

OCTOBER - DECEMBER 2018

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Space Science Week is scheduled for March 26-28, 2019 at The National Academy of Sciences Building in Washington, D.C.

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The National Academies of
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SPACE STUDIES BOARD NEWS

THE BOARD AND ITS DISCIPLINE COMMITTEES

The **Space Studies Board (SSB)** met November 7-9, 2018 at the Arnold and Mabel Beckman Center in Irvine, California for the 60th Anniversary of the board. On the first day of the meeting the board received updates from the Science Mission Directorate (Michael New), the board's discipline committee chairs (see page 5 of this newsletter), and representatives from NASA's Science Advisory Committees. The board also received an update from board member Mary Lynne Dittmar on the National Space Council User's Advisory Group (of which she is also a member). Tom Young gave an update on the JWST Independent Review Board (IRB) and Greg Robinson (NASA) talked about NASA's approach and progress in implementing the IRB recommendations. The board then heard from Charles Norton (NASA) on NASA's strategy for leveraging smallsats and cubesats. The second day included a quick update on the preparations and activities for Astro2020; a briefing from Louise Prockter, co-chair of the report *Visions into Voyages for Planetary Science in the Decade 2013-2022: A Midterm Review*; an update from the European Space Science Committee (Athena Coustenis and Nicolas Walter); and an update on the SSB's international activities (David Smith). The majority of the day focused on preparations for the upcoming SSB workshop which will address science opportunities using the Gateway. The board heard an update on the Gateway from Jason Crusan (NASA), then heard from NASA representatives (Steve Clarke, Exploration; Lori Glaze, Planetary Science; Paul Hertz, Astrophysics; and Peg Luce, Heliophysics) on NASA science enabled by the Gateway. Betsy Cantwell (ASEB Vice Chair) then talked about science enabled by commercial partnerships. The board then heard from 2 panel sessions about the science enabled by the Gateway, the first focused on the Gateway as an untended science platform and the second focused on enabling engineering.

The board's next meeting will be held at the Keck Center in Washington, D.C., April 30-May 1, 2019. More information on the board is available at http://sites.nationalacademies.org/SSB/SSB_052281.

The **Committee on Astrobiology and Planetary Science (CAPS)** did not meet during this quarter. The committee's two short reports on NASA's current lunar science and exploration initiative were completed during this quarter and sent to reviewers. The reports were revised in December and delivered to NASA February 7, 2019. The committee's next meeting will be held at Space Science Week in Washington, D.C., March 26-28, 2019. More information on CAPS is available at http://sites.nationalacademies.org/SSB/SSB_067577.

The **Committee on Astronomy and Astrophysics (CAA)** met at the Arnold and Mabel Beckman Center, October 29-30, 2018. The committee received updates from and discussed preparations for the next decadal survey (Astro2020) with agency representatives (Richard Green, NSF; Paul Hertz, NASA; and Eric Linder, DOE). The committee also held a focus session on the preparations for Astro2020. The committee's next meeting will be held at Space Science Week in Washington, D.C., March 26-28, 2019. 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 on Oct. 23-25, 2018 in Irvine, CA to conduct strategic planning for the upcoming decadal survey. On the first day of the meeting, SLPSRA Director Craig Kundrot briefed the committee on SLPSRA's status including its role in Gateway planning and the implementation of the decadal midterm report recommendations. The committee also received detailed program science presentations in several areas. David Tomko, NASA, presented on developments in the Space Biology program, including Genelab successes, and Bill Paloski, NASA, discussed Human Research programs and progress on retiring flight medical risks. Brad Carpenter, NASA, presented on Fundamental Physics research on the ISS, including the status of the Cold Atom laboratory launched in May. Francis Chiaramonte,

SSB MEMBERSHIP

JULY 1, 2018—JUNE 30, 2019

FIONA HARRISON, *Chair (through Dec 31, 2018)*
California Institute of Technology

JAMES H. CROCKER *Vice Chair*
Lockheed Martin Space Systems Company
(retired)

GREGORY P. ASNER
Carnegie Institution for Science

JEFF M. BINGHAM
Consultant

ADAM BURROWS
Princeton University

MARY LYNNE DITTMAR
Dittmar Associates, Inc.

