

# The Quarantine and Certification of Martian Samples



Space Studies Board  
National Research Council

# Quarantine And Certification Of Martian Samples

**National Research Council, Division on  
Earth and Life Studies, Board on Life  
Sciences, Division on Engineering and  
Physical Sciences, Space Studies  
Board, Committee on an Astrobiology  
Strategy for the Exploration of Mars**

## **Quarantine And Certification Of Martian Samples:**

**The Quarantine and Certification of Martian Samples** National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, Committee on Planetary and Lunar Exploration, 2002-05-16 One of the highest priority activities in the planetary sciences identified in published reports of the Space Studies Board's Committee on Planetary and Lunar Exploration COMPLEX and in reports of other advisory groups is the collection and return of extraterrestrial samples to Earth for study in terrestrial laboratories In response to recommendations made in such studies NASA has initiated a vigorous program that will within the next decade collect samples from a variety of solar system environments In particular the Mars Exploration Program is expected to launch spacecraft that are designed to collect samples of martian soil rocks and atmosphere and return them to Earth perhaps as early as 2015 International treaty obligations mandate that NASA conduct such a program in a manner that avoids the cross contamination of both Earth and Mars The Space Studies Board's 1997 report Mars Sample Return Issues and Recommendations examined many of the planetary protection issues concerning the back contamination of Earth and concluded that although the probability that martian samples will contain dangerous biota is small it is not zero 1 Steps must be taken to protect Earth against the remote possibility of contamination by life forms that may have evolved on Mars Similarly the samples collected at great expense must be protected against contamination by terrestrial biota and other matter Almost certainly meeting these requirements will entail opening the sample return container in an appropriate facility on Earth presumably a BSL 4 laboratory where testing biosafety certification and quarantine of the samples will be carried out before aliquots are released to the scientific community for study in existing laboratory facilities The nature of the required quarantine facility and the decisions required for disposition of samples once they are in it were regarded as issues of sufficient importance and complexity to warrant a study by the Committee on Planetary and Lunar Exploration COMPLEX in isolation from other topics Previous studies have been much broader including also consideration of the mission that collects samples on Mars and brings them to Earth atmospheric entry sample recovery and transport to the quarantine facility The charge to COMPLEX stated that the central question to be addressed in this study is the following What are the criteria that must be satisfied before martian samples can be released from a quarantine facility

**Mars Sample Handling Protocol Workshop Series**, 2001      **Assessment of Planetary Protection**

**Requirements for Mars Sample Return Missions** National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, Committee on the Review of Planetary Protection Requirements for Mars Sample Return Missions, 2009-06-06 NASA maintains a planetary protection policy to avoid the forward biological contamination of other worlds by terrestrial organisms and back biological contamination of Earth from the return of extraterrestrial materials by spaceflight missions Forward contamination issues related to Mars missions were addressed in a 2006 National Research Council NRC book Preventing the Forward Contamination of Mars However it has been more than 10 years since back

contamination issues were last examined Driven by a renewed interest in Mars sample return missions this book reviews updates and replaces the planetary protection conclusions and recommendations contained in the NRC s 1997 report Mars Sample Return Issues and Recommendations The specific issues addressed in this book include the following The potential for living entities to be included in samples returned from Mars Scientific investigations that should be conducted to reduce uncertainty in the above assessment The potential for large scale effects on Earth s environment by any returned entity released to the environment Criteria for intentional sample release taking note of current and anticipated regulatory frameworks and The status of technological measures that could be taken on a mission to prevent the inadvertent release of a returned sample into Earth s biosphere *Assessment of Mars Science and Mission Priorities* National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, Committee on Planetary and Lunar Exploration, 2003-08-08 Within the Office of Space Science of the National Aeronautics and Space Administration NASA special importance is attached to exploration of the planet Mars because it is the most like Earth of the planets in the solar system and the place where the first detection of extraterrestrial life seems most likely to be made The failures in 1999 of two NASA missions Mars Climate Orbiter and Mars Polar Lander caused the space agency s program of Mars exploration to be systematically rethought both technologically and scientifically A new Mars Exploration Program plan summarized in Appendix A was announced in October 2000 The Committee on Planetary and Lunar Exploration COMPLEX a standing committee of the Space Studies Board of the National Research Council was asked to examine the scientific content of this new program This goals of this report are the following Review the state of knowledge of the planet Mars with special emphasis on findings of the most recent Mars missions and related research activities Review the most important Mars research opportunities in the immediate future Review scientific priorities for the exploration of Mars identified by COMPLEX and other scientific advisory groups and their motivation and consider the degree to which recent discoveries suggest a reordering of priorities and Assess the congruence between NASA s evolving Mars Exploration Program plan and these recommended priorities and suggest any adjustments that might be warranted **Vision and Voyages for Planetary Science in the Decade 2013-2022** National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, Committee on the Planetary Science Decadal Survey, 2012-01-30 In recent years planetary science has seen a tremendous growth in new knowledge Deposits of water ice exist at the Moon s poles Discoveries on the surface of Mars point to an early warm wet climate and perhaps conditions under which life could have emerged Liquid methane rain falls on Saturn s moon Titan creating rivers lakes and geologic landscapes with uncanny resemblances to Earth s Vision and Voyages for Planetary Science in the Decade 2013 2022 surveys the current state of knowledge of the solar system and recommends a suite of planetary science flagship missions for the decade 2013 2022 that could provide a steady stream of important new discoveries about the solar system Research priorities defined in the report were selected through a rigorous review that

