

SPACE STUDIES BOARD NEWS



JANUARY – MARCH 2018

INSIDE THIS ISSUE



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The National Academies of
SCIENCES • ENGINEERING • MEDICINE

SPACE STUDIES BOARD NEWS

THE BOARD AND ITS DISCIPLINE/STANDING COMMITTEES

The Space Studies Board (SSB) did not meet during the first quarter. The next meeting of the SSB will be May 1-3. The first day will be a joint session with the Aeronautics and Space Engineering Board. More information on the board is available at http://sites.nationalacademies.org/SSB/SSB_052281.

During this quarter, the four discipline committees supported by NASA SMD (CAA, CAPS, CESAS, and CSSP) and the ASEB/SSB standing Committee on Biological and Physical Sciences in Space (CBPSS) met in plenary and parallel sessions at the **2018 Space Science Week**, March 27-29, 2018. During the afternoon of March 27 all 5 committees met in plenary which commenced with comments from Fiona Harrison (SSB chair) and Richard Rowberg (Interim SSB Director) who provided a brief overview of the board's current activities. Thomas Zurbuchen (SMD Associate Administrator) then provided an overview of the NASA Science Mission Directorate budget, program, and priorities, and concluded by taking questions from the audience. The plenary session also included a focus session on International Collaboration. The focus session featured overviews on the ESA Space Science (Fabio Favata, ESA SCI), ESA Human and Robotic Exploration (David Parker, ESA HRE), ESA Earth Observation Programs (Maurice Borgeaud, ESA EO), Chinese Academy of Sciences (Ji Wu, CAS NSSC), JAXA Institute of Space and Astronautical Science (Hitoshi Kuninaka, JAXA ISAS), and JAXA ISAS Research (Masaki Fujimoto, JAXA ISAS). For more information on the discipline and standing committees, please visit http://sites.nationalacademies.org/SSB/SSB_052296.

On the evening of March 28, David Reitze (Executive Director of the LIGO Laboratory at CalTech) gave a public lecture on *The Gravitational Wave Astronomical Revolution*, which drew over 200 attendees. A recording of the lecture is available at <https://livestream.com/accounts/7036396/events/8098619/videos/172496813>.

The Committee on Astrobiology and Planetary Science (CAPS) met during Space Science Week (March 27-29, 2018) in Washington, DC. A short report evaluating the NASA Planetary Science Division's plans for the lunar and science exploration initiative and its consistency with the Visions & Voyages decadal survey is being authored and will be delivered to NASA in mid-June. A second short report addressing the role of commercial providers in support of lunar science goals will be delivered to NASA at the end of November. More information on CAPS is available at http://sites.nationalacademies.org/ssb/ssb_067577.

The Committee on Astronomy and Astrophysics (CAA) held its spring meeting during Space Science Week (March 27-29, 2018) in Washington, DC. The committee discussed preparations and planning for the next decadal survey in astronomy and astrophysics and other topics. CAA is also preparing to host an early career Astronomer workshop for young professionals in the field in early October at the Keck Center. The committee's next meeting is scheduled to take place at the Beckman Center in the fall of 2018. More information on CAA is available at http://sites.nationalacademies.org/BPA/BPA_048755.

The Committee on Biological and Physical Sciences in Space (CBPSS) met March 27-29, 2018 as part of the annual Space Science Week event. During the first day, the committee received a status update on NASA's Space Life and Physical Sciences Research and Applications program from SLPSRA Director Craig Kundrot that included feedback on the recent midterm review report, discussion of the Lunar Orbital Platform-Gateway, and NASA's strategic plan and reorganization. The committee also had an extensive discussion with current president of the American Society for Gravitational and Space Research (ASGSR), Dr. Anna-Lisa Paul, about planning for science community input to the next decadal survey in life and physical sciences. The day concluded in afternoon plenary with the other discipline committees of the Space Studies Board, where panelists discussed international programs and collaboration. CBPSS devoted its second day

SSB MEMBERSHIP

JULY 1, 2017—JUNE 30, 2018

FIONA HARRISON, *Chair*
California Institute of Technology

ROBERT D. BRAUN, *Vice Chair*
University of Colorado, Boulder

JAMES ANDERSON
Harvard University

JEFF M. BINGHAM
Consultant

JAY C. BUCKEY
Geisel School of Medicine at Dartmouth

ADAM BURROWS
Princeton University

MARY LYNNE DITTMAR
Dittmar Associates, Inc.

