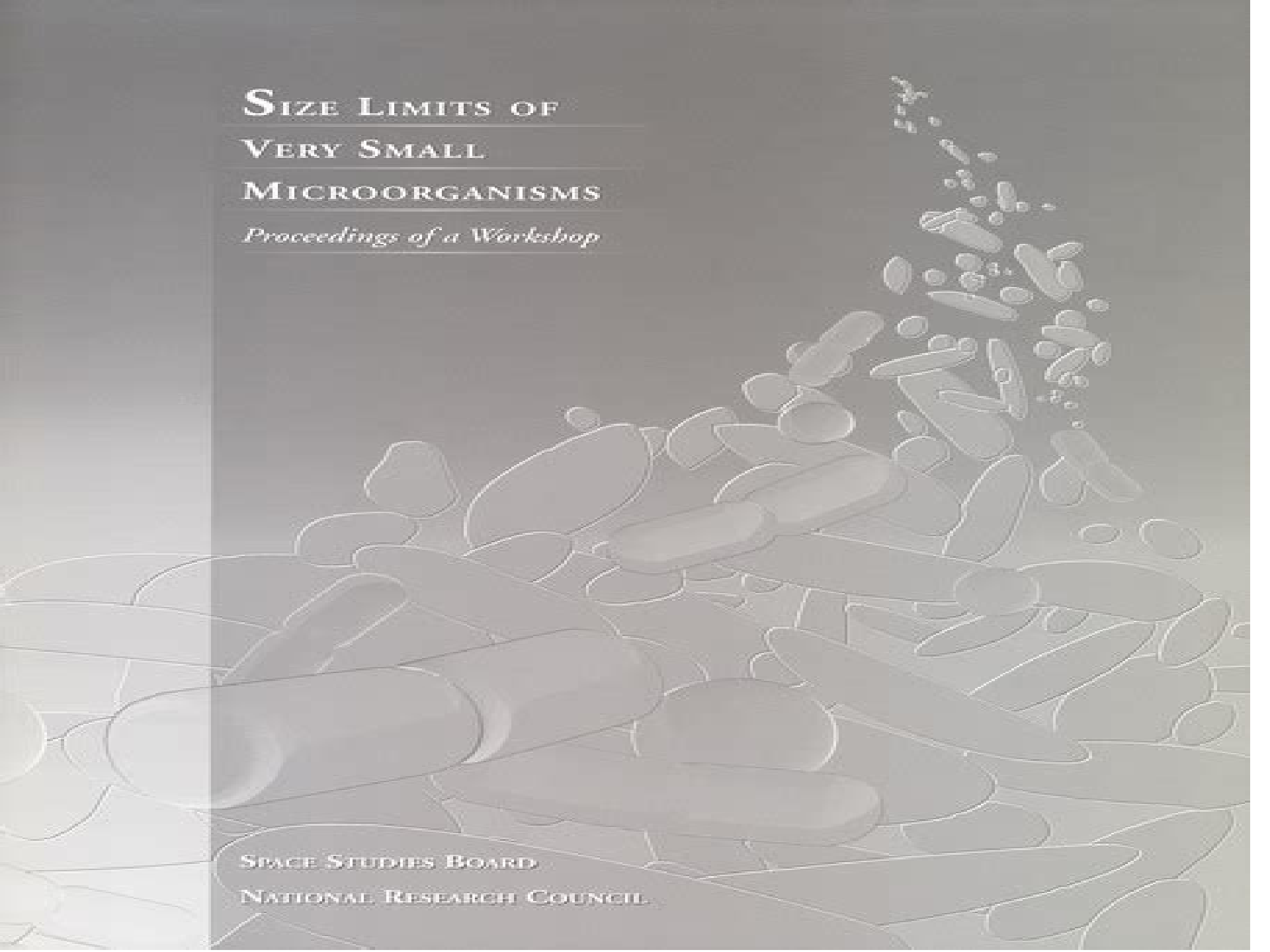


An abstract illustration of various microorganisms, including bacteria and viruses, rendered in a light gray, semi-transparent style. The organisms are scattered across the page, with a higher concentration in the upper right quadrant. The background is a dark gray gradient.