included input from five expert panels NASA's highest priority large mission should be the Mars Astrobiology Explorer Cacher MAX C a mission to Mars that could help determine whether the planet ever supported life and could also help answer questions about its geologic and climatic history Other projects should include a mission to Jupiter's icy moon Europa and its subsurface ocean and the Uranus Orbiter and Probe mission to investigate that planet's interior structure atmosphere and composition For medium size missions Vision and Voyages for Planetary Science in the Decade 2013-2022 recommends that NASA select two new missions to be included in its New Frontiers program which explores the solar system with frequent mid size spacecraft missions If NASA cannot stay within budget for any of these proposed flagship projects it should focus on smaller less expensive missions first Vision and Voyages for Planetary Science in the Decade 2013-2022 suggests that the National Science Foundation expand its funding for existing laboratories and establish new facilities as needed It also recommends that the program enlist the participation of international partners This report is a vital resource for government agencies supporting space science the planetary science community and the public

**Review of Goals and Plans for NASA's Space and Earth Sciences** National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, Panel on Review of NASA Science Strategy Roadmaps, 2006-05-05 Both the President's commission on how to implement the President's space exploration initiative and Congress asked the NRC undertake an assessment and review of the science proposed to be carried out under the initiative An initial response to that request was the NRC February 2005 report Science in NASA's Vision for Space Exploration While that report's preparation NASA created capabilities and strategy roadmapping efforts which became the object of the next phase of the NRC review The new NASA administrator modified that NASA activity resulting in changes in the NRC review effort This report provides a review of six science strategy roadmaps robotic and human exploration of Mars solar system exploration universe exploration search for earth like planets earth science and applications from space and sun earth system connection In addition an assessment of cross cutting and integration issues is presented

Planets and Life Woodruff T. Sullivan, III, John Baross, 2007-09-13 Astrobiology involves the study of the origin and history of life on Earth planets and moons where life may have arisen and the search for extraterrestrial life It combines the sciences of biology chemistry palaeontology geology planetary physics and astronomy This textbook brings together world experts in each of these disciplines to provide the most comprehensive coverage of the field currently available Topics cover the origin and evolution of life on Earth the geological physical and chemical conditions in which life might arise and the detection of extraterrestrial life on other planets and moons The book also covers the history of our ideas on extraterrestrial life and the origin of life as well as the ethical philosophical and educational issues raised by astrobiology Written to be accessible to students from diverse backgrounds this text will be welcomed by advanced undergraduates and graduates who are taking astrobiology courses

**Space Studies Board Annual Report 2014** National Research Council, Division on Engineering and Physical Sciences, Space Studies

Board,2015-04-10 The original charter of the Space Science Board was established in June 1958 3 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 2014 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 Research Council 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

**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

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*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

*An Astrobiology Strategy for the Exploration of Mars* National Research Council, Division on Earth and Life Studies, Board on Life Sciences, Division on Engineering and Physical Sciences, Space Studies Board, Committee on an Astrobiology Strategy for the Exploration of Mars, 2007-07-26 Three recent developments have greatly increased interest in the search for life on Mars The first is new information about the Martian environment including evidence of a watery past and the possibility of atmospheric methane The second is the possibility of microbial viability on Mars Finally the Vision for Space Exploration initiative included an explicit directive to search for the evidence of life on Mars These scientific and political developments led NASA to request the NRC s assistance in formulating an up to date integrated astrobiology strategy for Mars exploration Among other topics this report presents a review of current knowledge about possible life on Mars an astrobiological assessment of current Mars missions a review of Mars mission planetary protection and findings and recommendations The report notes that the greatest increase in understanding of Mars will come from the collection and return to Earth of a well chosen suite of Martian surface materials

