professors, researchers, academicians, microbiologists, agricultural scientists, and biotechnologists.

Extremophiles Springer Science & Business Media
Pollution has accompanied polar exploration since Captain John Davis' arrival on the Antarctic continent in 1821 and has become an unavoidable consequence

of oil spills in our polar regions. Fortunately, many of the organisms indigenous to Polar ecosystems have the ability to degrade pollutants. It is this metabolic capacity that forms the basis for bioremediation as a potential treatment for the hydrocarbons that contaminate the pristine polar environments. The only book to cover the breadth of microbial ecology and diversity in polar regions with an emphasis on bioremediation, *Polar Microbiology: The Ecology, Biodiversity, and Bioremediation Potential of Microorganisms in Extremely Cold Environments* examines the diversity of polar microorganisms and their ability to degrade

petroleum hydrocarbon contaminants in polar terrestrial and aquatic environments. Providing a unique perspective of these microorganisms in extremely cold temperatures, the book focuses on their taxonomy, physiology, biochemistry, population structure, bioremediation potential, and potential for biotechnology applications. Leading investigators in the field provide complete coverage of the microbiology relevant to the study of biodiversity and biodegradation of pollutants in the Arctic and Antarctic, including: Microbial extremophiles living in cold and subzero temperature environments Genetics and physiology of cold adaptation of

microorganisms
Biodegradative microbial consortia in a defined closed environment
Molecular characterization of biodegradative microbial populations
Molecular approaches to assess biodegradation of petroleum hydrocarbons
Environmental impact of hydrocarbon contamination
Microbial biodiversity across Antarctic deserts
By bringing together the current state of scientific knowledge and research on microbial community structures in extremely cold temperatures, this thought provoking resource is the ideal starting point for the research that must be done if we are to effectively reduce human's eco-footprint on our polar regions.