JOSEPH FULLER, JR.
Futron Corporation

THOMAS R. GAVIN
Jet Propulsion Laboratory

SARAH GIBSON
National Center for Atmospheric Research

VICTORIA HAMILTON
Southwest Research Institute

ANTHONY C. JANETOS
Boston University

CHRYSSA KOUVELIOTOU
The George Washington University

DENNIS P. LETTENMAIER
University of California, Los Angeles

ROSALY M. LOPES
Jet Propulsion Laboratory

DAVID J. MCCOMAS
Princeton Plasma Physics Laboratory

LARRY PAXTON, JR.
Johns Hopkins University, Applied Physics Laboratory

ELIOT QUATAERT
University of California, Berkeley

BARBARA SHERWOOD LOLLAR
University of Toronto

HARLAN E. SPENCE
University of New Hampshire

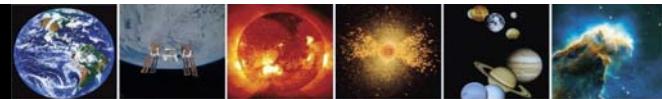
MARK H. THIEMENS
University of California, San Diego

MEENAKSHI WADHWA
Arizona State University

EDWARD L. WRIGHT
University of California, Los Angeles

LIAISON

CHARLES KENNEL
U.S. Representative to COSPAR



to a symposium titled "Space Life and Physical Sciences Research Supporting Moon and Mars Missions," which was organized by the committee following a joint NASA-CBPSS planning session during the committee's October 2017 meeting. The morning symposium speakers provided an integrated set of presentations on emerging research findings pointing to unexpectedly profound impacts of exercise and low-gravity, that cascaded from gene expression though nearly every key organ system in humans. The afternoon speakers focused on the development status, and space-environment design issues, of human exploration technologies and processes for Moon and Mars missions, including nuclear propulsion and nuclear surface power systems, in situ resource utilization, and regolith processing.

Also during this quarter, committee co-chair Rob Ferl and staff Sandra Graham attended the 3-day Lunar Orbital Platform-Gateway science workshop in Denver, CO where Dr. Ferl gave a presentation discussing life and physical sciences research discussed in the decadal report for pursuit on the platform. More information on CBPSS can be found at http://sites.nationalacademies.org/SSB/SSB_145312.

The Committee on Earth Science and Applications from Space (CESAS) met in Washington, DC on March 27-29, 2018 as part of the Space Science Week. Agenda items for the meeting included updates from NASA's Earth Science Division, NOAA NESDIS, and USGS (sustained land imaging) and briefings on: NASA's PACE mission; opportunities for balloons, airships, and UAVs in Earth Science research; ESA's Earth Science and Copernicus programs; and NASA's ESTO program. The committee also was briefed by the decadal survey co-chairs on the recently released report, "Thriving on Our Changing Planet: A Decadal Strategy for Earth

Observation from Space" (<https://www.nap.edu/catalog/24938/thriving-on-our-changing-planet-a-decadal-strategy-for-earth>). In closed session, the committee also discussed a draft of the popularization of the decadal survey, a highly illustrated report summary intended for a broader audience than the rather lengthy and technical report itself. The popularization is expected to be published in the late summer. The next meeting of the committee will take place in the fall, site and dates to be announced. More information on CESAS is available at http://sites.nationalacademies.org/SSB/SSB_066587.