JEFF DOZIER
University of California, Santa Barbara

JOSEPH FULLER, JR.
Futron Corporation (retired)

SARAH GIBSON
National Center for Atmospheric Research

VICTORIA HAMILTON
Southwest Research Institute

CHRYSSA KOUVELIOTOU
The George Washington University

DENNIS P. LETTENMAIER
University of California, Los Angeles

ROSALY M. LOPES
Jet Propulsion Laboratory

STEPHEN J. MACKWELL
Universities Space Research Association

DAVID J. MCCOMAS
Princeton University

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

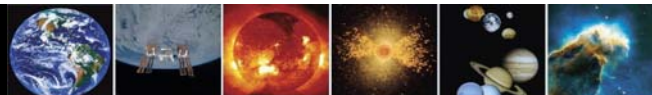
ERIKA WAGNER
Blue Origin, LLC

PAUL WOOSTER
Space Explorations Technologies

EDWARD L. WRIGHT
University of California, Los Angeles

LIAISON

CHARLES KENNEL
U.S. Representative to COSPAR



NASA, presented on Physical Sciences research and talked about the increasing importance of zero boil-off tank research to exploration. The first day ended with a discussion of possible spring meeting topics. On the second day, the committee heard talks intended to help define the environment in which the decadal study would take place. Randy Giles of CASIS discussed the National Lab research strategy and activities, including those aligned with the decadal and midterm studies; ISS Director Sam Scimemi provided a detailed update on NASA's ISS transition planning; and Advanced Exploration Systems Deputy Director John Guidi briefed the committee on the planning for Gateway and lunar science capabilities. The rest of the open meeting was devoted to discussions between NASA and the committee on an extensive set of issues previously identified by NASA and the committee as critical to framing the task statement for the decadal study, including questions about the post ISS landscape and the evolving role of commercial entities in microgravity research.

During this period CBPSS members Betsy Cantwell (ASU), Jim Pawelczyk (Penn State), Rob Ferl (University of Florida), and Steven Collicott (Purdue) participated in roundtable discussions intended to inform the White House development of a National Microgravity Strategy. Member Erika Wagner represented the committee at the November 7-9 meeting of the Space Studies Board in Irvine, CA, and CBPSS study director Sandra Graham was presented with a Distinguished Service Award by the American Society of Gravitational and Space Research during its November meeting. Additionally during this period, final contractual approvals were received for the conversion of CBPSS to a discipline committee, allowing it to write brief reports on specific questions related to the implementation of the decadal report or its midterm review. Nominations and appointments will be made to this new discipline committee in early 2019. The committee's next meeting will be held at Space Science Week in Washington, D.C., March 26-28, 2019. 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 from October 25-26, 2019 in Washington, DC. During the meeting, the committee received updates on agency programs and plans from NASA (Mike Freilich, Director of the Earth Science Division), NOAA (Ajay Mehta, Senior Advisor-NESDIS), and USGS (Tim Newman, Program Coordinator for Land Remote Sensing). The committee also was briefed by study co-chair and CESAS co-chair, Chelle Gentemann, on the results of the SSB study, *Open Source Software Policy Options for NASA Earth and Space Sciences*. Continuing to pursue its interest in issues related to "big data," cloud computing, and techniques and applications for data analytics on Earth observational data, the committee also held sessions with Kevin Murphy, Program Executive of Earth Science Data Systems, NASA; and Ed Kearns, Chief Data Officer, NOAA. The committee also made preliminary plans for its March meeting and reviewed a draft of a "popularization"—a richly illustrated summary intended for distribution to a wide audience including the general public—of the recently published decadal survey in Earth Science and Applications from Space. The committee's next meeting will be held at Space Science Week in Washington, D.C., March 26-28, 2019. More information on CESAS is avail-

able at http://sites.nationalacademies.org/SSB/SSB_066587.

