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Earth Science and Applications from Space National Research Council 2005-10-07 The Earth is a dynamic planet whose changes and variations affect our communications, energy, health, food, housing, and transportation infrastructure. Understanding these changes requires a range of observations acquired from a variety of land-, sea-, air-, and space-based platforms. To assist NASA, NOAA, and the USGS develop these tools, the NRC was asked by these agencies to carry out a decadal strategy survey of Earth science and applications from space. In particular, the study is to develop the key scientific questions on which to focus Earth and environmental observations in the period 2005-2015, and a prioritized list of space programs, missions, and supporting activities to address these questions. This interim report outlines a key element of the studyâ€"the rationale for tying Earth observations to societal needâ€"and identifies urgent near-term actions needed to achieve this goal. A final report, due in late 2006, will provide the list of recommended space missions, programs, and supporting.
Review of Goals and Plans for NASA's Space and Earth Sciences National Research Council 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.
Decadal Science Strategy Surveys National Research Council 2007-07-11 The Workshop on Decadal Science Strategy Surveys was held on November 14-16, 2006, to promote discussions of the use of National Research Council (NRC) decadal surveys for developing and implementing scientific priorities, to review lessons learned from the most recent surveys, and to identify potential approaches for future surveys that can enhance their realism, utility, and endurance. The workshop involved approximately 60 participants from academia, industry, government, and the NRC. This report summarizes the workshop presentations, panel discussions, and general discussions on the use of decadal surveys for developing and implementing scientific priorities in astronomy and astrophysics, planetary science, solar and space physics, and Earth science. Decadal Science Strategy Surveys: Report of a Workshop summarizes the evnts of the three day workshop.
Science in NASA's Vision for Space Exploration National Research Council 2005-02-01 In January 2004, President Bush announced a new space policy directed at human and robotic exploration of space. The National Academies released a report at the same time that independently addressed many of the issues contained in the new policy. In June, the President's Commission on Implementation of United States Space Exploration Policy issued a report recommending that NASA ask the National Research Council (NRC) to reevaluate space science priorities to take advantage of the exploration vision. Congress also directed the NRC to conduct a thorough review of the science NASA is proposing to undertake within the initiative. This report provides an initial response to those requests. It presents guiding principles for selecting science missions that enhance and support the exploration program. The report also presents findings and recommendations to help guide NASA's space exploration strategic planning activity. Separate NRC reviews will be carried out of strategic roadmaps that NASA is developing to implement the policy.
Principal-Investigator-Led Missions in the Space Sciences National Research Council 2006-04-22 Principal Investigator-Led (PI-led) missions are an important element of NASA's space science enterprise. While several NRC studies have considered aspects of PI-led missions in the course of other studies for NASA, issues facing the PI-led missions in general have not been subject to much analysis in those studies. Nevertheless, these issues are raising increasingly important questions for NASA, and it requested the NRC to explore them as they currently affect PI-led missions. Among the issues NASA asked to have examined were those concerning cost and scheduling, the selection process, relationships among PI-led team members, and opportunities for knowledge transfer to new PIs. This report provides a discussion of the evolution and current status of the PIled mission concept, the ways in which certain practices have affected its performance, and the steps that can carry it successfully into the future. The study was done in collaboration with the National Academy of Public Administration.
Space Radiation Hazards and the Vision for Space Exploration National Research Council 2006-10-10 Fulfilling the President's Vision for Space Exploration (VSE) will require overcoming many challenges. Among these are the hazards of space radiation to crews traveling to the Moon and Mars. To explore these challenges in some depth and to examine ways to marshal research efforts to address them, NASA, NSF, and the NRC sponsored a workshop bringing together members of the space and planetary science, radiation physics, operations, and exploration engineering communities. The goals of the workshop were to increase understanding of the solar and space physics in the environment of Earth, the Moon, and Mars; to identify compelling relevant research goals; and discuss directions this research should take over the coming decade. This workshop report presents a discussion of radiation risks for the VSE, an assessment of specifying and predicting the space radiation environment, an analysis of operational strategies for space weather support, and a summary and conclusions of the workshop.
Plasma Science National Research Council 2008-01-20 As part of its current physics decadal survey, Physics 2010, the NRC was asked by the DOE, NSF, and NASA to carry out an assessment of and outlook for the broad field of plasma science and engineering over the next several years. The study was to focus on progress in plasma research, identify the most compelling new scientific opportunities, evaluate prospects for broader application of plasmas, and offer guidance to realize these opportunities. The study paid particular attention to these last two points. This "demand-side" perspective provided a clear look at what plasma research can do to help achieve national goals of fusion energy, economic competitiveness, and nuclear weapons stockpile stewardship. The report provides an examination of the broad themes that frame plasma research: low-temperature plasma science and engineering; plasma physics at high energy density; plasma science of magnetic fusion; space and astrophysical science; and basic plasma science. Within those themes, the report offers a bold vision for future developments in plasma science.
Exploration of the Outer Heliosphere and the Local Interstellar Medium National Research Council