The Committee on Solar and Space Physics (CSSP) held its spring meeting as part of Space Science Week on March 27-29, 2018, in Washington, DC. The committee heard updates from NASA Heliophysics, NSF Geospace, NSF Astronomy, NOAA's Space Weather Prediction Center, and the NASA Heliophysics Advisory Committee. The committee also heard about science opportunities of the proposed deep space gateway, Chinese activities in solar and space science, an update on the Parker Solar Probe mission, and a science talk on the formation of the slow solar wind and the ground state of space weather. The CSSP will hold its next meeting in Fall 2018. More information on CSSP is available at http://sites.nationalacademies.org/SSB/SSB_052324.

STUDY COMMITTEES

The Committee on an Astrobiology Science Strategy for the Search for Life in the Universe, chaired by Barbara Sherwood Lollar of the University of Toronto, is holding its third and final meeting April 25-27 in Washington, DC. The committee is on schedule to deliver its report to NASA by the end of August 2018. More information about the project is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_180812.

The Committee on Best Practices for a Future Open Code Policy for NASA Space Science held its second meeting January 17-19, 2018, in Washington, DC. Highlights of this meeting included presentations from the NASA Office of General Council and Technology Transfer Program about current software release policies, and a panel discussion among representatives from peer-reviewed journals. The committee also held its third meeting February 26-28, 2018, in Irvine, CA. This meeting was fully devoted to the discussion and drafting of the committee's report in closed executive session. More information about the project is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_178892.

The report from the **2017-2027 Decadal Survey for Earth Science and Applications from Space** (ESAS 2017: www.nas.edu/eesas2017) was approved on December 30, 2017 and a pre-publication version of the report, *Thriving on Our Changing Planet: A Decadal Strategy for Earth Observation from Space*, was delivered to agency sponsors—NASA, NOAA, and USGS—in January 2018. Dissemination activities and editing of the pre-publication report were the focus of the survey committee and staff during this quarter. Town Halls to discuss the survey were held on January 10, 2018 at the 98th annual meeting of the American Meteorological Society in Austin, Texas and on February 14, 2018 at the 2018 AGU Ocean Sciences meeting in Portland, Oregon. The survey co-chairs, Waleed Abdalati and Bill Gail, also made numerous briefings to agency officials, Congressional staff, OMB and OSTP,

SSB DISCIPLINE/STANDING COMMITTEE CO-CHAIRS (January-June 2018)

Committee on Astrobiology and Planetary Science (CAPS)

Christopher H. House, The Pennsylvania State University
William B. McKinnon, Washington University, St. Louis

Committee on Astronomy and Astrophysics (CAA)

(joint with the Board on Physics and Astronomy)

Marcia Rieke, University of Arizona
Steven Ritz, University of California, Santa Cruz

Committee on Biological and Physical Sciences in Space (CBPSS)

(joint with the Aeronautics and Space Engineering Board)

Elizabeth Cantwell, Arizona State University
Robert J. Ferl, University of Florida

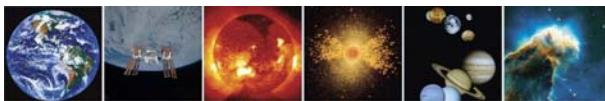
Committee on Earth Science and Applications from Space (CESAS)

Michael D. King, University of Colorado, Boulder
Joyce E. Penner, University of Michigan

Committee on Solar and Space Physics (CSSP)

Sarah Gibson, National Center for Atmospheric Research
Maura E. Hagan, Utah State University

For more information, go to <http://sites.nationalacademies.org/SSB/ssb_052296>.



various agency advisory groups, and several committees of the National Academies. In addition, the study director, Art Charo, reviewed the decadal survey at a meeting of Committee on the Peaceful Uses of Outer Space (COPUOS)-Scientific and Technical Subcommittee, and at the Ninth US-EU Space Dialogue. Publication of the edited version of the survey report is expected by June 1, 2018 to be followed shortly thereafter by a short brochure that will serve as a popularization of the report. The full report may be read online or downloaded at no cost via a link on the survey website or directly from National Academies Press at: <https://www.nap.edu/catalog/24938/thriving-on-our-changing-planet-a-decadal-strategy-for-earth>.

