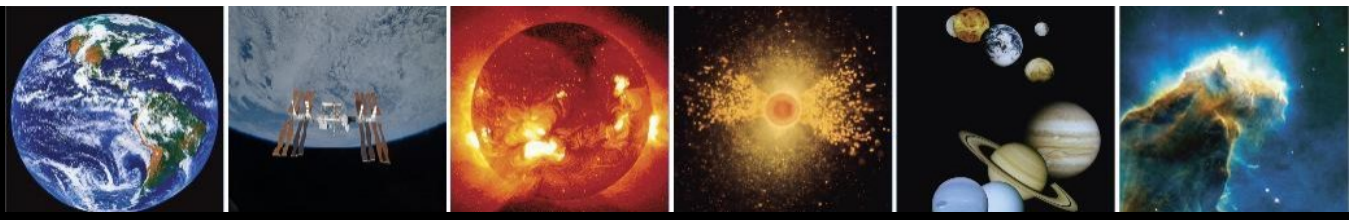
SPACE STUDIES BOARD NEWS



OCTOBER-DECEMBER 2016

Inside This Issue

"Neil [Gehrels] was a pioneering astronomer, a great instrumentalist, and the leader of astrophysics missions spanning from gamma rays to the infrared…He was also a mentor and friend to many, including myself. The entire astronomical community is mourning his loss."

Fiona Harrison, SSB Chair (from 1/1/17)

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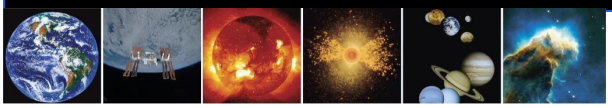


FROM THE CHAIR

Transitions and Continuity

Our country is in the midst of a political transition. While many things will change, the science questions and exploration goals that drive the NASA mission are enduring. One of the roles of the Space Studies Board is to identify and articulate these questions and goals. We strive to provide continuity by offering quality scientific advice to the government—a task we have been pursuing for nearly 60 years.

There is a broad consensus in the space community that success in the space sciences requires persistence and endurance. Congress has recognized the importance of making steady progress in pursuit of scientific goals and the NASA authorization legislation, which was in development before the election, is a bipartisan endorsement of the importance of continuing to move forward on science missions that require 5-15 years of support and human exploration goals that build on decades of investment. Once we have started a project, redesigning the requirements or deviating from the optimal funding profile can cost hundreds of millions or even billions of dollars.

The Space Studies Board provides, through its decadal surveys, a non-political and independent vision of the highest priority scientific goals for the civilian space program. The surveys identify compelling scientific questions and challenges in areas such as searching for life in our Solar System and beyond, understanding the forces that shape the evolution of the universe, determining how solar activity affects Earth, and understanding our changing planet.

Remarkably, NASA's role in understanding our changing planet is frequently a subject of the nation's policy discourse. NASA is not charged with developing or implementing climate policy, but the stated purpose of its Earth science program is "the development of a scientific understanding of Earth's system and its response to natural or human-induced changes and to improve prediction of climate, weather, and natural hazards". This goal of understanding our home planet ought to be a high scientific priority regardless of future policy choices.

Like the vast majority of active scientists, I have become convinced that human activity is increasing the abundance of carbon dioxide in the atmosphere and that this increased abundance is heating our planet. However, there is much we do not understand about the changing climate or how to respond to it. There are non-linear feedbacks that both enhance and suppress global warming. NASA's roles are to collect high quality data on the changing Earth, to characterize and model these data and to help understand these feedback processes. Those in the political realm who are more skeptical about climate science, should be particularly supportive of these roles for our nation's space agency since we need high quality data and continuity of data to establish clearly the trends seen in Earth's changing climate and thereby inform future policy choices.

The Space Studies Board's recent report, "Continuity of NASA Earth Observations from Space: A Value Framework" articulates how to understand the importance of the continuity of space-based Earth observation data sets. If we are to understand our changing Earth and play for its future, we require quality long-term measurements that are accurately calibrated and can be compared across time. The report notes:

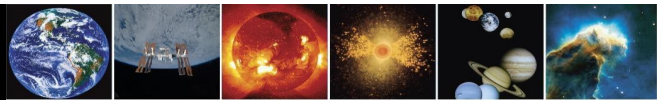
> Detection and attribution of climatic changes and long-term trends in the Earth system—addressing, for example, land cover and land use, storm intensity, ground water change, aerosols, ozone pollution and recovery, ice mass loss, and sea level change—require sustained measurements. Such measurements are also necessary to understand climate processes characterized by low-frequency variability. Because changes on a wide range of time and space scales affect Earth, each measurement's sampling characteristics need to be carefully designed to meet well-defined scientific and societal sampling objectives.

As the new administration and the new Congress contemplate priorities for the coming years, I hope that their choices value continuity in our data acquisition and scientific direction and in the vision of our exploration program.

