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# Geomicrobiology: Molecular and Environmental Perspective

 Springer

# Geomicrobiology Molecular And Environmental Perspective

**Surajit Das,Hirak Ranjan Dash**



## **Geomicrobiology Molecular And Environmental Perspective:**

*Geomicrobiology: Molecular and Environmental Perspective* Alexander Loy, Martin Mandl, Larry L. Barton, 2010-07-23 The interaction of microorganisms with geological activities results in processes influencing development of the Earth's geo and biospheres. In assessing these microbial functions, scientists have explored short and long-term geological changes attributed to microorganisms and developed new approaches to evaluate the physiology of microbes including microbial interaction with the geological environment. As the field of geomicrobiology developed, it has become highly interdisciplinary, and this book provides a review of the recent developments in a cross section of topics including origin of life, microbial mineral interactions, and microbial processes functioning in marine as well as terrestrial environments. A major component of this book addresses molecular techniques to evaluate microbial evolution and assess relationships of microbes in complex natural communities. Recent developments in so-called omics technologies including meta-genomics and meta-proteomics and isotope labeling methods allow new insights into the function of microbial community members and their possible geological impact. While this book summarizes current knowledge in various areas, it also reveals unresolved questions that require future investigations. Information in these chapters enhances our fundamental knowledge of geomicrobiology that contributes to the exploitation of microbial functions in mineral and environmental biotechnology applications. It is our hope that this book will stimulate interest in the general field of geomicrobiology and encourage others to explore microbial processes as applied to the Earth.

Microbial Life of Cave Systems Annette Summers Engel, 2015-10-16 The earth's subsurface contains abundant and active microbial biomass living in water, occupying pore space, and colonizing mineral and rock surfaces. Caves are one type of subsurface habitat, being natural solutionally or collapse-enlarged openings in rock. Within the past 30 years, there has been an increase in the number of microbiology studies from cave environments to understand cave ecology, cave geology, and even the origins of life. By emphasizing the microbial life of caves and the ecological processes and geological consequences attributed to microbes, this book provides the first authoritative and comprehensive account of the microbial life of caves for students, professionals, and general readers.

Geomicrobes: Life in Terrestrial Deep Subsurface Malin Bomberg, Lasse Ahonen, 2017-07-17 The deep subsurface is, in addition to space, one of the last unknown frontiers to human kind. A significant part of life on Earth resides in the deep subsurface, hiding great potential of microbial life of which we know only little. The conditions in the deep terrestrial subsurface are thought to resemble those of early Earth, which makes this environment an analog for studying early life, in addition to possible extraterrestrial life in ultra-extreme conditions. Early microorganisms played a great role in shaping the conditions on the young Earth. Even today, deep subsurface microorganisms interact with their geological environment, transforming the conditions in the groundwater and on rock surfaces. Essential elements for life are richly present but in difficultly accessible form. The elements driving the microbial deep life are still not completely identified. Most of the microorganisms detected by novel molecular techniques still lack