The **Committee on an Exoplanet Science Strategy** held its first meeting March 6-7, 2018, in Washington, DC. During this meeting, the committee held a discussion with NASA on its charge and received presentations on the exoplanet-related capabilities of ground and space-based telescopes, including JWST and WFIRST. The committee's second meeting is scheduled to take place April 19-20, 2018, in Irvine, CA, and its third meeting is scheduled for June 5-6, 2018, in Washington, DC. The final report is due to NASA by the end of August 2018. More information about the project is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_180659.

The **Committee on Extraterrestrial Sample Analysis Facilities** held its second meeting January 22-24, 2018, in Houston, TX, hosted by the Lunar and Planetary Institute. The committee held panel discussions on the curation and analysis of challenging materials, laboratory management and viability, and technological development and innovation in techniques. The committee also toured the Astromaterials Curation and Astromaterials Research and Exploration Science facilities at Johnson Space Center. The committee's third meeting was held April 3-5, in Washington, DC. More information about the project is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_178893

The **Committee on a Midterm Assessment of Implementation of the Decadal Survey on Life and Physical Sciences Research at NASA** has completed most of the editing process for its report, *A Midterm Assessment of Implementation of the Decadal Survey on Life and Physical Sciences Research at NASA*, which was released as a prepublication in December 2017. Dissemination of the report continued in this period, including a briefing to OMB and OSTP staff in February. Published copies of the report are expected to be available in May 2018.

The **Committee on Planetary Protection Requirements for Sample-Return Missions from Martian Moons** is a joint activity between the Space Studies Board and the European Space Science Committee of the European Science Foundation (ESF), with some participation by Japanese scientists. The committee is the result of parallel requests sent by the Planetary Protection Offices of NASA and the European Space Agency to the National Academies and ESF, respectively, to assess the results of research jointly sponsored by NASA and ESA on whether or not hypothetical martian organisms can survive ejection from the surface of Mars during a giant impact and subsequent emplacement on the surfaces of Phobos and Deimos. A major goal of this activity is to determine whether or not

samples returned from the martian moons receive a planetary protection classification of "restricted" or "unrestricted" Earth return. The joint committee held its first planned meeting in London on November 7-9, 2017. Since the first meeting, NASA has requested that the committee consider several additional questions. To undertake this expanded task, the committee will hold a second meeting (possibly in London) on September 18-20. More information on the project is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_181917.

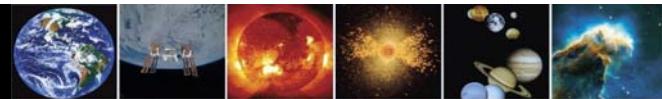
The **Committee on the Review of Planetary Protection Policy Development Processes** did not meet during this quarter. The committee has assembled a complete draft of its report and is scheduled to send it to external reviewers before the end of April. Additional information about the committee and its activities is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_175768.

The **Committee on the Review of Progress Toward Implementing the Decadal Survey Vision and Voyages for Planetary Sciences** held its fifth meeting February 26-28, 2018 in Washington. The committee is finalizing its report prior to submitting it to review and aims to deliver its report to NASA in summer 2018. Additional information about this project is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_177619.

OTHER ACTIVITIES

COSPAR held its annual business meetings in Paris on March 19-21. The Science Program Committee met March 19 to finalize the arrangements for and detailed scientific agenda of COSPAR's 42nd Scientific Assembly, to be held in Pasadena, California on July 14-21, 2018. The COSPAR Scientific Advisory Committee and COSPAR Bureau met on March 20 and 21, respectively. The Bureau confirmed that the next "off-year" COSPAR Symposium will take place in Tel Aviv, Israel on November 4-8 (to be confirmed), 2019. The theme of the meeting is "Small Satellites for Sustainable Science and Development." The 43rd Scientific Assembly will be held in Sydney, Australia on August 15-23, 2020. The location of the 44th Scientific Assembly will be determined by the COSPAR Council in July. The contending cities are: Athens, Greece; Lausanne, Switzerland; Prague, Czech Republic; and Warsaw, Poland. Additional information about COSPAR can be found at <https://cosparhq.cnes.fr/>.