On a much more local scale, the Space Studies Board is going through its own transition. I am grateful to have had the opportunity to have worked the outstanding scientists on the SSB and its superb staff. I very much valued my interactions with dedicated public servants who work at the federal agencies, in the administration and in Congress to enable the great things that we do in our civil space program. As we look forward to the future, I am delighted to be working with colleagues from the SSB and the Aeronautics and Space Engineering Board on organizing a one-day symposium on the future of civil space policy for the board's Spring meeting. I am thrilled that Fiona Harrison, an innovative astrophysicist who has successfully guided NASA's NuSTAR mission, will be the next chair of the Space Studies Board, and I wish her well as she helps steward the board in providing the bedrock of advice for our nation's space science program in the years ahead.

—David Spergel, SSB Chair

The views expressed here do not necessarily reflect those of the SSB or the National Academies of Sciences, Engineering, and Medicine.



SSB MEMBERSHIP

JULY 1, 2016—JUNE 30, 2017

DAVID N. SPERGEL, *Chair through December 31, 2016; Vice Chair from January 1, 2017*
Princeton University

FIONA HARRISON, *Chair from January 1, 2017*
California Institute of Technology

ROBERT D. BRAUN, *Vice Chair*
Georgia Institute of Technology

JAMES ANDERSON
Harvard University

JEFF M. BINGHAM
Consultant

JAY C. BUCKEY
Geisel School of Medicine at Dartmouth

MARY LYNNE DITTMAR
Dittmar Associates, Inc.

JOSEPH FULLER, JR.
Futron Corporation

THOMAS R. GAVIN
Jet Propulsion Laboratory

NEIL GEHRELS (through February 6, 2017)
NASA Goddard Space Flight Center

SARAH GIBSON
National Center for Atmospheric Research

WESLEY HUNTRESS
Carnegie Institution of Washington

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
Johns Hopkins University, Applied Physics Laboratory

SAUL PERLMUTTER
Lawrence Berkeley National Laboratory

ELIOT QUATAERT
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University of California, San Diego

MEENAKSHI WADHWA
Arizona State University

LIAISON

CHARLES KENNEL
U.S. Representative *TO COSPAR*

SSB Member News

SSB member Neil Gehrels passed away on February 6, 2017. Dr. Gehrels served as the chief of the Goddard Astroparticle Physics Laboratory working on the Fermi Gamma-ray Space Telescope, the Swift gamma-ray burst medium Explorer, the Wide Field Infrared Survey Telescope, and the Compton Gamma-ray Observatory.

"Neil was a pioneering astronomer, a great instrumentalist, and the leader of astrophysics missions spanning from gamma rays to the infrared," says Fiona Harrison, the Benjamin M. Rosen Professor of Physics and the Kent and Joyce Kresa Leadership Chair of the Division of Physics, Mathematics and Astronomy at Caltech. "He was also a mentor and friend to many, including myself. The entire astronomical community is mourning his loss."

Dr. Gehrels will be missed by the members and staff of the Space Studies Board.

Staff News

During this quarter the SSB hired two new Research Associates, Marchel Holle (in October) and Mia Brown (in December).

MARCHEL HOLLE joined the Space Studies Board as a Research Associate in 2016. Marchel received his B.A. in government with minors in physics and history from Hamilton College in 2016. While in school Marchel gained a wide breadth of experience in legislative and government affairs working with the Satellite Industry Association, the Aerospace Industries Association, SpaceX, The Space Foundation, and the Grocery Manufacturers Association.

MIA BROWN joined the Space Studies Board as a Research Associate in 2016. She comes to SSB with experience in both the civil and military space sectors and has primarily focused on policies surrounding US space programs in the international sector. Some of these organizations include NASA's Office of International and Interagency Relations, Arianespace, the United Nations Office for Disarmament Affairs (Austria), and the U.S. Department of State. From 2014 to 2015, Mia was the Managing Editor of the International Affairs Review. She received her M.A. in International Space Policy from the Space Policy Institute at the Elliott School of International Affairs. Prior to entering the Space Policy Institute, Mia received her M.A. in Historical Studies from the University of Maryland-Baltimore County (UMBC), where she concentrated in the history of science, technology, and medicine and defended a thesis on the development of the 1967 Outer Space Treaty.

The SSB will also be hosting a Christine Mirzyan Fellow in the first quarter of 2017.

JOEY SCHMITT is currently completing his PhD in astronomy at Yale University. He received his Master of Science and Master of Philosophy in astronomy in 2015 from Yale University and his B.S from the University of Iowa majoring in physics and astronomy and minoring in Latin. His PhD research has focused on exoplanets, planets outside of

the solar system, specifically the discovery and characterization of new exoplanets and doing statistics with populations of exoplanets. Much of this research has been made possible by the Planet Hunters citizen science project, in which online users help in the discovery of new planets and other astronomical phenomena. In addition to the citizen science project, Joey has participated in public outreach as an author for Astrobites.org and presenting weekly planetarium shows and telescope nights at the Leitner Family Observatory and Planetarium. Joey plans to use the Mirzayan Fellowship to learn the inner workings of science policy and as a jumping off point for a planned future career in science policy.

Cherie Achilles and Sarah Peacock completed their terms as Lloyd V. Berkner Space interns in November and December 2016. Their reflections on their experiences with the SSB are below.