**Safe on Mars** National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, Aeronautics and Space Engineering Board, Committee on Precursor Measurements Necessary to Support Human Operations on the Surface of Mars, 2002-05-29 This study commissioned by the National Aeronautics and Space Administration NASA examines the role of robotic exploration missions in assessing the risks to the first human missions to Mars Only those hazards arising from exposure to environmental chemical and biological agents on the planet are assessed To ensure that it was including all previously identified hazards in its study the Committee on Precursor Measurements Necessary to Support Human Operations on the Surface of Mars referred to the most recent report from NASA s Mars Exploration Program Payload Analysis Group MEPAG Greeley 2001 The committee concluded that the requirements identified in the present NRC report are indeed the only ones essential for NASA to pursue in order to mitigate potential hazards to the first human missions to Mars

**Assessment of NASA's Mars Architecture 2007-2016** National

Research Council, Division on Engineering and Physical Sciences, Space Studies Board, Committee to Review the Next Decade Mars Architecture, 2006-09-21 The United States and the former Soviet Union have sent spacecraft to Mars as early as 1966 with Mars exploration being priority for NASA spacecraft. Both sides however have failed as well as succeeded. The inability to determine if life exists on Mars is considered one of NASA's failures and undercut political support for additional Mars missions in the U.S. until the launch of the Mars Observer in 1992. Thus the exploration of life on Mars continues but with a new approach. Assessment of NASA's Mars Architecture 2007-2016 is an assessment by the Committee to Review the Next Decade Mars Architecture of the National Research Council (NRC) conducted by request of Dr. Mary Cleave, NASA's Associate Administrator for the Science Mission Directorate. The Committee addresses the following questions: Is the Mars architecture reflective of the strategies, priorities, and guidelines put forward by the National Research Council's solar system exploration decadal survey and related science strategies and NASA plans? Does the revised Mars architecture address the goals of NASA's Mars Exploration Program and optimize the science return given the current fiscal posture of the program? Does the Mars architecture represent a reasonably balanced mission portfolio? After several months of study, consideration, and incorporation of the guidance from NRC studies, especially *New Frontiers in the Solar System* and the *Vision for Space Exploration*, community consultations via individual inputs and a MEPAG-sponsored working group, a plan was created. This report includes the plan which has an Astrobiology Field Laboratory or two Mars Rovers mission planned for 2016, recommendations from the committee, NRC guidelines for Mars exploration, and more.

*When Biospheres Collide* Michael Meltzer, 2010. NOTE: NO FURTHER DISCOUNT FOR THIS PRINT PRODUCT OVERSTOCK SALE. Significantly reduced list price. This new book from the NASA History Series tackles an interesting duo of biological problems that will be familiar to anybody who has seen photos of Apollo astronauts quarantined after their return to Earth. Namely, how do we avoid contaminating celestial bodies with Earthly germs when we send spacecraft to study these bodies, and how do we avoid spreading foreign biological matter from space when our robotic and human spacefarers return to Earth? Biological matter from an external system could potentially cause an unchecked epidemic either on Earth or in space, so strict precautions are necessary. Each time a space vehicle visits another world, it runs the risk of forever changing that extraterrestrial environment. We are surrounded on Earth by a melange of different microorganisms, and if some of these hitchhike onboard a space mission, they could contaminate and start colonies on a different planet. Such an occurrence would irrevocably alter the nature of that world, compromise all future scientific exploration of the body, and possibly damage any extant life on it. By inadvertently carrying exotic organisms back to Earth on our spacecraft, we also risk the release of biohazardous materials into our own ecosystem. Such concerns were recognized by scientists even before the 1957 launch of Sputnik. This book presents the history of planetary protection by tracing the responses to the above concerns on NASA's missions to the Moon, Mars, Venus, Jupiter, Saturn, and many smaller bodies of our solar system. The book relates the extensive efforts put forth by



NASA to plan operations and prepare space vehicles that return exemplary science without contaminating the biospheres of other worlds or our own To protect irreplaceable environments NASA has committed to conducting space exploration in a manner that is protective of the bodies visited as well as of our own planet

**Planetary Protection Classification of Sample Return Missions from the Martian Moons** European Science Foundation, European Space Sciences Committee, National Academies of Sciences, Engineering, and Medicine, Division on Engineering and Physical Sciences, Space Studies Board, Committee on Planetary Protection Requirements for Sample Return Missions from Martian Moons, 2019-06-20 An international consensus policy to prevent the biological cross contamination of planetary bodies exists and is maintained by the Committee on Space Research COSPAR of the International Council for Science which is consultative to the United Nations Committee on the Peaceful Uses of Outer Space Currently COSPAR's planetary protection policy does not specify the status of sample return missions from Phobos or Deimos the moons of Mars Although the moons themselves are not considered potential habitats for life or of intrinsic relevance to prebiotic chemical evolution recent studies indicate that a significant amount of material recently ejected from Mars could be present on the surface of Phobos and to a lesser extent Deimos This report reviews recent theoretical experimental and modeling research on the environments and physical conditions encountered by Mars ejecta during certain processes It recommends whether missions returning samples from Phobos and or Deimos should be classified as restricted or unrestricted Earth return in the framework of the planetary protection policy maintained by COSPAR This report also considers the specific ways the classification of sample return from Deimos is a different case than sample return from Phobos