2004-10-25 This report is the summary of a workshop held in May 2003 by the Space Studies Board's Committee on Solar and Space Physics to synthesize understanding of the physics of the outer heliosphere and the critical role played by the local interstellar medium (LISM) and to identify directions for the further exploration of this challenging environment.

The Sun, the Earth, and Near-earth Space John A. Eddy 2009 " ... Concise explanations and descriptions - easily read and readily understood - of what we know of the chain of events and processes that connect the Sun to the Earth, with special emphasis on space weather and Sun-Climate."--Dear Reader.

Space Exploration United States. Congress. Senate. Committee on Commerce, Science, and Transportation. Subcommittee on Science, Technology, and Space 2014

The Sun to the Earth â¬" and Beyond National Research Council 2003-11-17 This volume, The Sun to the Earth-and Beyond: Panel Reports, is a compilation of the reports from five National Research Council (NRC) panels convened as part of a survey in solar and space physics for the period 2003-2013. The NRC's Space Studies Board and its Committee on Solar and Space Physics organized the study. Overall direction for the survey was provided by the Solar and Space Physics Survey Committee, whose report, The Sun to the Earth-and Beyond: A Decadal Research Strategy in Solar and Space Physics, was delivered to the study sponsors in prepublication format in August 2002. The final version of that report was published in June 2003. The panel reports provide both a detailed rationale for the survey committee's recommendations and an expansive view of the numerous opportunities that exist for a robust program of exploration in solar and space physics.

Issues Affecting the Future of the U.S. Space Science and Engineering Workforce National Research Council 2006-07-20 In January 2006, the President announced a new civilian space policy focusing on exploration. As part of its preparations to implement that policy, NASA asked the NRC to explore long-range science and technology workforce needs to achieve the space exploration vision, identify obstacles to filling those needs, and put forward solutions to those obstacles. As part of the study, the NRC held a workshop to identify important factors affecting NASA's future workforce and its capacity to implement the exploration vision. This interim report presents a summary of the highlights of that workshop and an initial set of findings. The report provides a review of the workforce implications of NASA's plans, an assessment of science and technology workforce demographics, an analysis of factors affecting the aerospace workforce for both NASA and the relevant aerospace industry, and preliminary findings and recommendations. A final report is scheduled for completion in early 2007.

Steps to Facilitate Principal-Investigator-Led Earth Science Missions National Research Council 2004-05-21 Principal-investigator (PI) Earth science missions are small, focused science projects involving relatively small spacecraft. The selected PI is responsible for the scientific and programmatic success of the entire project. A particular objective of PI-led missions has been to help develop university-based research capacity. Such missions, however, pose significant challenges that are beyond the capabilities of most universities to manage. To help NASA's Office of Earth Science determine how best to address these, the NRC carried out an assessment of key issues relevant to the success of university-based PI-led Earth observation missions. This report presents the result of that study. In particular, the report provides an analysis of opportunities to enhance such missions and recommendations about whether and, if so, how they should be used to build university-based research capabilities.

The Space Science Decadal Surveys National Academies of Sciences, Engineering, and Medicine 2015-10-28 The National Research Council has conducted 11 decadal surveys in the Earth and space sciences since 1964 and released the latest four surveys in the past 8 years. The decadal surveys are notable in their ability to sample thoroughly the research interest, aspirations, and needs of a scientific community. Through a rigorous process, a primary survey committee and thematic panels of community members construct a prioritized program of science goals and objectives and define an executable strategy for achieving them. These reports play a critical role in defining the nation's agenda in that science area for the following 10 years, and often beyond. The Space Science Decadal Surveys considers the lessons learned from previous surveys and presents options for possible changes and improvements to the process, including the statement of task, advanced preparation, organization, and execution. This report discusses valuable aspects of decadal surveys that could taken further, as well as some challenges future surveys are likely to face in searching for the richest areas of scientific endeavor, seeking community consensus of where to go next, and planning how to get there. The Space Science Decadal Surveys describes aspects in the decadal survey prioritization process, including balance in the science program and across the discipline; balance between the needs of current researchers and the development of the future workforce; and balance in mission scale - smaller, competed programs versus large strategic missions.