My time as a Lloyd V. Berkner Space Policy Intern was an eye-opening experience into the importance of Space Studies Board committees and studies and how they influence NASA's policies. During my first week, I was introduced to the Decadal Survey for Earth Science and Applications from Space (ESAS). I attended a three-day weather panel meeting and later a two-day meeting about the various integrating themes across earth science disciplines. As a person who has spent the last ten years in planetary science, the opportunity to hear discussions between leading earth-science researchers about the critical observations required to solve key research questions on Earth was fascinating. As the Survey process progressed, I attended another meeting where science panel representatives and lead committee members discussed how to identify, prioritize, and implement the most critical Earth science measurements needed in the next ten years. Observing the process and discussions from the ESAS Decadal Survey broadened my understanding of the issues at the forefront of Earth science research and how technology development and new orbital missions are central to achieving the goals defined in the ESAS report.

In addition to the ESAS Decadal Survey, I participated in a planning committee meeting for a workshop entitled Searching for Life Across Space and Time and learned about the wide-ranging topics in astrobiology. I contributed to a report assessing the National Science Foundation's 2015 Geospace Portfolio Review, where I learned about the field of geospace research. Attending the committee meeting on Large Strategic NASA Science Missions, I was exposed to all four NASA Science Mission Directorates and learned how missions of various scales are competed and funded. Lastly, at the end of my internship and following the presidential election, I was able to speak to top space policy experts about the influence of the executive branch to NASA's vision and what changes might lie ahead for NASA under a new administration.

As a Berkner Intern, I gained a broader perspective on NASA's science goals, missions, and vision for the future. I learned about areas of research I had never been exposed to and about space policy and how Congress' decisions influence the space program. This internship exposed me to new people, perspectives, and opportunities that I would never been able to experience in graduate school alone. I am so grateful to have had the opportunity to work with the Space Studies Board.

I am very grateful for my semester spent with the Space Studies Board as a Lloyd V. Berkner intern. It was an incredible learning experience and I am going miss working here. I especially enjoyed the opportunity to work on a variety of projects spanning a broad range of topics and meeting the committee members and policy makers involved. My internship started in the middle of a busy week with three NRC meetings happening simultaneously. It was a unique and exciting experience going from a meeting with various NASA directors discussing the future of strategic missions one day to sitting at a table with experts in solar physics discussing how to forecast space weather the next. Through attending SSB and ASEB committee meetings and helping with an upcoming report, I gained a better understanding of the nature of top-level space policy discussions and the importance of the outcomes of these discussions.

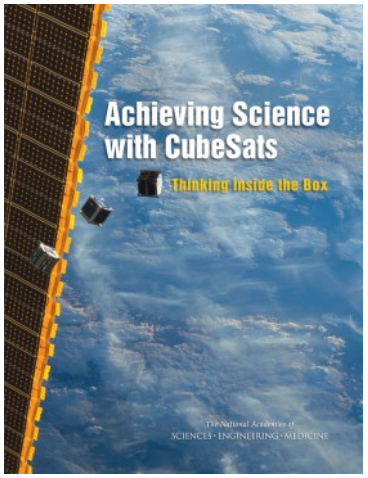
I spent the majority of my time at the National Academies working on the Searching for Life Across Space and Time Workshop. It was a very gratifying experience helping with the preparations and execution of a workshop closely aligned with my academic research. I enjoyed getting to know the speakers and committee members better than if I had been a general attendee and I gained insight into how much hard work goes into putting on workshops and conferences - something I had previously taken for granted.

I greatly appreciate the mentorship I received from the SSB program officers as well as them taking the time to set up meetings to introduce me to important people in the space policy field. Being at the academies during a presidential transition spurred many interesting conversations with both these policy figures and members of the SSB regarding key issues in civil space that our next administration will face and endeavors they might focus on. I also want to thank the research associates and program coordinators and assistants who I worked closely with during my time with the SSB - you guys rock! This internship has been a wonderful experience and has furthered my understanding of how space policy is formulated and implemented. The skills and knowledge I have gained through this opportunity will undoubtedly contribute to future success in my career.

SSB ACTIVITIES

THE BOARD AND ITS STANDING COMMITTEES

The **Space Studies Board (SSB)** met November 2-4 in Irvine, CA. The morning session on the first day included reports from the standing committee co-chairs, Marcia Rieke and Steve Ritz (CAA), Phil Christensen (CAPS), Michael King (CESAS), Todd Hoeksema (CSSP), and Rob Ferl (CBPSS); and plans for the 2017 Space Science Week and the new discipline committees (more information below). The afternoon session: included an update on the planning for COSPAR 2018 in Pasadena, CA (Gregg Vane); an update on other COSPAR activities (David Smith, SSB staff); and an update from Athena Coustenis (ESSC Chair) on the ESSC's activities. That was followed by a session with Thomas Zurbuchen (NASA AA for SMD) on a status report from the NASA Science Mission Directorate; and a session on Current and Future Issues and Activities of the SSB, including report briefings on *Extending Science—NASA's Space Science Mission Extensions & the Senior Review Process* and *New Worlds, New Horizons: A Midterm* Assessment; and a discussion of a future potential study on an open code future for space science. Day 2 included a session on planning for the Joint SSB/ASEB symposium on civil space policy which will take place May 2, 2017 during the joint SSB/ASEB spring meetings; a session on setting a research agenda for space weather; and an overview of the planning for the SSB workshop *Searching for Life Across Space and Time* (Jim Kasting, planning committee chair). That was followed by a talk from Joshua Brost, SpaceX on SpaceX and plans for the Red Dragon missions to Mars; and a session on the interconnectivity or interdependence of missions across the SMD disciplines with perspectives from astrobiology (Penny Boston, NAI) and astronomy (Chryssa Kouveliotou, GWU). Day 2 ended with a science talk from Kevin Hand, JPL on the science of ocean worlds.