Planetary Protection of the Outer Solar System: This 3-year activity, funded via the European Union's Horizon 2020 funding program and organized by the European Science Foundation (ESF), was formally initiated in January 2016, and is designed to address a series of closely related topics in the general area of planetary protection for the icy bodies of the outer solar system. Although the National Academies is not formally involved in this project, the Space Studies Board has observer status on the PPOSS steering group and has agreed, with NASA's concurrence, to sponsor the participation of two U.S. experts in activities associated with PPOSS' so-called Work-Packages 3 and 5. Activities associated with Work-Package 5—a review of the current planetary protection regulation for the icy bodies of the outer solar system—commenced at a meeting held at Imperial College in London on February 7-9, 2018. A member of the SSB staff and two US ex-



perts—Geoffrey Collins (Wheaton College, Massachusetts) and Mark Saunders (NASA Langley Research Center, retired)—participated in the meeting in their own capacity as subject matter experts. The second and final planned meeting associated with Work-Package 5 will take place in Florence, Italy, on September 6-7. Additional information about PPOSS can be found at <http://pposs.org/>.

Science Strategy for Space Exploration of the Outer Solar System Icy Moons Oceans (ExoOceans) is a cooperative venture between the European Space Science Committee, the European Marine Board, and the International Space Science Institute (ISSI). Its goal is to review and synthesize the current status of astrobiological

knowledge about the outer solar system with particular emphasis on the icy satellites of the giant planets. The Space Studies Board is not formally involved in this activity but has agreed, with NASA's concurrence, to fund the participation of two US scientists—Christopher House (Pennsylvania State University) and Alexander Hayes (Cornell University)—in Exoceans activities. The group is scheduled to hold its second meeting at ISSI in Bern, Switzerland on June 18-22. A third and final meeting will also be held at ISSI in September. The outcome of this activity will be a book in the ISSI Space Science Series, published by Springer. More details about the ExoOceans project can be found at <http://www.essc.esf.org/membership/exooceans-study-group-meeting/> and <http://www.issibern.ch/workshops/exooceans/>.

The 7th CAS–NAS Forum for New Leaders in Space Science

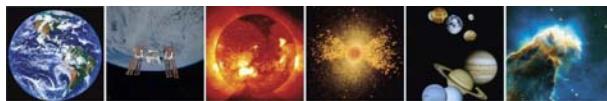
Jan 23–24, 2018, Guangzhou, China



The Forum for New Leaders in Space Science, a cooperative activity between the National Academies of Sciences, Engineering, and Medicine and the Chinese Academy of Sciences (CAS), is designed to provide opportunities for a highly select group of young space scientists from China and the United States to discuss their research activities in an intimate and collegial environment. Continuing support for this activity from CAS and the National Academies Presidents' Committee permitted the recruitment of a fourth cohort of young U.S. and Chinese scientists to begin during the third quarter of 2017. The fourth cohort, drawn from the space astronomy and astrophysics and solar and space physics communities, will meet in Guangzhou in southern China on January 23–24, 2018 and will meet in Pasadena, California on July 12–13, 2018 (i.e., immediately prior to the July 14–21 COSPAR Scientific Assembly). Additional details concerning this activity can be found at http://sites.nationalacademies.org/SSB/SSB_086017.

Maura Hagan, co-chair of the CSSP and dean of the College of Science and professor of physics at Utah State University is one of the senior scientists who attended the first forum of the fourth cohort. Below are her thoughts.