Plasma Physics of the Local Cosmos National Research Council 2004-06-06 Solar and space physics is the study of solar system phenomena that occur in the plasma state. Examples include sunspots, the solar wind, planetary magnetospheres, radiation belts, and the aurora. While each is a distinct phenomenon, there are commonalities among them. To help define and systematize these universal aspects of the field of space physics, the National Research Council was asked by NASA's Office of Space Science to provide a scientific assessment and strategy for the study of magnetized plasmas in the solar system. This report presents that assessment. It covers a number of important research goals for solar and space physics. The report is complementary to the NRC report, The Sun to the Earthâ€"and Beyond: A Decadal Research Strategy for Solar and Space Physics, which presents priorities and strategies for future program activities.

The Uninhabitable Earth David Wallace-Wells 2020-03-17 #1 NEW YORK TIMES BESTSELLER • “The Uninhabitable Earth hits you like a comet, with an overflow of insanely lyrical prose about our pending Armageddon.”—Andrew Solomon, author of The Noonday Demon With a new afterword It is worse, much worse, than you think. If your anxiety about global warming is dominated by fears of sea-level rise, you are barely scratching the surface of what terrors are possible—food shortages, refugee emergencies, climate wars and economic devastation. An “epoch-defining book” (The Guardian) and “this generation’s Silent Spring” (The Washington Post), The Uninhabitable Earth is both a travelogue of the near future and a meditation on how that future will look to those living through it—the ways that warming promises to transform global politics, the meaning of technology and nature in the modern world, the sustainability of capitalism and the trajectory of human progress. The Uninhabitable Earth is also an impassioned call to action. For just as the world was brought to the brink of catastrophe within the span of a lifetime, the responsibility to avoid it now belongs to a single generation—today’s. Praise for The Uninhabitable Earth “The Uninhabitable Earth is the most terrifying book I have ever read. Its subject is climate change, and its method is scientific, but its mode is Old Testament. The book is a meticulously documented, white-knuckled tour through the cascading catastrophes that will soon engulf our warming planet.”—Farhad Manjoo, The New York Times “Riveting. . . . Some readers will find Mr. Wallace-Wells’s outline of possible futures alarmist. He is indeed alarmed. You should be, too.”—The Economist “Potent and evocative. . . . Wallace-Wells has resolved to offer something other than the standard narrative of climate change. . . . He avoids the ‘eerily banal language of climatology’ in favor of lush, rolling prose.”—Jennifer Szalai, The New York Times “The book has potential to be this generation’s Silent Spring.”—The Washington Post “The Uninhabitable Earth, which has become a best seller, taps into the underlying emotion of the day: fear. . . . I encourage people to read this book.”—Alan Weisman, The New York Review of Books

Space Studies Board Annual Report 2014 National Research Council 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.

Priorities in Space Science Enabled by Nuclear Power and Propulsion National Research Council

2006-04-20 In 2003, NASA began an R&D effort to develop nuclear power and propulsion systems for solar system exploration. This activity, renamed Project Prometheus in 2004, was initiated because of the inherent limitations in photovoltaic and chemical propulsion systems in reaching many solar system objectives. To help determine appropriate missions for a nuclear power and propulsion capability, NASA asked the NRC for an independent assessment of potentially highly meritorious missions that may be enabled if space nuclear systems became operational. This report provides a series of space science objectives and missions that could be so enabled in the period beyond 2015 in the areas of astronomy and astrophysics, solar system exploration, and solar and space physics. It is based on but does not reprioritize the findings of previous NRC decadal surveys in those three areas.