**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.

**Assessment of the Report of NASA's Planetary Protection Independent Review Board** National Academies of Sciences, Engineering, and Medicine, Division on Engineering and Physical Sciences, Space Studies Board, Committee to Review the Report of the NASA Planetary Protection Independent Review Board, 2020-10-19

The goal of planetary protection is to control to the degree possible the biological cross-contamination of planetary bodies. Guidelines developed by the Committee on Space Research (COSPAR) are used by all spacefaring nations to guide their preparations for encounters with solar system bodies. NASA's Science Mission Directorate has convened the Planetary Protection Independent Review Board (PPIRB) to consider updating the COSPAR guidelines given the growing interest from commercial and private groups in exploration and utilization of Mars and other bodies in space. At the request of NASA, this publication reviews the findings of the PPIRB and comments on their consistency with the recommendations of the recent National Academies report *Review and Assessment of the Planetary Protection Policy Development Processes: The Goals, Rationales, and Definition of Planetary Protection* National Academies of Sciences, Engineering, and Medicine, Division on Engineering and Physical Sciences, Space Studies Board, Committee to Review the Planetary Protection Policy Development Processes, 2017-09-19.

Solar system exploration is in an extraordinary state of expansion. Scientific capabilities to search for evidence of extant or relic life outside Earth among the principal goals of solar system exploration are advancing rapidly. In this time of rapid transition in exploring solar system bodies, the importance of reexamining planetary protection policies, including the need for clarity in how NASA establishes such policies, has become more urgent. Overall, this study seeks to review the current state of planetary protection policy development, assess the responsiveness of the policy development process to contemporary and anticipated needs, and recommend actions that might assure the effectiveness of NASA's future coordination and execution of planetary protection. This interim report focuses on

the goals of and rationales for planetary protection policies and suggests a working definition of planetary protection consistent with those goals It does not address future commercial planetary missions human missions to planetary bodies or roles and responsibilities for implementing policies but these issues will be addressed in the final report

This book delves into Quarantine And Certification Of Martian Samples. Quarantine And Certification Of Martian Samples is a crucial topic that must be grasped by everyone, from students and scholars to the general public. The book will furnish comprehensive and in-depth insights into Quarantine And Certification Of Martian Samples, encompassing both the fundamentals and more intricate discussions.

1. This book is structured into several chapters, namely:
    - Chapter 1: Introduction to Quarantine And Certification Of Martian Samples
    - Chapter 2: Essential Elements of Quarantine And Certification Of Martian Samples
    - Chapter 3: Quarantine And Certification Of Martian Samples in Everyday Life
    - Chapter 4: Quarantine And Certification Of Martian Samples in Specific Contexts
    - Chapter 5: Conclusion
  2. In chapter 1, the author will provide an overview of Quarantine And Certification Of Martian Samples. The first chapter will explore what Quarantine And Certification Of Martian Samples is, why Quarantine And Certification Of Martian Samples is vital, and how to effectively learn about Quarantine And Certification Of Martian Samples.
  3. In chapter 2, the author will delve into the foundational concepts of Quarantine And Certification Of Martian Samples. The second chapter will elucidate the essential principles that must be understood to grasp Quarantine And Certification Of Martian Samples in its entirety.
  4. In chapter 3, this book will examine the practical applications of Quarantine And Certification Of Martian Samples in daily life. This chapter will showcase real-world examples of how Quarantine And Certification Of Martian Samples can be effectively utilized in everyday scenarios.
  5. In chapter 4, the author will scrutinize the relevance of Quarantine And Certification Of Martian Samples in specific contexts. This chapter will explore how Quarantine And Certification Of Martian Samples is applied in specialized fields, such as education, business, and technology.
  6. In chapter 5, this book will draw a conclusion about Quarantine And Certification Of Martian Samples. The final chapter will summarize the key points that have been discussed throughout the book.
- The book is crafted in an easy-to-understand language and is complemented by engaging illustrations. This book is highly recommended for anyone seeking to gain a comprehensive understanding of Quarantine And Certification Of Martian Samples.

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### Quarantine And Certification Of Martian Samples Introduction

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