SIZE LIMITS OF VERY SMALL MICROORGANISMS

Proceedings of a Workshop

SPACE STUDIES BOARD
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Size Limits Of Very Small Microorganisms Proceedings Of A Workshop

Richard Gordon



Size Limits Of Very Small Microorganisms Proceedings Of A Workshop:

Size Limits of Very Small Microorganisms National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, Commission on Physical Sciences, Mathematics, and Applications, Steering Group for the Workshop on Size Limits of Very Small Microorganisms, 1999-09-13

How small can a free living organism be On the surface this question is straightforward in principle the smallest cells can be identified and measured But understanding what factors determine this lower limit and addressing the host of other questions that follow on from this knowledge require a fundamental understanding of the chemistry and ecology of cellular life The recent report of evidence for life in a martian meteorite and the prospect of searching for biological signatures in intelligently chosen samples from Mars and elsewhere bring a new immediacy to such questions How do we recognize the morphological or chemical remnants of life in rocks deposited 4 billion years ago on another planet Are the empirical limits on cell size identified by observation on Earth applicable to life wherever it may occur or is minimum size a function of the particular chemistry of an individual planetary surface These questions formed the focus of a workshop on the size limits of very small organisms organized by the Steering Group for the Workshop on Size Limits of Very Small Microorganisms and held on October 22 and 23 1998 Eighteen invited panelists representing fields ranging from cell biology and molecular genetics to paleontology and mineralogy joined with an almost equal number of other participants in a wide ranging exploration of minimum cell size and the challenge of interpreting micro and nano scale features of sedimentary rocks found on Earth or elsewhere in the solar system This document contains the proceedings of that workshop It includes position papers presented by the individual panelists arranged by panel along with a summary for each of the four sessions of extensive roundtable discussions that involved the panelists as well as other workshop participants

Origin of Life via Archaea Richard Gordon, 2024-10-01 This book surveys the models for the origin of life and presents a new model starting with shaped droplets and ending with life as polygonal Archaea it collects the most published micrographs of Archaea discovered only in 1977 which support this conclusion and thus provides the first visual survey of Archaea Origin of Life via Archaea s purpose is to add a new hypothesis on what are called shaped droplets as the starting point for flat polygonal Archaea supporting the Vesicles First hypothesis The book contains over 6000 distinct references and micrographs of 440 extant species of Archaea 41% of which exhibit polygonal phenotypes It surveys the intellectual battleground of the many ideas of the origin of life on earth chemical equilibrium autocatalysis and biotic polymers This book contains 17 chapters some coauthored on a wide range of topics on the origin of life including Archaea s origin patterns and species It shows how various aspects of the origin of life may have occurred at chemical equilibrium not requiring an energy source contrary to the general assumption For the reader s value its compendium of Archaea micrographs might also serve many other interesting questions about Archaea One chapter presents a theory for the shape of flat polygonal Archaea in terms of the energetics at the surface edges and corners of the S

layer Another shows how membrane peptides may have originated The book also includes a large table of most extant Archaea that is searchable in the electronic version It ends with a chapter on problems needing further research Audience This book will be used by astrobiologists origin of life biologists physicists of small systems geologists biochemists theoretical and vesicle chemists **Introduction to Nanoscience** Gabor L. Hornyak, Joydeep Dutta, H.F. Tibbals, Anil Rao, 2008-05-15