Solar and Space Physics and Its Role in Space Exploration National Research Council 2004-11-11 In February 2004, the President announced a new goal for NASA; to use humans and robots together to explore the Moon, Mars, and beyond. In response to this initiative, NASA has adopted new exploration goals that depend, in part, on solar physics research. These actions raised questions about how the research agenda recommended by the NRC in its 2002 report, The Sun to the Earth and Beyond, which did not reflect the new exploration goals, would be affected. As a result, NASA requested the NRC to review the role solar and space physics should play in support of the new goals. This report presents the results of that review. It considers solar and space physics both as aspects of scientific exploration and in support of enabling future exploration of the solar system. The report provides a series of recommendations about NASA's Sun-Earth Connections program to enable it to meet both of those goals.

Solar and Space Physics National Research Council 2013-08-26 From the interior of the Sun, to the upper atmosphere and near-space environment of Earth, and outward to a region far beyond Pluto where the Sun's influence wanes, advances during the past decade in space physics and solar physics-the disciplines NASA refers to as heliophysics-have yielded spectacular insights into the phenomena that affect our home in space. Solar and Space Physics, from the National Research Council's (NRC's) Committee for a Decadal Strategy in Solar and Space Physics, is the second NRC decadal survey in heliophysics. Building on the research accomplishments realized during the past decade, the report presents a program of basic and applied research for the period 2013-2022 that will improve scientific understanding of the mechanisms that drive the Sun's activity and the fundamental physical processes underlying near-Earth plasma dynamics, determine the physical interactions of Earth's atmospheric layers in the context of the connected Sun-Earth system, and enhance greatly the capability to provide realistic and specific forecasts of Earth's space environment that will better serve the needs of society. Although the recommended program is directed primarily at NASA and the National Science Foundation for action, the report also recommends actions by other federal agencies, especially the parts of the National Oceanic and Atmospheric Administration charged with the day-to-day (operational) forecast of space weather. In addition to the recommendations included in this summary, related recommendations are presented in this report.

The Scientific Context for Exploration of the Moon National Research Council 2006-09-19 Because of the Moon's unique place in the evolution of rocky worlds, it is a prime focus of NASA's space exploration vision. Currently NASA is defining and implementing a series of robotic orbital and landed missions to the Moon as the initial phase of this vision. To realize the benefits of this activity, NASA needs a comprehensive, well-validated, and prioritized set of scientific research objectives. To help establish those objective, NASA asked the NRC to provide guidance on the scientific challenges and opportunities enabled by sustained robotic and human exploration of the Moon during the period 2008-2013+. This interim report, which focuses on science of the Moon, presents a number of scientific themes describing broad scientific goals important for lunar research, discussions of how best to reach these goals, a set of three priority areas that follow from the themes, and recommendations for these priorities and related areas. A final report will follow in the summer of 2007.

Space Studies Board Annual Report 2013 National Research Council 2014-04-09 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 2013 covers a message from the chair of the SSB, Charles F. Kennel. 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 2010 National Research Council 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.

Review of NASA Plans for the International Space Station National Research Council 2006-05-05 In January 2004, President Bush announced a new space policy directed at human and robotic exploration of space. In June 2004, the President's Commission on Implementation of United States Space Exploration Policy issued a report recommending among other things that NASA ask the National Research Council (NRC) to reevaluate space science priorities to take advantage of the exploration vision. Congress also directed the NRC to conduct a thorough review of the science NASA is proposing to undertake within the initiative. In February 2005, the NRC released Science in NASA's Vision for Space Exploration, the first report of the two studies undertaken to carry out these requests. The second report focuses on NASA's plan for the ISS. This report provides broad advice on programmatic issues that NASA is likely to face as it attempts to develop an updated ISS utilization plan. It also presents an assessment of potentially important research and testbed activities that may have to be performed on the ISS to help ensure success of some exploration objectives.

Assessment of Options for Extending the Life of the Hubble Space Telescope National Research Council 2005-03-28 The Hubble Space Telescope (HST) has operated continuously since 1990. During that time, four space shuttle-based service missions were launched, three of which added major observational capabilities. A fifth â€" SM-4 â€" was intended to replace key telescope systems and install two new instruments. The loss of the space shuttle Columbia, however, resulted in a decision by NASA not to pursue the SM-4 mission leading to a likely end of Hubble's useful life in 2007-2008. This situation resulted in an unprecedented outcry from scientists and the public. As a result, NASA began to explore and develop a robotic servicing mission; and Congress directed NASA to request a study from the National Research Council (NRC) of the robotic and shuttle servicing options for extending the life of Hubble. This report presents an assessment of those two options. It provides an examination of the contributions made by Hubble and those likely as the result of a servicing mission, and a comparative analysis of the potential risk of the two options for servicing Hubble. The study concludes that the Shuttle option would be the most effective one for prolonging Hubble's productive life.