The **Committee on Solar and Space Physics (CSSP)** held its fall meeting October 16-18, 2018, in Irvine, CA. CSSP heard updates from NASA Heliophysics Division, NSF Geospace Section, NSF Division of Astronomical Sciences, NOAA Space Weather Prediction Center, and the NASA Heliophysics Advisory Council. CSSP received detailed briefings on the status of the Parker Solar Probe and GOLD missions as well as briefings on demographics of the scientific community and recent activity of the Space Weather Operations, Research, and Mitigation Subcommittee. The committee discussed the upcoming midterm review of the decadal survey in solar and space physics and received a briefing on the recently released report *Open Source Software Policy Options for NASA Earth and Space Sciences*. The CSSP held a focus session on small satellite constellations with perspectives from the NSF CubeSat program and NASA's smallsat program. The session also included discussions of opportunities and challenges of commercial satellite constellations with speakers from Google and Iridium as well as a final group discussion of potential short reports. The committee's next meeting will be held at Space Science Week in Washington, D.C., March 26-28, 2019. 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** has completed its work and has been disbanded. Attention now focusses on preparing the report for formal publication by the National Academies Press; currently scheduled for the first quarter of 2019. The report is available in prepublication format at <https://www.nap.edu/catalog/25252>.

SSB DISCIPLINE/STANDING COMMITTEE CO-CHAIRS

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)

Vassiliki (Vicky) Kalogera, Northwestern University
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

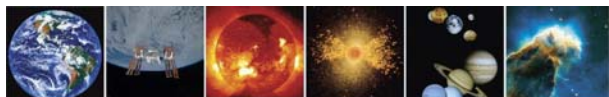
Committee on Earth Science and Applications from Space (CESAS)

Chelle Gentemann, Earth & Space Research
Steve Running, University of Montana (emeritus)

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.



The **Committee on Best Practices for a Future Open Code Policy for NASA Space Science** released its final report in December 2018. More information about the project is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_178892. The report is available at <https://www.nap.edu/catalog/25217>.

The **Decadal Survey on Astronomy and Astrophysics 2020 (Astro2020)** is pleased to announce the appointment of the survey committee co-chairs, Fiona A. Harrison (NAS), California Institute of Technology, and Robert C. Kennicutt, Jr. (NAS), University of Arizona and Texas A&M University. The co-chairs spoke at a townhall at the American Astronomical Society meeting in Seattle, WA, on January 9, 2019. Astro2020 requested nominations for survey committee and panel membership through February 5, 2019. Science white papers were accepted from January 7 to February 19, 2019. More information on Astro2020 is available at <http://nas.edu/astro2020>.

Thriving on Our Changing Planet: A Decadal Strategy for Earth Observation from Space, the report from the **2017-2027 Decadal Survey for Earth Science and Applications from Space** ("ESAS2017" www.nas.edu/esas2017), was released in pre-publication format in January 2018. An edited and final version of the report was completed at the end of the quarter. The final version of the report is available for free download at: <https://www.nap.edu/catalog/24938>. Hard copies of the report are also available for purchase at this site.

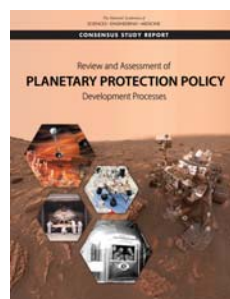
The **Committee on an Exoplanet Science Strategy** hosted a Town Hall to present its report to the Fall Meeting of the American Geophysical Union (AGU) in Washington, DC on December 10. The published version of the report was delivered to NASA on December 20 and the final manuscript is available for download at <https://www.nap.edu/catalog/25187/>. More information about the project is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_180659 and the webcast of the public release is available at <https://vimeo.com/288795711>.

The **Committee on Extraterrestrial Sample Analysis Facilities** released its prepublication report on December 20, 2018. More information about the project is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_178893. The report is available at <https://www.nap.edu/catalog/25312/>.

The **Committee on Near Earth Object Observations in the Infrared and Visible Wavelengths** held its first meeting in Washington December 19-21. The committee heard from various experts on topics related to deploying a space-based telescope to search for NEOs. The committee began planning for its second meeting, to be held February 25-27 in Irvine, and is planning a third meeting, in April in Washington, D.C.. The committee has begun drafting its report with the plan of delivering it to NASA by June. This study was requested by NASA Chief Scientist Jim Green, the first study requested of the Academies by the NASA Chief Scientist's Office.