cultured representatives Nevertheless using modern sequencing techniques and bioinformatics the functional roles of these microorganisms are being revealed We are starting to see the differences and similarities between the life in the deep subsurface and surface domains We may even begin to see the function of evolution by comparing deep life to life closer to the surface of Earth Deep life consists of organisms from all known domains of life This Research Topic reveals some of the rich diversity and functional properties of the great biomass residing in the deep dark subsurface *Processes in Microbial Ecology* David L. Kirchman,2012-02-02 A final chapter is devoted to symbiosis and other relationships between microbes and larger organisms **Environmental Microbiology and Microbial Ecology** Larry L. Barton,Robert J. C. McLean,2019-01-09 An authoritative overview of the ecological activities of microbes in the biosphere Environmental Microbiology and Microbial Ecology presents a broad overview of microbial activity and microbes interactions with their environments and communities Adopting an integrative approach this text covers both conventional ecological issues as well as cross disciplinary investigations that combine facets of microbiology ecology environmental science and engineering molecular biology and biochemistry Focusing primarily on single cell forms of prokaryotes and cellular forms of algae fungi and protozoans this book enables readers to gain insight into the fundamental methodologies for the characterization of microorganisms in the biosphere The authors draw from decades of experience to examine the environmental processes mediated by microorganisms and explore the interactions between microorganisms and higher life forms Highly relevant to modern readers this book examines topics including the ecology of microorganisms in engineered environments microbial phylogeny and interactions microbial processes in relation to environmental pollution and many more Now in its second edition this book features updated references and major revisions to chapters on assessing microbial communities community relationships and their global impact New content such as effective public communication of research findings and advice on scientific article review equips readers with practical real world skills Explores the activities of microorganisms in specific environments with case studies and actual research data Highlights how prominent microbial biologists address significant microbial ecology issues Offers guidance on scientific communication including scientific presentations and grant preparation Includes plentiful illustrations and examples of microbial interactions community structures and human bacterial connections Provides chapter summaries review questions selected reading lists a complete glossary and critical thinking exercises Environmental Microbiology and Microbial Ecology is an ideal textbook for graduate and advanced undergraduate courses in biology microbiology ecology and environmental science while also serving as a current and informative reference for microbiologists cell and molecular biologists ecologists and environmental professionals *Microbial Diversity in the Genomic Era* Surajit Das,Hirak Ranjan Dash,2018-09-20 Microbial Diversity in the Genomic Era presents insights on the techniques used for microbial taxonomy and phylogeny along with their applications and respective pros and cons Though many advanced techniques for the identification of any unknown bacterium are available in the genomics era a far fewer

number of the total microbial species have been discovered and identified to date The assessment of microbial taxonomy and biosystematics techniques discovered and practiced in the current genomics era with suitable recommendations is the prime focus of this book Discusses the techniques used for microbial taxonomy and phylogeny with their applications and respective pros and cons Reviews the evolving field of bacterial typing and the genomic technologies that enable comparative analysis of multiple genomes and the metagenomes of complex microbial environments Provides a uniform standard methodology for species designation

*Environmental Microbiology* Eugene L. Madsen, 2015-07-09 New and expanded for its second edition *Environmental Microbiology From Genomes to Biogeochemistry Second Edition* is a timely update to a classic text filled with ideas connections and concepts that advance an in depth understanding of this growing segment of microbiology Core principles are highlighted with an emphasis on the logic of the science and new methods driven discoveries Numerous up to date examples and applications boxes provide tangible reinforcement of material covered Study questions at the end of each chapter require students to utilize analytical and quantitative approaches to define and defend arguments and to apply microbiological paradigms to their personal interests Essay assignments and related readings stimulate student inquiry and serve as focal points for teachers to launch classroom discussions A companion website with downloadable artwork and answers to study questions is also available *Environmental Microbiology From Genomes to Biogeochemistry Second Edition* offers a coherent and comprehensive treatment of this dynamic emerging field building bridges between basic biology evolution genomics ecology biotechnology climate change and the environmental sciences