Issues and Opportunities Regarding the U.S. Space Program National Research Council 2004-03-02 Ever since the completion of the Apollo program, there has been a lack of consensus about the future of human spaceflight. The Columbia tragedy in February 2003 rekindled public debate about this question. In November 2003, the Space Studies Board and the Aeronautics and Space Engineering Board organized a workshop to explore aspects of the question, what should be the principal purpose, goals, and priorities of the U.S. civil space program? This report presents a factual summary of that workshop, which identified past lessons learned and guiding principles for the future of the civil space program. Seven broad themes

emerged from the workshop, and these themes are highlighted in the report. The report also presents discussions of strategies for the human spaceflight program and guiding principles of and boundary conditions for a 21st century space policy.

Space Studies Board Annual Report 2009 National Research Council 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.

Extending the Effective Lifetimes of Earth Observing Research Missions National Research Council 2005-11-18 While NASA Earth Science missions are planned on the basis of a specified lifetime, often they are able to function beyond the end of that period. Until recently NASA had no formal mechanism for determining whether those missions should be extended or whether the resources necessary for the extension should be applied to new missions. In August 2004, when NASA merged Earth and space sciences, the agency began using the Science Review process to make those extension determinations. NASA had asked the NRC to assess extension review processes, and after the merger, this study focused on the Science Review process. This report presents an assessment of that process and provides recommendations for adapting it to Earth Science missions.

Vision and Voyages for Planetary Science in the Decade 2013-2022 National Research Council 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.

Assessment of NASA's Mars Architecture 2007-2016 National Research Council 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 succeed. 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?, and 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 Mild Rovers mission planned for 2016, recommendations from the committee, NRC guidelines for mars exploration, and more.

Beyond Earth Asif A. Siddiqi 2018 This is a completely updated and revised version of a monograph published in 2002 by the NASA History Office under the original title Deep Space Chronicle: A Chronology of Deep Space and Planetary Probes, 1958-2000. This new edition not only adds all events in robotic deep space exploration after 2000 and up to the end of 2016, but it also completely corrects and updates all accounts of missions from 1958 to 2000--Provided by publisher.

Space Studies Board Annual Report 2017 National Academies of Sciences, Engineering, and Medicine 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.

The Astrophysical Context of Life National Research Council 2005-06-25 In 1997, the National Aeronautics and Space Administration (NASA) formed the National Astrobiology Institute to coordinate and fund research into the origins, distribution, and fate of life in the universe. A 2002 NRC study of that program, Life in the Universe: An Assessment of U.S. and International Programs in Astrobiology, raised a number of concerns about the Astrobiology program. In particular, it concluded that areas of astrophysics related to the astronomical environment in which life arose on earth were not well represented in the program. In response to that finding, the Space Studies Board requested the original study committee, the Committee on the Origins and Evolution of Life, to examine ways to augment and integrate astronomy and astrophysics into the Astrobiology program. This report presents the results of that study. It provides a review of the earlier report and related efforts, a detailed examination of the elements of the astrobiology program that would benefit from greater integration and augmentation of astronomy and astrophysics, and an assessment of ways to facilitate the integration of astronomy with other astrobiology disciplines.

Distributed Arrays of Small Instruments for Solar-Terrestrial Research National Research Council 2006-06-19 A recommendation of the NRC's decadal survey in solar and space physics, published in 2002, was the Small Instrument Distributed Ground-Based Network, which would provide global-scale ionospheric and upper atmospheric measurements crucial to understanding the atmosphere-ionosphere-magnetosphere system. To explore the scientific rationale for this distributed array of small instruments (known as DASI), the infrastructure needed to support and make use of such arrays, and proposals for a deployment implementation plan, the NRC held a workshop of interested parties at the request of the National Science Foundation. This report presents a summary of that workshop focusing on the science and

instruments, and on infrastructure issues. It describes the themes emerging from the workshop: the need to address the magnetosphere-ionosphere-magnetosphere ensemble as a system; the need for real-time observations; and the insufficiency of current observations.