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 partici-

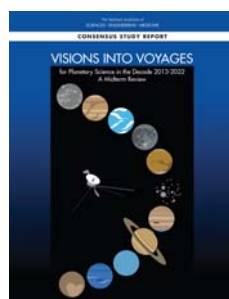
pation by Japanese scientists. The committee is the result of parallel requests sent by the Planetary Protection Offices of NASA and the European Space Agency to the National Academies and ESF, respectively, to assess the results of research jointly sponsored by NASA and ESA on whether or not hypothetical 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 report was publicly released on January 18, 2019. More information on the project is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_181917. The report is available at <https://www.nap.edu/catalog/25357/>.



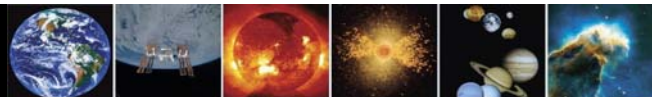
The **Committee on the Review of Planetary Protection Policy Development Processes** was disbanded at the end of August and the final, printed version of its report, *Review and Assessment of the Planetary Protection Policy Development Processes* was released by the National Academies Press in late September, 2018. A special panel discussion of issues identified in the report was held at the International Astronautical Congress in Bremen in

October and a similar event is contemplated for the 2019 IAC in Washington, D.C. A final round of briefings—to the Federal Aviation Administration and the National Space Council—were held in December. Additional information about the committee, its activities, and its report is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_175768. The report is available at <https://www.nap.edu/catalog/25172/>.

The **Committee on the Review of Progress Toward Implementing the Decadal Survey-Solar and Space Physics: A Science for a Technological Society** was appointed during this quarter. The committee co-chairs are Robyn Millan, Dartmouth College and Tom Woods, Laboratory for Atmospheric and Space Physics, University of Colorado-Boulder. As the quarter ended, the committee was planning for its first in-person meeting, which will take place February 25-27, 2019 in Washington, DC. The study statement of task, committee roster, and meeting information may be found at: http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_188088.



The **Committee on the Review of Progress Toward Implementing the Decadal Survey Vision and Voyages for Planetary Sciences** delivered its report to NASA in late July, it went public in early August, and was printed and distributed in December. Representatives of the committee briefed the report to NASA officials, congressional staff, and Congressman Culberson, who has a keen interest in the subject. Co-chair Louise Prockter and study director Dwayne Day also briefed the report to the Outer Planets Assessment Group in Pasadena in September, and Dr. Prockter briefed the report to the Mars Exploration Assessment



Group as well as the Space Studies Board's Committee on Astrobiology and Planetary Sciences. NASA has indicated plans to implement several of the committee's recommendation, such as developing a Mars Exploration Program strategic plan. Additional information about this project is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_177619. The report is available at <https://www.nap.edu/catalog/25186>.

OTHER ACTIVITIES

COSPAR: The next round of business meetings—i.e., annual meetings of the COSPAR Bureau and the science program committees for the 2019 symposium in Israel and the 2020 scientific assembly in Australia—will take place in Paris, France, on March 18-21, 2019. Also scheduled for the Paris meeting is a debriefing on a COSPAR leadership retreat held at COSPAR's new headquarters in Montpellier, France, in early December. Additional information about COSPAR is available at <https://cosparhq.cnes.fr/>.

Planetary Protection of the Outer Solar System (PPOSS) is a 3-year activity, funded via the European Union's Horizon 2020 funding program and organized by the European Science Foundation (ESF); it did not meet during this quarter and is currently engaged in completing work on its various projects. The SSB is not formally engaged in this activity but is funding the participation of two U.S. experts in a subset of its activities. Additional information about PPOSS is available 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). It did not meet during this quarter. 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 SSB is not formally involved in this activity but is funding the participation of two U.S. experts in its activities. More details about the ExoOceans project is available at <http://www.essc.esf.org/membership/exooceans-study-group-meeting/> and <http://www.issibern.ch/workshops/exooceans/>.

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. The Forum is currently accepting applications from U.S.- and China-based young researchers in the areas of planetary science and earth-observation from space for participation in meetings to be held in Beijing on May 15-16, 2019, and in Washington, D.C. on October 28-29, 2019. Additional details concerning this activity, including application instructions, are available at http://sites.nationalacademies.org/SSB/SSB_086017.