**Comprehensive Biotechnology**, 2011-08-26 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      **Inorganic Chemistry for Geochemistry and Environmental Sciences** George W. Luther, III, 2016-05-05 Inorganic Chemistry for Geochemistry and Environmental Sciences Fundamentals and Applications discusses the structure bonding and reactivity of molecules and solids of environmental interest bringing the reactivity of non metals and metals to inorganic chemists geochemists and environmental chemists from diverse fields Understanding the principles of inorganic chemistry including chemical bonding frontier molecular orbital theory electron transfer processes formation of nano particles transition metal ligand complexes metal catalysis and more are essential to describe earth processes over time scales ranging from 1 nanosec to 1 Gigayr Throughout the book fundamental chemical principles are illustrated with relevant examples from geochemistry environmental and marine chemistry allowing students to better understand environmental and geochemical processes at the molecular level Topics covered include Thermodynamics and kinetics of redox reactions Atomic structure Symmetry Covalent bonding and bonding in solids and nanoparticles Frontier Molecular Orbital Theory Acids and bases Basics of transition metal chemistry including Chemical reactivity of materials of geochemical and environmental interest Supplementary material is provided online including PowerPoint slides problem sets and solutions Inorganic Chemistry for Geochemistry and Environmental Sciences is a rapid assimilation textbook for those studying and working in areas of geochemistry inorganic chemistry and environmental chemistry wishing to enhance their understanding of environmental processes from the molecular level to the global level      **International Society for Microbial Electrochemistry and Technology: Outputs From the 2018 Regional Meetings** Sarah Glaven, Uwe Schröder, Eileen Hao Yu, Srikanth Mutnuri, Jeffrey A. Gralnick, Chi Ho Chan, 2020-07-09      **Systems Biogeochemistry of Major Marine Biomes** Aninda Mazumdar, Wriddhiman Ghosh, 2022-04-01 Systems Biogeochemistry of Major Marine Biomes A comprehensive system level discussion of the geomicrobiology of the Earth's oceans In Systems Biogeochemistry of Major Marine Biomes a team of distinguished researchers delivers a systemic overview of biogeochemistry across a number of major physiographies of the global ocean the waters and sediments overlying continental margins the deep sub surfaces the Arctic and Antarctic oceans and the physicochemical extremes such as the hypersaline and sulfidic marine zones cold methane seeps and hydrothermal ecosystems The book explores state of the art advances in marine geomicrobiology and investigates the drivers of biogeochemical processes It highlights the imperatives of the unique fringe and cryptic processes while studying the geological manifestations and ecological feedbacks of in situ microbial metabolisms Taking a holistic approach toward the understanding of marine biogeochemical provinces this book emphasizes the centrality of culture dependent and culture independent meta omics based microbiological information within a systems biogeochemistry framework Perfect for researchers and scientists in the fields of geochemistry geophysics geomicrobiology oceanography and marine science Systems Biogeochemistry of Major Marine Biomes will also earn a place in the libraries of policymakers and advanced graduate students seeking a one stop reference on marine biogeochemistry      **The Hologenome Concept:**

**Human, Animal and Plant Microbiota** Eugene Rosenberg, Ilana Zilber-Rosenberg, 2014-01-31 Groundbreaking research over the last 10 years has given rise to the hologenome concept of evolution This concept posits that the holobiont host plus all of its associated microorganisms and its hologenome sum of the genetic information of the host and its symbiotic microorganisms acting in concert function as a unique biological entity and therefore as a level of selection in evolution All animals and plants harbor abundant and diverse microbiota including viruses Often the amount of symbiotic microorganisms and their combined genetic information far exceed that of their host The microbiota with its microbiome together with the host genome can be transmitted from one generation to the next and thus propagate the unique properties of the holobiont The microbial symbionts and the host interact in a cooperative way that affects the health of the holobiont within its environment Beneficial microbiota protects against pathogens provides essential nutrients catabolizes complex polysaccharides renders harmful chemicals inert and contributes to the performance of the immune system In humans and animals the microbiota also plays a role in behavior The sum of these cooperative interactions characterizes the holobiont as a unique biological entity Genetic variation in the hologenome can be brought about by changes in either the host genome or the microbial population genomes microbiome Evolution by cooperation can occur by amplifying existing microbes gaining novel microbiota and by acquiring microbial and viral genes Under environmental stress the microbiome can change more rapidly and in response to more processes than the host organism alone and thus influences the evolution of the holobiont Prebiotics probiotics synbiotics and phage therapy are discussed as applied aspects of the hologenome concept