Preventing the Forward Contamination of Mars National Research Council 2006-04-22 Recent spacecraft and robotic probes to Mars have yielded data that are changing our understanding significantly about the possibility of existing or past life on that planet. Coupled with advances in biology and life-detection techniques, these developments place increasing importance on the need to protect Mars from contamination by Earth-borne organisms. To help with this effort, NASA requested that the NRC examine existing planetary protection measures for Mars and recommend changes and further research to improve such measures. This report discusses policies, requirements, and techniques to protect Mars from organisms originating on Earth that could interfere with scientific investigations. It provides recommendations on cleanliness and biological burden levels of Mars-bound spacecraft, methods to reach those levels, and research to reduce uncertainties in preventing forward contamination of Mars.

The Sun to the Earth â¬" and Beyond National Research Council 2003-12-17 This volume, The Sun to the Earth-and Beyond: Panel Reports, is a compilation of the reports from five National Research Council (NRC) panels convened as part of a survey in solar and space physics for the period 2003-2013. The NRC's Space Studies Board and its Committee on Solar and Space Physics organized the study. Overall direction for the survey was provided by the Solar and Space Physics Survey Committee, whose report, The Sun to the Earth-and Beyond: A Decadal Research Strategy in Solar and Space Physics, was delivered to the study sponsors in prepublication format in August 2002. The final version of that report was published in June 2003. The panel reports provide both a detailed rationale for the survey committee's recommendations and an expansive view of the numerous opportunities that exist for a robust program of exploration in solar and space physics.

Exploring Organic Environments in the Solar System National Research Council 2007-03-09 The sources, distributions, and transformation of organic compounds in the solar system are active study areas as a means to provide information about the evolution of the solar system and the possibilities of life elsewhere in the universe. There are many organic synthesis processes, however, and ambiguity surrounds the relative effectiveness of these processes in explaining the distribution of organic compounds in the solar system. As a consequence, NASA directed the NRC to determine what processes account for the reduced carbon compounds found throughout the solar system and to examine how planetary exploration can advance understanding of this central issue. This report presents a discussion of the chemistry of carbon; an analysis of the formation, modification, and preservation of organic compounds in the solar system; and an assessment of research opportunities and strategies for enhancing our understanding of organic material in the solar system.

The Sun to the Earth--and Beyond National Research Council (U.S.). Solar and Space Physics Survey Committee 2003

Solar and Space Physics National Research Council 2013-09-26 From the interior of the Sun, to the upper atmosphere and near-space environment of Earth, and outward to a region far beyond Pluto where the Sun's influence wanes, advances during the past decade in space physics and solar physics-the disciplines NASA refers to as heliophysics-have yielded spectacular insights into the phenomena that affect our home in space. Solar and Space Physics, from the National Research Council's (NRC's) Committee for a Decadal Strategy in Solar and Space Physics, is the second NRC decadal survey in heliophysics. Building on the research accomplishments realized during the past decade, the report presents a program of basic and applied research for the period 2013-2022 that will improve scientific understanding of the mechanisms that drive the Sun's activity and the fundamental physical processes underlying near-Earth plasma dynamics, determine the physical interactions of Earth's atmospheric layers in the context of the connected Sun-Earth system, and enhance greatly the capability to provide realistic and specific forecasts of Earth's space environment that will better serve the needs of society. Although the recommended program is directed primarily at NASA and the National Science Foundation for action, the report also recommends actions by other federal agencies, especially the parts of the National Oceanic and Atmospheric Administration charged with the day-to-day (operational) forecast of space weather. In addition to the recommendations included in this summary, related recommendations are presented in this report.

An Assessment of Balance in NASA's Science Programs National Research Council 2006-06-30 When the space exploration initiative was announced, Congress asked the NRC to review the science NASA proposed to carryout under the initiative. It also asked the NRC to assess whether this program would provide balanced scientific research across the established disciplines supported by NASA in addition to supporting the new initiative. In 2005, the NRC released three studies focusing on a portion of that task, but changes at NASA forced the postponement of the last phase. This report presents that last phase with an assessment of the health of the NASA scientific disciplines under the budget requests imposed by the exploration initiative. The report also provides an analysis of whether the science budget appropriately reflects cross-disciplinary scientific priorities.

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