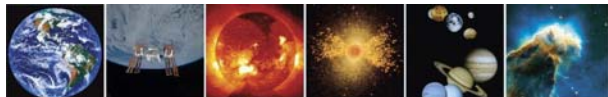


Space Science Week 2019

Space Science Week will be held March 26-28, 2019 at the NAS Building, 2101 Constitution Avenue, NW, Washington D.C. Space Science Week is a three-day gathering of the discipline 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 26. A public lecture will be held on March 27 (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



REPORT RELEASES

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



Exoplanet Science Strategy

The past decade has delivered remarkable discoveries in the study of exoplanets. Hand-in-hand with these advances, a theoretical understanding of the myriad of processes that dictate the formation and evolution of planets has matured, spurred on by the avalanche of unexpected discoveries. Appreciation of the factors that make a planet hospitable to life has grown in sophistication, as has understanding of the context for biosignatures, the remotely detectable aspects of a planet's atmosphere or surface that reveal the presence of life.

Exoplanet Science Strategy highlights strategic priorities for large, coordinated efforts that will support the scientific goals of the broad exoplanet science community. This report outlines a strategic plan that will answer lingering questions through a combination of large, ambitious community-supported efforts and support for diverse, creative, community-driven investigator research.

Available at: <https://www.nap.edu/catalog/25187>



Open Source Software Policy Options for NASA Earth and Space Sciences

Modern science is ever more driven by computations and simulations. In particular, the state of the art in space and Earth science often arises from complex simulations of climate, space weather, and astronomical phenomena. At the same time, scientific work requires data processing, presentation, and analysis through broadly available proprietary and community software. Implicitly or explicitly, software is central to science. Scientific discovery, understanding, validation, and interpretation are all enhanced by access to the source code of the software used by scientists.

This report investigates and recommends options for NASA's Science Mission Directorate (SMD) as it considers how to establish a policy regarding open source software to complement its existing policy on open data. In particular, the report reviews existing data and software policies and the lessons learned from the implementation of those policies, summarizes community perspectives, and presents policy options and recommendations for implementing an open

source software policy for NASA SMD.

Available at: <https://www.nap.edu/catalog/25217>

An Astrobiology Strategy for the Search for Life in the Universe

Astrobiology is the study of the origin, evolution, distribution, and future of life in the universe. It is an inherently interdisciplinary field that encompasses astronomy, biology, geology, heliophysics, and planetary science, including complementary laboratory activities and field studies conducted in a wide range of terrestrial environments. Combining inherent scientific interest and public appeal, the search for life in the solar system and beyond provides a scientific rationale for many current and future activities carried out by the National Aeronautics and Space Administration (NASA) and other national and international agencies and organizations.

Requested by NASA, this study offers a science strategy for astrobiology that outlines key scientific questions, identifies the most promising research in the field, and indicates the extent to which the mission priorities in existing decadal surveys address the search for life's origin, evolution, distribution, and future in the universe. This report makes recommendations for advancing the research, obtaining the measurements, and realizing NASA's goal to search for signs of life in the universe.

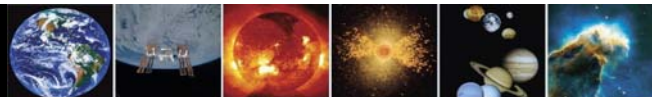
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Strategic Investments in Instrumentation and Facilities for Extraterrestrial Sample Curation and Analysis

The United States possesses a treasure-trove of extraterrestrial samples that were returned to Earth via space missions over the past four decades. Analyses of these previously returned samples have led to major breakthroughs in the understanding of the age, composition, and origin of the solar system. Having the instrumentation, facilities and qualified personnel to undertake analyses of returned samples, especially from missions that take up to a decade or longer from launch to return, is thus of paramount importance if the National Aeronautics and Space Administration (NASA) is to capitalize fully on the investment made in these missions, and to achieve the full scientific impact afforded by these extraordinary samples. Planetary science may be entering a new golden era of extraterrestrial sample return; now is the time to assess how prepared the scientific community is to take advantage of these opportunities.

Strategic Investments in Instrumentation and Facilities for Extraterrestrial Sample Curation and Analysis assesses the current capabilities within the planetary science community for sample return analyses and curation, and what capabilities are currently missing that will be needed for future sample return missions. This report evaluates whether current laboratory support infrastructure and NASA's investment strategy is adequate to meet these analytical challenges and advises how the community can keep abreast of evolving and new techniques in order to stay at the forefront of extraterrestrial sample analysis.