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The next meeting is the joint SSB/ASEB spring meeting and symposium on civil space policy. The ASEB will meet on May 1, the symposium will take place on May 2 and the SSB will meet on May 3-4. Visit <www.nas.edu/ssb> to stay up to date on board, workshop, and study committee meetings and developments.

The standing committees supported by NASA-SMD (**CAA, CAPS, CESAS, and CSSP)** held their last meetings this fall before, on January 1, 2017, they will be reconstituted as "discipline committees." The new status will enable them to draft reports containing consensus conclusions and findings on the implementation of their respective decadal surveys.

The **Committee on Astrobiology and Planetary Science (CAPS)** did not meet during this quarter. Current efforts focus the transition of CAPS from standing committee to a discipline committee. As part of this transition, new appointments will be made during the first quarter of 2017 to replace members whose terms have finished or to replace members whose specific individual circumstances are incompatible with the stricter conflict-of-interest requirements associated with the committee's enhanced status. It is anticipated that all the membership changes will be completed in time for the next meeting of CAPS, which will be held at the National Academy of Sciences Building in Washington, D.C. as part of Space Science Week on March 28-30, 2017. To learn about upcoming meetings, and download presentations from past meetings, please visit http://sites.nationalacademies.org/SSB/SSB_067577.

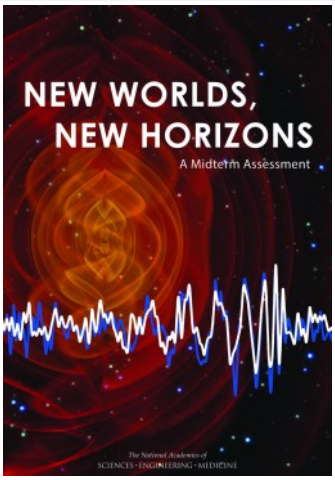
The **Committee on Astronomy and Astrophysics (CAA)** met in-person on October 31 to November 1, 2016 in Irvine, CA. The meeting opened with discussions with Jim Ulvestad (NSF Astronomy), Paul Hertz (NASA Astrophysics), and Kathy Turner (DOE High Energy Physics) about their perspectives on and preparations for the next decadal survey in astronomy and astrophysics. The committee then held a focus session on planning for the next survey and discussed such subjects as the study's scope, timing, the CATE process, and community outreach and input, among others. The meeting also featured talks by Jackie Hewitt, MIT, on the mid-decadal astronomy and astrophysics report (the authoring committee for which she chaired); Dave Silva, NOAA, on the state of the ground-based optical and infrared system; Fabio Favata, ESA, on developments with ESA's Athena and L3 (eLISA) missions; Eric Smith, NASA, on JWST's progress; and Neil Gehrels and Kevin Grady, NASA, on progress on WFIRST. The meeting closed with committee discussions about the next meeting during Space Science Week 2017. The next committee meeting will take place March 28-30, 2017 as part of Space Science Week at the National Academy of Sciences Building in Washington, D.C. For more information about the CAA, and to download presentations from past meetings, please visit http://sites.nationalacademies.org/BPA/BPA_048755.

The **Committee on Biological and Physical Sciences in Space (CBPSS)** met for a day and a half on December 13th and 14th in Irvine, California to obtain updates on developments and challenges in the microgravity research program and to plan for both the pending midterm review of progress on the 2011 decadal microgravity study recommendations. At the meeting, CBPSS heard from new NASA Division of Space Life and Physical Sciences Research and Applications (SLPSRA) Director, Craig Kundrot, regarding the status and new directions for the microgravity program, and there was discussion that included such issues as the role of microgravity research in NASA technology development and exploration needs. The committee also received detailed program science presentations in several areas. David Tomko, NASA, presented on Space Biology research findings and flight challenges, and Steve Davison, NASA, discussed Human Research planning and progress on retiring flight medical risks. Francis Chiaramonte, NASA, presented on Physical Sciences research and

updated the committee on the status of the Physical Sciences Informatics database. Brad Carpenter, NASA, presented on Fundamental Physics research on the ISS, including the Cold Atom laboratory. The open session of the meeting concluded with a roundtable discussion between NASA representatives and the committee on the upcoming mid-term review, ISS resource challenges, and the role of the microgravity research program in relation to the science community, other government agencies and the nation. During this period CBPSS co-chair Robert Ferl and staffer Sandra Graham both attended the American Society for Gravitational and Space Research in Cleveland, Ohio on November 26-29, 2016. The next committee meeting will take place March 28-30, 2017 as part of Space Science Week at the National Academy of Sciences Building in Washington, D.C. For more information about the CBPSS, and to download presentations from past meetings, please visit http://sites.nationalacademies.org/SSB/SSB_145312.