**Relationship Between Microbes and the Environment for Sustainable Ecosystem Services, Volume 2** Jastin Samuel, Ajay Kumar, Joginder Singh Panwar, 2022-08-20 Relationship Between Microbes and Environment for Sustainable Ecosystem Services Volume Two Microbial Mitigation of Waste for Sustainable Ecosystem Services promotes advances in sustainable solutions value added products and fundamental research in microbes and the environment Topics include advanced and recent discoveries in the use of microbes for sustainable development Volume Two describes the successful application of microbes and their derivatives for waste management of potentially toxic and relatively novel compounds This proposed book will be helpful to environmental scientists experts and policymakers working in the field of microbe based mitigation of environmental wastes The book provides reference information ranging from the description of various microbial applications for the sustainability in different aspects of food energy environment industry and social development Covers the latest developments recent applications and future research avenues in microbial biotechnology for sustainable development Includes expressive tables and figures with concise information about sustainable ecosystem services Provides a wide variety of applications and modern practices of harnessing the potential of microbes in the environment **Manual of Environmental Microbiology** Cindy H. Nakatsu, Robert V. Miller, Suresh D. Pillai, 2020-08-11 The single most comprehensive resource for environmental microbiology Environmental microbiology the study of the roles that microbes

play in all planetary environments is one of the most important areas of scientific research The Manual of Environmental Microbiology Fourth Edition provides comprehensive coverage of this critical and growing field Thoroughly updated and revised the Manual is the definitive reference for information on microbes in air water and soil and their impact on human health and welfare Written in accessible clear prose the manual covers four broad areas general methodologies environmental public health microbiology microbial ecology and biodegradation and biotransformation This wealth of information is divided into 18 sections each containing chapters written by acknowledged topical experts from the international community Specifically this new edition of the Manual Contains completely new sections covering microbial risk assessment quality control and microbial source tracking Incorporates a summary of the latest methodologies used to study microorganisms in various environments Synthesizes the latest information on the assessment of microbial presence and microbial activity in natural and artificial environments The Manual of Environmental Microbiology is an essential reference for environmental microbiologists microbial ecologists and environmental engineers as well as those interested in human diseases water and wastewater treatment and biotechnology

*Phytotechnologies* Naser A. Anjum, Maria E. Pereira, Iqbal Ahmad, Armando C. Duarte, Shahid Umar, Nafees A. Khan, 2012-10-23 *Phytotechnologies Remediation of Environmental Contaminants* highlights the use of natural and inherent traits of plants and associated microbes to exclude accumulate or metabolize a variety of contaminants with the goal of efficiently and sustainably decontaminating the biosphere from unwanted hazardous compounds Contributed by an international team of authors the book ensures a balance between theory and practice without compromising the basic conceptual framework of Phytotechnologies Divided into three major sections the book Introduces contaminants and contaminated sites and also highlights the significance of genus Brassica and vetiver grass species for varied environmental contaminants remediation Presents an exhaustive exploration of potential strategies for enhancing plants and associated microbes mediated environmental contaminants remediation Overviews major physiological biochemical and genetic molecular mechanisms responsible for plant tolerance and adaptation to varied environmental contaminants A one stop source of cutting edge answers and time saving access Phytotechnologies Remediation of Environmental Contaminants is a common platform for engineers environmental microbiologists plant physiologists and molecular biologists with the common aim of sustainable solutions to vital environmental issues In short the book provides a conceptual overview of ecosystems approaches and phytotechnologies and their cumulative significance in relation to various environmental problems and potential solutions

**Molecular Evolutionary Models in Drug**

**Discovery** Juan Bueno, 2020-01-22 *Molecular Evolutionary Models in Drug Discovery* explores the application of evolutionary molecular models in drug discovery in which secondary metabolites play a fundamental role Secondary metabolites are not produced in isolation they are the result of the interaction of genes metabolism and the environment The book examines the role of secondary metabolites as leads in drug discovery and on the development of a rational bioprospecting model for new



medicines based on the evolution of secondary metabolism These evolutionary models are part of biological systems and are the most reliable expression of the functioning of living beings Examines the integration and application of evolutionary models in the pharmaceutical industry to create new drug development platforms Investigates the biotechnological prospecting of secondary metabolites and their potential use in the discovery of new drugs Evaluates the ecosystem of living beings and how its molecular adaptation might improve the success of therapies