"The Forum for New Leaders in Space Science is a cooperative activity between the Space Studies Board and the National Space Science Center (NSSC) of the Chinese Academy of Sciences (CAS) designed to provide opportunities for young space scientists from China and the United States to discuss their research activities in a relaxed setting. Early in 2018, I witnessed the value of the forums first hand when I accompanied the cohort of eight talented young US astrophysicists and solar and space physicists to the seventh forum which was held in Guangzhou, China. Our hosts, including scientists from the CAS and NSSC, selected eight outstanding space science scholars from their country to participate in the forum. The scientific program included lots of time for rich discussion after each scientist presented their research. Discussion continued during the breaks and over meals of delicious Cantonese cuisine. During the social part of the program participants were encouraged to engage with those that they didn't yet know. I was delighted to see the camaraderie of the group develop and the scientific exchanges deepen during the course of the meeting. I look forward to the eighth forum in Pasadena in July when we will all come together once again to build upon the relationships and scientific exchanges that began in Guangzhou."



NEW RELEASES

Copies of reports are available from the SSB office at 202-334-3477 or at <<http://www.nap.edu/>>.

Thriving on Our Changing Planet: A Decadal Strategy for Earth Observation from Space

We live on a dynamic Earth shaped by both natural processes and the impacts of humans on their environment. It is in our collective interest to observe and understand our planet, and to predict future behavior to the extent possible, in order to effectively manage resources, successfully respond to threats from natural and human-induced environmental change, and capitalize on the opportunities – social, economic, security, and more – that such knowledge can bring.

By continuously monitoring and exploring Earth, developing a deep understanding of its evolving behavior, and characterizing the processes that shape and reshape the environment in which we live, we not only advance knowledge and basic discovery about our planet, but we further develop the foundation upon which benefits to society are built. *Thriving on Our Changing Planet* presents prioritized science, applications, and observations, along with related strategic and programmatic guidance, to support the U.S. civil space Earth observation program over the coming decade.

Available at: <http://www.nap.edu/catalog/24938/thriving-on-our-changing-planet-a-decadal-strategy-for-earth>

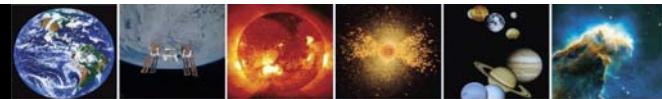
A Midterm Assessment of Implementation of the Decadal Survey on Life and Physical Sciences Research at NASA

The 2011 National Research Council decadal survey on biological and physical sciences in space, *Recapturing a Future for Space Exploration: Life and Physical Sciences Research for a New Era*, was written during a critical period in the evolution of science in support of space exploration. The research agenda in space life and physical sciences had been significantly descoped during the programmatic adjustments of the Vision for Space Exploration in 2005, and this occurred in the same era as the International Space Station (ISS) assembly was nearing completion in 2011. Out of that period of change, *Recapturing a Future for Space Exploration* presented a cogent argument for the critical need for space life and physical sciences, both for enabling and expanding the exploration capabilities of NASA as well as for contributing unique science in many fields that can be enabled by access to the spaceflight environment.

Since the 2011 publication of the decadal survey, NASA has seen tremendous change, including the retirement of the Space Shuttle Program and the maturation of the ISS. NASA formation of the Division of Space Life and Physical Sciences Research and Applications provided renewed focus on the research of the decadal survey. NASA has modestly regrown some of the budget of space life and physical sciences within the agency and engaged the U.S. science community outside NASA to join in this research. In addition, NASA has collaborated with the international space science community.

This midterm assessment reviews NASA's progress since the 2011 decadal survey in order to evaluate the high-priority research identified in the decadal survey in light of future human Mars exploration. It makes recommendations on science priorities, specifically those priorities that best enable deep space exploration.