Tomorrow's nanoscientist will have a truly interdisciplinary and nano-centric education rather than for example a degree in chemistry with a specialization in nanoscience For this to happen the field needs a truly focused and dedicated textbook This full color masterwork is such a textbook It introduces the nanoscale along with the societal impacts of nanoscience then presents an overview of characterization and fabrication methods The authors systematically discuss the chemistry physics and biology aspects of nanoscience providing a complete picture of the challenges opportunities and inspirations posed by each facet before giving a brief glimpse at nanoscience in action nanotechnology **Space Studies Board Annual Report 2009** National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, 2010-01-01 The Space Studies Board SSB was established in 1958 to serve as the focus of the interests and responsibilities in space research for the National Academies The SSB provides an independent authoritative forum for information and advice on all aspects of space science and applications and it serves as the focal point within the National Academies for activities on space research It oversees advisory studies and program assessments facilitates international research coordination and promotes communications on space science and science policy between the research community the federal government and the interested public The SSB also serves as the U S National Committee for the International Council for Science Committee on Space Research COSPAR The present volume reviews the organization activities and reports of the SSB for the year 2009

Astrobiology Charles S. Cockell, 2020-04-09 A guide to understanding the formation of life in the Universe The revised and updated second edition of *Astrobiology* offers an introductory text that explores the structure of living things the formation of the elements required for life in the Universe the biological and geological history of the Earth and the habitability of other planets Written by a noted expert on the topic the book examines many of the major conceptual foundations in astrobiology which cover a diversity of traditional fields including chemistry biology geosciences physics and astronomy The book explores many profound questions such as How did life originate on Earth How has life persisted on Earth for over three billion years Is there life elsewhere in the Universe What is the future of life on Earth *Astrobiology* is centered on investigating the past and future of life on Earth by looking beyond Earth to get the answers *Astrobiology* links the diverse scientific fields needed to understand life on our own planet and potentially life beyond This new second edition Expands on information about the nature of astrobiology and why it is useful Contains a new chapter What is Life that explores the history of attempts to understand life Contains 20% more material on the astrobiology of Mars icy moons the structure of life and the habitability of planets New Discussion Boxes to stimulate debate and thought about key questions in

astrobiology New review and reflection questions for each chapter to aid learning New boxes describing the careers of astrobiologists and how they got into the subject Offers revised and updated information throughout to reflect the latest advances in the field Written for students of life sciences physics astronomy and related disciplines the updated edition of Astrobiology is an essential introductory text that includes recent advances to this dynamic field *Space Studies Board Annual Report 2010* National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, 2011-01-01 The Space Studies Board SSB was established in 1958 to serve as the focus of the interests and responsibilities in space research for the National Academies The SSB provides an independent authoritative forum for information and advice on all aspects of space science and applications and it serves as the focal point within the National Academies for activities on space research It oversees advisory studies and program assessments facilitates international research coordination and promotes communications on space science and science policy between the research community the federal government and the interested public The SSB also serves as the U S National Committee for the International Council for Science Committee on Space Research COSPAR This volume reviews the organization activities and reports of the SSB for the year 2010 **The Biophysics of Cell Membranes** Richard M. Epand, Jean-Marie Ruyschaert, 2017-09-25 This volume focuses on the modulation of biological membranes by specific biophysical properties The readers are introduced to emerging biophysical approaches that mimic specific states like membrane lipid asymmetry membrane curvature lipid flip flop lipid phase separation that are relevant to the functioning of biological membranes The first chapter describes innovative methods to mimic the prevailing asymmetry in biological membranes by forming asymmetrical membranes made of monolayers with different compositions One of the chapters illustrates how physical parameters like curvature and elasticity can affect and modulate the interactions between lipids and proteins This volume also describes the sensitivity of certain ion channels to mechanical forces and it presents an analysis of how cell shape is determined by both the cytoskeleton and the lipid domains in the membrane The last chapter provides evidence that liposomes can be used as a minimal cellular model to reconstitute processes related to the origin of life Each topic covered in this volume is presented by leading experts in the field who are able to present clear authoritative and up to date reviews The novelty of the methods proposed and their potential for a deeper molecular description of membrane functioning are particularly relevant experts in the areas of biochemistry biophysics and cell biology while also presenting clear and thorough introductions making the material suitable for students in these fields as well **How Life Began** Alexandre Meinesz, 2024-05-31 The origin of life is a hotly debated topic The Christian Bible states that God created the heavens and the Earth all in about seven days roughly six thousand years ago This episode in Genesis departs markedly from scientific theories developed over the last two centuries which hold that life appeared on Earth about 3.5 billion years ago in the form of bacteria followed by unicellular organisms half a millennia later It is this version of genesis that Alexandre Meinesz explores in this engaging tale of life's