Available at: <https://www.nap.edu/catalog/25312>



SSB OUTREACH AND STAFF NEWS

The SSB in conjunction with the Division on Earth and Life Studies exhibited at the American Geophysical Union (AGU) Fall meeting on December 10-14, 2018 in Washington, DC. The SSB updated attendees with information about our mission, our activities, and recent reports of the Space Studies Board. The AGU Fall meeting is a gathering of more than 24,000 individuals interested in issues related to Earth and space sciences. It was AGU was established in 1919 by the National Research Council and this year marks its 100th anniversary. Other outreach activities include participation at the American Astronomical Society in Washington DC, in January 2018, and Lunar and Planetary Science Conference in Grapevine Texas in March 2019.

Several current and former members of the SSB and its ad hoc committees received awards at the recent American Geophysical Union Annual meeting, held in Washington, DC in December .

William Bowie Medal

Daniel N. Baker, University of Colorado Boulder

Robert E. Horton Medal

Dennis P. Lettenmaier, University of California, Los Angeles

Roger Revelle Medal

Isaac Held, NOAA Geophysical Fluid Dynamics Laboratory

Charles A. Whitten Medal

David T. Sandwell, University of California, San Diego

Ambassador Award

Rosaly M. C. Lopes, Jet Propulsion Laboratory, California Institute Technology

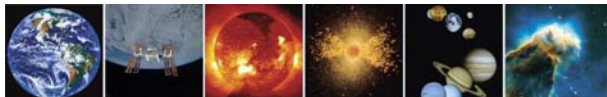


Sandra Graham, SSB Senior Program Officer, received the Orr Reynolds Distinguished Service Award from the American Society for Gravitational and Space Research.



Gregory Mack joined the Board on Physics and Astronomy (BPA) on January 7, 2019 as a Senior Program Officer. Greg will be working with the SSB as the Study Director for the CAA and as a staff member of Astro2020.

Greg Mack made his career transition from academia to science policy almost 6 years ago. Following his PhD in theoretical astrophysics at Ohio State in 2008, he was a visiting assistant professor of physics and astronomy at Ohio Wesleyan University for 4 years. Realizing he wanted to focus more on science policy, especially regarding communicating the importance of science to the public and policymakers, he applied for and was awarded a AAAS Science & Technology Policy Fellowship where he was placed in the National Science Foundation Division of Physics in the fall of 2013. In that role he worked on ways to improve the communication of physics and science by NSF and assisted with the proposal review process, and went on to serve in a short term position as a Program Director in the NSF Division of Astronomical Sciences. In January 2016, he took on a different role with science policy and the physics community at the American Physical Society, where he managed all grassroots advocacy efforts for APS and interacted frequently with Capitol Hill. He is excited to be at the National Academies and to get back to more of the scientific specifics of physics and astronomy while still looking at the bigger picture of national science policy.



Radaka Lightfoot joined the SSB on October 22, 2018 as a Senior Financial Assistant.

Radaka Lightfoot is the Senior Financial Assistant for the Space Studies Board and the Aeronautics and Space Engineering Board. She previously worked with the Institute of International Education working on USAID funded projects to assist students from Indonesia, Egypt and Tanzania obtain their Bachelors and Masters degrees. Prior to that she was the Finance Support Specialist at the Regional Offices of Whole Foods Market. She holds a BA in Mass Media from the University of the District of Columbia and is a member of Delta Sigma Theta Sorority Incorporated.



Sara Crandall joined the SSB and the BPA on January 22, 2019 as a Christine Mirzayan Science and Technology Policy Fellow. Sara will be mentored by Abigail Sheffer and will be helping with Astro 2020.

Sara Crandall is currently a graduate student researcher of astrophysics at the University of California Santa Cruz. She holds an M.S. and B.S. in physics from Kansas State University. Sara conducts research on the physical parameters of dwarf stars, currently investigating whether our collected data on stellar surface activity might be the key to more precise determinations of

stellar ages. Outside of her PhD work Sara advocates for affordable and family-friendly campus housing. She also teaches astronomy and math at a local jail. Sara is eager to dive into the science policy realm, and as a Mirzayan Fellow she hopes to cultivate her insight on the symbiotic relationship between scientists and legislators. She looks forward to participating in the Space Studies Board as we help develop the future of astronomy.