Available at: <http://www.nap.edu/catalog/24966/a-midterm-assessment-of-implementation-of-the-decadal-survey-on-life-and-physical-sciences-research-at-nasa>



SSB Staff

MICHAEL H. MOLONEY

Director (through March 2, 2018)

RICHARD ROWBERG

Interim Director (from March 5, 2018)

ARTHUR A. CHARO

Senior Program Officer

SANDRA J. GRAHAM

Senior Program Officer

DAVID H. SMITH

Senior Program Officer

DWAYNE A. DAY*

Senior Program Officer

DAVID LANG*

Senior Program Officer

ABIGAIL SHEFFER

Program Officer

NATHAN BOLL

Associate Program Officer

SARAH BROTHERS

Associate Program Officer

MA BROWN

Research Associate

MARCHEL HOLLE

Research Associate

ANDREA REBHLZ*

Program Associate

ANESIA WILKS

Senior Program Assistant

DIONNA WISE

Program Associate

CARMELA J. CHAMBERLAIN

Administrative Coordinator

MEG KNEMEYER

Financial Officer

CELESTE A. NAYLOR

Information Management Associate

TANJA E. PILZAK

Manager, Program Operations

EMILY MORAVEC

Christine Mirzayan Science and Technology Policy Fellow (joint with BPA, through April 6, 2018)



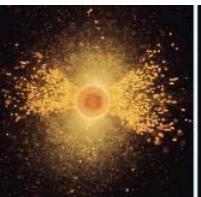
SSB Staff News

Michael Moloney, former director of Space and Aeronautics at the Space Studies Board (SSB) and the Aeronautics and Space Engineering Board (ASEB) assumed the role of CEO of the American Institute of Physics on March 5, 2018. The American Institute of Physics is an organization of physical science societies, representing scientists, engineers, educators, and students. AIP delivers valuable services and expertise in education and student programs, science communications, government relations, career services, statistical research in physics employment and education, industrial outreach and the history of physics and allied fields. AIP publishes "Physics Today," the most closely followed magazine of the physical sciences community. <http://www.aip.org>.

Michael held several positions at the National Academies of Sciences, Engineering, and Medicine. Prior to serving as the director of Space and Aeronautics for 8 years, he also served as the associate director of the Board on Physics and Astronomy, and as a study director for the National Materials Advisory Board (now the National Materials and Manufacturing Board). Since joining the National Academies, Michael oversaw the production of close to 100 reports, including five decadal surveys in astronomy and astrophysics, Earth science and applications from space, planetary science, microgravity sciences, and solar and space physics. He has also played a leading role in the production of decadal surveys in several physics disciplines -- including atomic, molecular and optical physics, condensed matter physics, and plasma physics.

The staff and members of the SSB and ASEB will miss Michael and his leadership, but we look forward to seeing what he does in this new venture.

* Staff of other Academies boards who are shared with the SSB.



SSB Meeting Calendar

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- May 1-3 Space Studies Board Washington, DC
- June 5-6 Exoplanet Science Strategy Washington, DC
- July 12-13 Forum for New Leaders in Space Science Pasadena, CA
- July 14-21 COSPAR 42nd Scientific Assembly Pasadena, CA

Upcoming Events

- November 7-9 Space Studies Board Irvine, CA

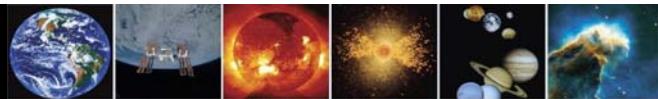


National Academy of Sciences
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2101 Constitution Ave NW
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Keck Center
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Washington, DC

Arnold and Mabel Beckman
100 Academy Drive
Irvine, CA

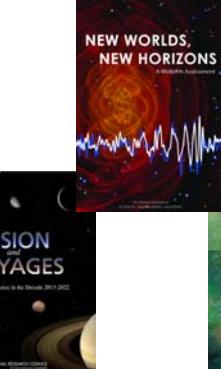
J. Erik Jonsson Conference Center
314 Quissett Ave
Woods Hole, MA



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