The **Committee on Earth Science and Applications from Space (CESAS)** met on October 4-5, 2016 in Washington, DC. In addition to agency-provided updates on the land imaging programs at USGS and activities within NASA's Earth Science Division and NOAA NESDIS, the meeting featured sessions devoted to an exploration of data issues of interest to both the committee and to the work of the decadal survey, "ESAS 2017." Among the topics explored were Big Data and Earth Science, the impact of cloud computing, new roles for the commercial sector in data acquisition and processing, and whether there are areas that require near-term attention to prepare for Earth science data needs through the decadal survey interval, 2017-2027, and beyond. The CESAS website, http://sites.nationalacademies.org/SSB/SSB_066587 has further information, including links to presentations, for this and other recent meetings. The committee's next meeting will take place in Washington, DC on March 28-29, 2017 as part of the SSB's Space Science Week.

The **Committee on Solar and Space Physics (CSSP)** held its fall meeting October 5-7, 2016 in Washington, DC. The committee heard agency updates from NASA Heliophysics, NSF Geospace Section and NSF Division of Astronomical Sciences, and NOAA. The committee also heard an update on NASA's Solar Probe Plus mission and an overview of topics discussed by the NASA Advisory Council Science Committee – Heliophysics. For the meeting's second day, the CSSP held a focus session on Gaps in Space Weather Forecasting, featuring presentations and discussions from NASA, NOAA, USAF, and the Office of the Federal Coordinator for Meteorology as well as science-focused talks from Lisa Upton, High Altitude Observatory; Ryan Mcgranaghan, Dartmouth College; and Andrés Muñoz-Jaramillo, Georgia State University. On the third day, the committee held follow-up discussion with NASA Heliophysics and discussed possible topics for study by the SSB. The CSSP's next meeting will be held at the SSB's Space Science Week, March 28-30, at the National Academy of Sciences building in Washington, DC. Further information about the committee is available at http://sites.nationalacademies.org/SSB/SSB_052324.



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STUDY COMMITTEES

The **Committee on the Assessment of the National Science Foundation's 2015 Geospace Portfolio Review** held their third and final meeting August 21-22, in Woods Hole, MA, to prepare a draft of their report. The report was released January 31, 2017. More information about this project is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_169109. The report is available at https://www.nap.edu/catalog/24666/assessment-of-the-national-science-foundations-2015-geospace-portfolio-review.

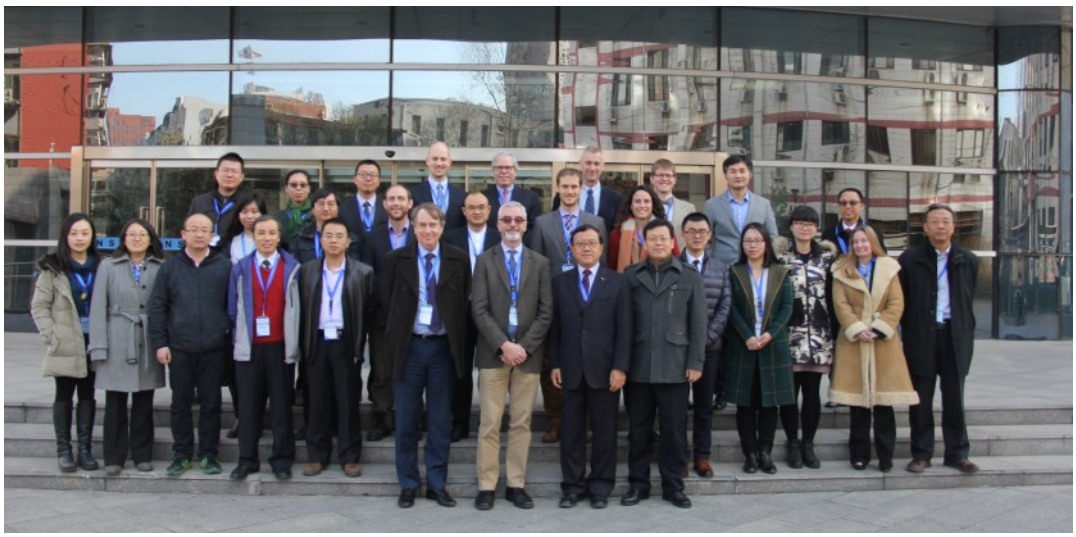
The **2017-2027 Decadal Survey for Earth Science and Applications from Space (ESAS 2017)** was very active during the quarter with numerous teleconferences among and between the steering committee and panels. In addition, the survey steering committee met in person from November 7-10 in Irvine, California with participation from representatives from each of the committee's five supporting study panels. On December 13, 2016, the survey co-chairs presented an update to the community in a town hall at the fall meeting of the American Geophysical Union in San Francisco. As the quarter ended, preparations were underway for a similar town hall to be held at on January 24, 2017 at the 97th Annual Meeting of the American Meteorological Society in Seattle. In addition, preparations were underway for the next steering committee meeting (January 18-20, 2017 in Irvine) and the third and final meeting of the five study panels, which will meet jointly from February 15-18, 2017 in Irvine, California. Some 100 members of the community are participating on one or more of the survey's committees. Links on the survey website, www.nas.edu/esas2017, describe survey activities during the quarter in more detail; also posted on the website are survey newsletters to the community.