Jonathan Lutz completed his terms as Lloyd V. Berkner Space intern in November 2018. His reflections on his experiences with the SSB are below.

I spent the autumn of 2018 in Washington, DC learning more than I could have imagined alongside the Space Studies Board. Having come from a purely science background as an astrophysics major in Boulder, Colorado, working on space policy in the nation's capital was a big change of pace. Before interning at the Academies, I had no idea how much of an influence space policy has on NASA's goals and the commercial space industry as a whole.

Upon arriving, I was greeted by all of the friendly faces of the Board. My first assignment was cross-referencing the bibliography of a decadal with in-text citations for a decadal survey. I had no idea what a decadal survey was at the

time. Now I have an immense appreciation for the effort and expertise that goes into each consensus study report, especially the five periodic decadal surveys.

I met so many friendly people in the space industry during my time in DC. The list includes NASA Chief Scientists and department heads, Bill Nye the Science Guy, and a Project Scientist for the James Webb Space Telescope. One highlight of my internship was a trip to Newport Beach, California for the meeting of the Committee on Astronomy and Astrophysics. It was an honor to be in attendance with so many great astrophysicists. Tom Young—a legend in the space industry—gave a presentation on his involvement in the independent review of the James Webb Space Telescope. Hearing his expert opinion was a huge learning experience and gave me a different perspective on the inner workings of NASA. There are many other highlights of my internship, including attending the Aeronautics Research and Technology Roundtable and designing a few covers for SSB reports.

As an astrophysics major, I do not have a background in policy and lawmaking. This internship gave me critical insight into the fiscal and political side of spaceflight. I hope to serve on a Space Studies Board committee later on in life, as they are instrumental in guiding the field of astronomy and space exploration. I would like to thank everyone on the Space Studies and Aeronautics and Space Engineering Boards for their hospitality and wisdom. I look forward to using what I have learned this fall in my future career in the aerospace field.

SSB Staff

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Senior Program Officer

SANDRA J. GRAHAM

Senior Program Officer

GREGORY MACK*

Senior Program Officer (from January 7, 2019)

ABIGAIL SHEFFER

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DIONNA WISE

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MEG KNEMEYER

Financial Officer

RADAKA LIGHTFOOT

Senior Financial Associate (from October 22, 2018)

CELESTE A. NAYLOR

Information Management Associate

TANJA E. PILZAK

Manager, Program Operations

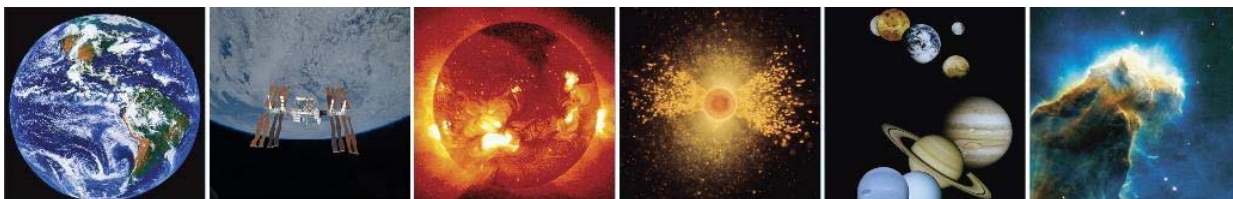
SARA CRANDALL

Christine Mirzayan Science and Technology Policy Fellow (from January 22, 2019)

JONATHAN LUTZ

Lloyd V. Berkner Space Policy Intern (through November 30, 2018)

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



SSB Meetings Calendar

J A N U A R Y						
S	M	T	W	Th	F	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
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F E B R U A R Y						
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A P R I L						
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14	15	16	17	18	19	20
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28	29	30				