### **Advances in Applied Microbiology**

,2016-02-23 Published since 1959 Advances in Applied Microbiology continues to be one of the most widely read and authoritative review sources in microbiology The series contains comprehensive reviews of the most current research in applied microbiology and includes recent research on the roles of fungal communities in soil nutrient recycling the microbial nitrogen cycle in soil and the inter kingdom associations between soil bacteria fungi and mycorrhizal fungi Contains contributions from leading authorities in the field of applied microbiology Informs and updates on all the latest developments in the field Includes new information on the role of fungal communities in soil nutrient recycling the microbial nitrogen cycle in soil and the inter kingdom associations between soil bacteria fungi and mycorrhizal fungi

### **Biomining Technologies**

David Barrie Johnson,Christopher George Bryan,Michael Schlömann,Francisco Figueroa Roberto,2022-11-14 This book describes emerging and established industrial processes of biomining technologies used for the recovery of metals of economic interest from e g mineral ores mining and electronic wastes using microbiological technologies Multiple chapters focus on engineering design and operation of biomining systems Several industrial case studies from China Chile Peru Russia Kazakhstan and Finland are included which emphasises the practical approach of the book The reader not only learns more about the biology diversity and ecology of microorganisms involved in biomining processes but also about microbial biomolecular and cultivation tools used in the biomining industry Special emphasis is put on emerging biotechnologies enabling the use of biomining for recycling metals from e wastes waste streams and process waters Finally the future impacts and direction of biomining towards sustainability in a metal demanding world are also highlighted The book is aimed at an interdisciplinary audience involving operators and researchers working across disciplines including geology chemical engineering microbiology and molecular biology This is reflected by the content of this book as well as by its authors who are all leading practitioners and authorities in their fields

### **Stressors in the Marine Environment**

Martin Solan,Nia Whiteley,2016-03-10 A multitude of direct and indirect human influences have significantly altered the environmental conditions composition and diversity of marine communities However understanding and predicting the combined impacts of single and multiple stressors is particularly challenging because observed ecological feedbacks are underpinned by a number of physiological and behavioural responses that reflect stressor type severity and timing Furthermore integration between the traditional domains of physiology and ecology tends to be fragmented and focused towards the effects of a specific stressor or set of circumstances This novel volume summarises the latest research in the physiological and ecological

responses of marine species to a comprehensive range of marine stressors including chemical and noise pollution ocean acidification hypoxia UV radiation thermal and salinity stress before providing a perspective on future outcomes for some of the most pressing environmental issues facing society today Stressors in the Marine Environment synthesises the combined expertise of a range of international researchers providing a truly interdisciplinary and accessible summary of the field It is essential reading for graduate students as well as professional researchers in environmental physiology ecology marine biology conservation biology and marine resource management It will also be of particular relevance and use to the regulatory agencies and authorities tasked with managing the marine environment including social scientists and environmental economists

*Treatise on Geochemistry*, 2013-10-19 This extensively updated new edition of the widely acclaimed *Treatise on Geochemistry* has increased its coverage beyond the wide range of geochemical subject areas in the first edition with five new volumes which include the history of the atmosphere geochemistry of mineral deposits archaeology and anthropology organic geochemistry and analytical geochemistry In addition the original Volume 1 on Meteorites Comets and Planets was expanded into two separate volumes dealing with meteorites and planets respectively These additions increased the number of volumes in the *Treatise* from 9 to 15 with the index appendices volume remaining as the last volume Volume 16 Each of the original volumes was scrutinized by the appropriate volume editors with respect to necessary revisions as well as additions and deletions As a result 27% were republished without major changes 66% were revised and 126 new chapters were added In a many faceted field such as Geochemistry explaining and understanding how one sub field relates to another is key Instructors will find the complete overviews with extensive cross referencing useful additions to their course packs and students will benefit from the contextual organization of the subject matter Six new volumes added and 66% updated from 1st edition The Editors of this work have taken every measure to include the many suggestions received from readers and ensure comprehensiveness of coverage and added value in this 2nd edition The esteemed Board of Volume Editors and Editors in Chief worked cohesively to ensure a uniform and consistent approach to the content which is an amazing accomplishment for a 15 volume work 16 volumes including index volume

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