The **Committee on Large Strategic NASA Science Missions: Science Value and Role in a Balanced Portfolio** is co-chaired by Kathy Thornton of the University of Virginia and Ralph McNutt of the Johns Hopkins Applied Physics Laboratory. The committee held its second meeting December 7-10 at the Beckman Center. The committee heard from representatives of the decadal surveys as well as leaders of several flagship-class science missions. Among the issues that the committee discussed were the definition of large strategic missions, and how they are being conducted within NASA. The committee will hold its third meeting February 15-17 at the Keck Center. The committee plans to deliver its report to NASA in summer 2017. Additional information about this project can be found at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_173492.

The **Committee on a Midterm Assessment of Implementation of the Decadal Survey on Life and Physical Sciences Research at**

NASA began work in late October with the vetting of names previously nominated for the task through the auspices of the study's oversight committee (Committee on Biological and Physical Sciences). A balanced slate of individuals meeting the study criteria was selected, solicited to serve, and submitted to the Academies nomination process, and approval was received in early January 2017. Preliminary consultations were also conducted during this period with NASA, CBPSS, and science community members for study planning purposes, and a first meeting date of Feb. 7-9, 2017 in Washington, D.C. was set. More information on this project can be found at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_174910.

The **Committee on NASA Science Mission Extensions** delivered its final report to NASA which went public in early September. The co-chairs Vicky Hamilton and Harvey Tananbaum briefed the report to NASA officials and congressional staff and also presented to the NASA Advisory Committee's Science Committee. The report recommended that the 2-year cadence for conducting senior reviews of extended missions should be increased to every three years to increase efficiency. The draft House and Senate NASA authorization bills included this language, but were not passed in 2016. The report provides numerous examples of major scientific discoveries made in the extended phase of numerous missions across all of NASA's space science disciplines. More information about this project can be found at: http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_169078.



Forum for New Leaders in Space Science at the National Space Science Center in Bejing, China, December 2-3 *(photo courtesy of Michael Moloney)*

The **Committee on the Review of NASA's Planetary Science Division's Restructured Research and Analysis Programs** has completed all of its planned meetings. A complete draft of the committee's report was assembled in October-November and sent to 10 external reviewers for comment in late-November. The committee is currently responding to reviewer comments and it is anticipated that the revised report will be approved for delivery to NASA and subsequent public release during the first quarter of 2017. More information about the committee can be found at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_169563.

The **Committee on the Review of Planetary Protection Policy Development Processes,** is currently in the process of formation. The committee's chair, Joseph K. Alexander, was formally appointed during the final quarter of 2016 and is presently engaged with SSB staff in selection, recruitment and formal appointment of the remaining members of the committee. It is anticipated that the committee's membership will be finalized during the first quarter of 2017 and will hold its first meeting as soon as is practicable. In December, Mr. Alexander and SSB staff conducted preliminary discussions concerning the scope of the study with NASA officials—including the agency's chief scientist, associate administrator for the Science Mission Directorate, and planetary protection officer—and representatives from the Office of Space and Advanced Technology at the U.S. Department of State. In addition, Mr. Alexander met with representatives of the international planetary protection community at the December 14-15 meeting of the European Science Foundation's Planetary Protection of the Outer Solar System (see below) group at the German Aerospace Center in Cologne.

The **Committee on the Review of Progress Toward Implementing the Decadal Survey Vision and Voyages for Planetary Sciences** was funded at the end of the quarter. Work has begun on committee formation.

The workshop, **Searching for Life Across Space and Time,** was successfully held on December 5-6 at the Academies' Beckman Center in Irvine, California. Approximately 120 experts from the fields of astrobiology, astrophysics and planetary science together with as many as 92 online participants spent two-full days discussing the search for life in the solar system and extrasolar planetary systems. The in-person presentations and discussions were supplemented by 43 posters displayed throughout the workshop. A workshop proceedings will be drafted during the first quarter of 2017 and formally published by the National Academies Press in the second quarter of 2017. Additional details and the video recording of the workshop can be found at http://sites.nationalacademies.org/ssb/currentprojects/ssb_173278.

The SSB's sister Board, the Aeronautics and Space Engineering Board, also publishes a newsletter; visit <http://sites.nationalacademies.org/DEPS/ASEB/DEPS_046908> to subscribe or to view past newsletters. SSB's division, the Division on Engineering and Physical Sciences, also publishes a newsletter; visit <http://sites.nationalacademies.org/DEPS/DEPS_059299> to subscribe.