- February 25-27 Near Earth Object Observations in the Infrared and Visible Wavelengths Irvine, CA
- February 25-27 Review of the Progress Toward Implementing the Decadal Survey—Solar and Space Physics: A Science for a Technological Society Washington, DC
- March 26-28 Space Science Week 2019 Washington, DC
 Committee on Astrobiology and Planetary Science
 Committee on Astronomy and Astrophysics
 Committee on Biological and Physical Science in Space
 Committee on Earth Science and Applications from Space
 Committee on Solar and Space Physics
- April 3-5 Review of the Progress Toward Implementing the Decadal Survey—Solar and Space Physics: A Science for a Technological Society Boulder, CO
- April 9-11 Near Earth Object Observations in the Infrared and Visible Wavelengths Washington, DC
- April 30-May 2 Space Studies Board Washington, DC

Upcoming Events

- November 6-8, 2019 Space Studies Board Irvine, CA
- March 31-April 2, 2020 Space Science Week Washington, DC
- April 28-30, 2020 Space Studies Board Washington, DC



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



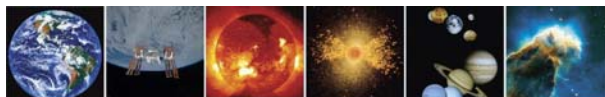
Keck Center
500 Fifth St NW,
Washington, DC



Arnold and Mabel Beckman
Center
100 Academy Drive
Irvine, CA



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



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- ☐ An Astrobiology Strategy for the Search for Life in the Universe (2018)
- ☐ Open Source Software Policy Options for NASA Earth and Space Sciences (2018)
- ☐ Exoplanet Science Strategy (2018)
- ☐ Visions into Voyages for Planetary Sciences in the Decade 2013-2022: A Mid-term Review (2018)
- ☐ Report Series: Committee on Astronomy and Astrophysics: Mission Concept Studies (2018) *Available online only*
- ☐ Review and Assessment of Planetary Protection Policy Development Processes (2018)
- ☐ Thriving on Our Changing Planet: A Decadal Strategy for Earth Observation from Space (2018) *Available online only*
- ☐ A Midterm Assessment of Implementation of the Decadal Survey on Life and Physical sciences Research at NASA (2017)
- ☐ America's Future in Civil Space: Proceedings of a Workshop-in Brief (2017)
- ☐ Searching for Life Across Space and Time: Proceedings of a Workshop (2017)
- ☐ Powering Science: NASA's Large Strategic Science Missions (2017)
- ☐ Report Series: Committee on Astrobiology and Planetary Science: Getting Ready for the Next Planetary Sciences Decadal Survey (2017) *Available online only*
- ☐ Report Series: Committee on Astronomy and Astrophysics: Small Explorer Missions (2017) *Available online only*
- ☐ Report Series: Committee on Solar and Space Physics: Heliophysics Science Centers (2017) *Available online only*
- ☐ Review of the Restructured Research and Analysis Programs a NASA's Planetary Science Division (2017)
- ☐ Assessment of the National Science Foundation's 2015 Geospace Portfolio Review (2017)
- ☐ Extending Science—NASA's Space Science Mission Extensions and the Senior Review Process (2016)
- ☐ New Worlds, New Horizons: A Midterm Assessment (2016)
- ☐ Achieving Science with CubeSats: Thinking Inside the Box (2016)
- ☐ Continuity of NASA Earth Observations from Space: A Value Framework (2015)
- ☐ Review of the MEPAG Report on Mars Special Regions
- ☐ The Space Science Decadal Surveys: Lessons Learned and Best Practices (2015)
- ☐ Sharing the Adventure with the Student: Exploring the Intersections of NASA Space Science and Education: A Workshop Summary
- ☐ Solar and Space Physics: A Science for a Technological Society: An Overview (2014) Booklet
- ☐ Pathways to Exploration: Rationales and Approaches for a U.S. Program of Human Space Exploration (2014)
- ☐ 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)
- ☐ Solar and Space Physics: A Science for a Technological Society (2013)
- ☐ NASA's Strategic Direction and the Need for a National Consensus (2012)
- ☐ The Effects of Solar Variability on Earth's Climate: A Workshop Report (2012)
- ☐ Vision an Voyages for Planetary Science (2012) Booklet
- ☐ The Role of Life and Physical Sciences (2012) Booklet
- ☐ Earth Science and Applications from Space: A Midterm Assessment of NASA's Implementation of the Decadal Survey (2012)