origins and evolution How Life Began elucidates three origins or geneses of life bacteria nucleated cells and multicellular organisms and shows how evolution has sculpted life to its current biodiversity through four main events mutation recombination natural selection and geologic cataclysm As an ecologist who specializes in algae the first organisms to colonize Earth Meinesz brings a refreshingly novel voice to the history of biodiversity and emphasizes here the role of unions in organizing life For example the ingestion of some bacteria by other bacteria led to mitochondria that characterize animal and plant cells and the chloroplasts of plant cells As Meinesz charmingly recounts life s grandeur is a result of an evolutionary tendency toward sociality and solidarity He suggests that it is our cohesion and collaboration that allows us to solve the environmental problems arising in the decades and centuries to come Rooted in the science of evolution but enlivened with many illustrations from other disciplines and the arts How Life Began intertwines the rise of bacteria and multicellular life with Vermeer s portrait of Antoni van Leeuwenhoek the story of Genesis and Noah Meinesz s son s early experiences with Legos and his own encounters with other scientists All of this brings a very human and humanistic tone to Meinesz s charismatic narrative of the three origins of life

Space Studies Board Annual Report 2017 National Academies of Sciences, Engineering, and Medicine, Division on Engineering and Physical Sciences, Space Studies Board, 2018-12-19 The original charter of the Space Science Board was established in June 1958 three months before the National Aeronautics and Space Administration NASA opened its doors The Space Science Board and its successor the Space Studies Board SSB have provided expert external and independent scientific and programmatic advice to NASA on a continuous basis from NASA s inception until the present The SSB has also provided such advice to other executive branch agencies including the National Oceanic and Atmospheric Administration NOAA the National Science Foundation NSF the U S Geological Survey USGS the Department of Defense as well as to Congress Space Studies Board Annual Report 2017 covers a message from the chair of the SSB David N Spergel This report also explains the origins of the Space Science Board how the Space Studies Board functions today the SSB s collaboration with other National Academies of Sciences Engineering and Medicine units assures the quality of the SSB reports acknowledges the audience and sponsors and expresses the necessity to enhance the outreach and improve dissemination of SSB reports This report will be relevant to a full range of government audiences in civilian space research including NASA NSF NOAA USGS and the Department of Energy as well members of the SSB policy makers and researchers

Review and Assessment of Planetary Protection Policy Development Processes National Academies of Sciences, Engineering, and Medicine, Division on Engineering and Physical Sciences, Space Studies Board, Committee on the Review of Planetary Protection Policy Development Processes, 2018-10-17 Protecting Earth s environment and other solar system bodies from harmful contamination has been an important principle throughout the history of space exploration For decades the scientific political and economic conditions of space exploration converged in ways that contributed to effective development and implementation of planetary protection policies at national

and international levels However the future of space exploration faces serious challenges to the development and implementation of planetary protection policy The most disruptive changes are associated with 1 sample return from and human missions to Mars and 2 missions to those bodies in the outer solar system possessing water oceans beneath their icy surfaces Review and Assessment of Planetary Protection Policy Development Processes addresses the implications of changes in the complexion of solar system exploration as they apply to the process of developing planetary protection policy Specifically this report examines the history of planetary protection policy assesses the current policy development process and recommends actions to improve the policy development process in the future

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