OTHER ACTIVITIES

The **Forum for New Leaders in Space Science** is a cooperative activity between the National Academies and the Chinese Academy of Sciences (CAS) and 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. The third cohort of participants, representing the life- and physical-science research communities held the first of their two planned meetings at the National Space Science Center in Beijing on December 2-3, 2016. The same group is scheduled to meet again at the National Academies' J. Erik Jonsson Center in Woods Hole, Massachusetts, on May 16-17, 2017. SSB and CAS staff have outlined tentative plans to recruit a fourth cohort of young U.S. and Chinese scientists, representing the astrophysics and heliophysics communities, in mid-to-late-2017. If sufficient funds can be raised to support a fourth cohort, a forum will be held in China in January 2018, and in California, immediately prior to the July 2018 COSPAR Scientific Assembly in Pasadena. Additional details concerning this activity can be found at http://sites.nationalacademies.org/SSB/SSB_086017.

COSPAR is still in the process of recovering from the unprecedented cancellation of its 41st Scientific Assembly, which had been scheduled to take place in Istanbul, Turkey in August. To this end, the COSPAR Council used an electronic ballot to decide on Sydney, Australia, as the location of its 2020 scientific assembly. Similarly, COSPAR's Scientific Commissions and the Panels have worked via email and other virtual modalities to outline the scientific sessions to be held at the 2018 assembly in Pasadena, California. In addition, planning continues apace for the third of COSPAR's "off-year" symposia, to be held on Jeju Island, South Korea, on September 18-22, 2017. The next round of COSPAR business meetings (including the first meeting of the Science Program Committee for the Pasadena Assembly) will take place at COSPAR headquarters in Paris on March 20-22, 2017.

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. The PPOSS group addressing the activities so-called Work-Package 2—a document outlining best practices in addressing current planetary protection policies—held its final in-person meeting at the German Aerospace Center in Cologne on December 14-15, 2016. Work on the next major PPOSS activity, Work-Package 3—a document identifying current scientific and technical research issues relating to planetary protection for objects in the outer solar system—will commence at a pair of back-to-back meetings scheduled to take place at the German Aerospace Center on January 23-27, 2017 . 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 Work-Package 3 and follow-on activities. To this end, ESF selected Geoffrey Collins (Wheaton College) and Mark Saunders (NASA Langley Research Center, retired) as their preferred participants from a list of candidates drafted by the SSB staff. Additional U.S. experts will also participate and are being directly supported by PPOSS. Both Dr. Collins and Mr. Saunders are participating in their own recognizance as scientific and technical experts and their work and that of PPOSS is not officially endorsed by the SSB or the National Academies. Additional information about PPOSS can be found at http://pposs.org/.

Charles Norton, SSB committee member (CubeSats and Large Strategic Missions) at the National Academies booth at the AGU *(photo courtesy of Celeste Naylor)*

SSB STANDING COMMITTEE CO-CHAIRS (January-December 2016)

Committee on Astrobiology and Planetary Science (CAPS)

Philip R. Christensen, Arizona State University
Christopher H. House

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

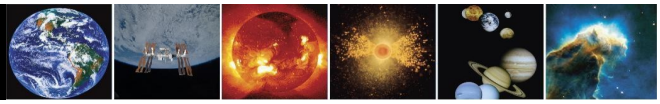
Committee on Earth Science and Applications from Space (CESAS)

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

Committee on Solar and Space Physics (CSSP)

J. Todd Hoeksema, Stanford University
Mary K. Hudson, Dartmouth College

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



NEW RELEASES

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

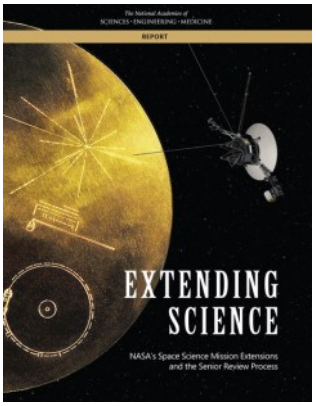
Assessment of the National Science Foundation's 2015 Geospace Portfolio Review

At the request of the Advisory Committee for Geosciences of the National Science Foundation (NSF), a review of the Geospace Section of the NSF Division of Atmospheric and Geospace Sciences was undertaken in 2015. The Portfolio Review Committee was charged with reviewing the portfolio of facilities, research programs, and activities funded by Geospace Section and to recommend critical capabilities and the balance of investments needed to enable the science program articulated in the 2013 NRC decadal survey *Solar and Space Physics: A Science for a Technological Society.* The Portfolio Review Committee's report *Investments in Critical Capabilities for Geospace Science 2016 to 2025* (ICCGS) was accepted by the Advisory Committee for Geosciences in April 2016.

Assessment of the National Science Foundation's 2015 Geospace Portfolio Review provides an independent assessment of the ICCGS report. This publication assesses how well the ICCGS provides a clear set of findings, conclusions, and recommendations for Geospace Section that align with the science priorities of the NRC decadal survey, and adequately take into account issues such as the current budget outlook and the science needs of the community. Additionally, this study makes recommendations focused on options and considerations for NSF's implementation of the ICCGS recommendations.

Available at https://www.nap.edu/catalog/24666/assessment-of-the-national-science-foundations-2015-geospace-portfolio-review.

Extending Science—NASA's Space Science Mission Extensions and the Senior Review Process



NASA operates a large number of space science missions, approximately three-quarters of which are currently in their extended operations phase. They represent not only a majority of operational space science missions, but a substantial national investment and vital national assets. They are tremendously scientifically productive, making many of the major discoveries that are reported in the media and that rewrite textbooks.

Extending Science – NASA's Space Science Mission Extensions and the Senior Review Process evaluates the scientific benefits of missions extensions, the current process for extending missions, the current biennial requirement for senior reviews of mission extensions, the balance between starting new missions and extending operating missions, and potential innovative cost-reduction proposals for extended missions, and makes recommendations based on this review.

Available at https://www.nap.edu/catalog/23624/extending-science-nasas-space-science-mission-extensions-and-the-senior.

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Lloyd V. Berkner Space Policy Intern

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

2 Through December 2016

3 From December 2016

4 From October 2016

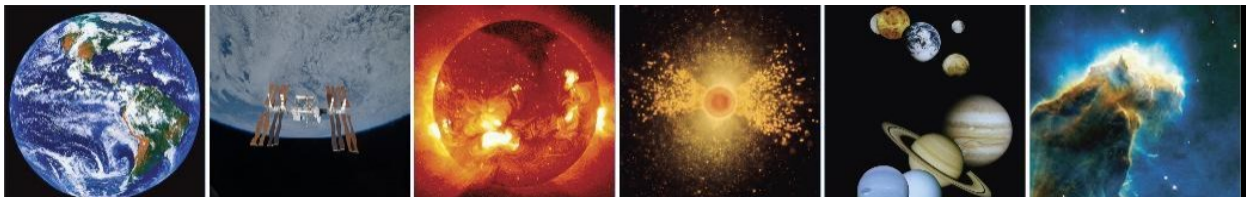
5 Through November 2016

Space Science Week 2017

Space Science Week will be held March 28-30, 2017 at the NAS Building, 2101 Constitution Avenue, NW, Washington D.C. Space Science Week is a three-day gathering of the discipline and standing committees of the Space Studies Board, the Board on Physics and Astronomy (BPA), and the Aeronautics and Space Engineering Board (ASEB) to discuss issues and advances in their relevant fields. The committees will meet in parallel with a plenary session on the afternoon of March 28. A public lecture will be held on March 29 (see more information below). More information, including the registration for the full meeting, is available at www.nas.edu/ssw.

The discipline and standing committees include:

- Committee on Astronomy and Astrophysics (CAA; joint with the BPA)
- Committee on Astrobiology and Planetary Science (CAPS)
- Committee on Biological and Physical Sciences in Space (CBPSS; joint with the ASEB)
- Committee on Earth Science and Applications from Space
- Committee on Solar and Space Physics



SSB Calendar

January

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April

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16	17	18	19	20	21	22
23/30	24	25	26	27	28	29

January 18-20	Decadal Survey for Earth Science and Applications from Space—Steering Cmte	Irvine, CA
February 7-9	Midterm Assessment of Implementation of the Decadal Survey on Life and Physical Sciences Research at NASA (joint with ASEB)	Washington, DC
February 15-17	Large Strategic NASA Science Missions: Science Value and Role in a Balanced Portfolio	Washington, DC
February 15-18	Decadal Survey for Earth Science and Applications from Space—Panel Jamboree Global Hydrological Cycles and Water Resources Weather and Air Quality: Minutes to Subseasonal Marine and Terrestrial Ecosystems and Natural Resource Management Climate Variability and Change: Seasonal to Centennial Earth Surface and Interior: Dynamics and Hazards	Irvine, CA
March 6-8	Decadal Survey for Earth Science and Applications from Space—Steering Cmte	Washington, DC
March 7-9	Planetary Protection Policy Development	Washington, DC
March 28-30	Space Science Week Committee on Astronomy and Astrophysics Committee on Astrobiology and Planetary Science Committee on Biological and Physical Science in Space Committee on Earth Science and Applications from Space Committee on Solar and Space Physics	Washington, DC
April 18-20	Midterm Assessment of Implementation of the Decadal Survey on Life and Physical Sciences Research at NASA (joint with ASEB)	Washington, DC

National Academy of Sciences Building
2101 Constitution Ave NW
Washington, DC

Keck Center
500 Fifth St NW,
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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- ☐ Evaluation of the Implementation of WFIRST/AFTA in the Context of New Worlds, New Horizons in Astronomy and Astrophysics (2014)
- ☐ Review of the Draft 2014 Science Mission Directorate Science Plan (2014)
- ☐ Opportunities for High-Power, High-Frequency Transmitters to Advance Ionospheric/Thermospheric Research: Report of a Workshop (2014)
- ☐ Lessons Learned in Decadal Planning in Space Sciences: Summary of a Workshop (2013) CD
- ☐ Landsat and Beyond: Sustaining and Enhancing the Nations Land Imaging Program (2013)
- ☐ Solar and Space Physics: A Science for a Technological Society (2013) Book and CD
- ☐ NASA's Strategic Direction and the Need for a National Consensus (2012)
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