SPACE STUDIES BOARD NEWS

JULY—SEPTEMBER 2018

INSIDE THIS ISSUE

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

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 this quarter, but the executive committee (XCOM) of the board met August 7 in Pasadena, CA. In the morning, the XCOM members held discussions with the chairs of the SSB discipline and standing committees (CAPS, CAA, CBPSS, CESAS, and CSSP) and with NASA Science Mission Directorate associate administrator Thomas Zurbuchen about the most pressing issues facing the science disciplines. The afternoon was focused on strategic discussions related to upcoming projects, meetings, and potential projects. The evening speaker was Ed Stone (JPL) who told the story of Voyager. The board's next meeting will be held at the Arnold and Mabel Beckman Center in Irvine, CA, November 7-9, 2018. More information on the board is available at http://sites.nationalacademies.org/SSB/SSB_052281.

Ed Stone, JPL. *Photo courtesy of Dwayne Day.*

The **Committee on Astrobiology and Planetary Science (CAPS)** held its fall meeting September 11-13 in Irvine, California. During the meeting they heard presentations from commercial companies that will compete to fly NASA hosted science payloads to the lunar surface. The committee's findings will be published in a series of letter reports, slated for release in fall and winter 2018. More information on CAPS is available at http://sites.nationalacademies.org/SSB/SSB_067577.

The **Committee on Astronomy and Astrophysics (CAA)** released its report from the spring 2018 meeting, *Report Series: Committee on Astronomy and Astrophysics: Mission Concept Studies* on August 8, 2018. The committee's next meeting is scheduled to take place at the Beckman Center, October 29-30, 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)** did not meet during this period but discussions within the committee, and between SSB staff and NASA, have continued the planning for the conversion of the standing committee to a discipline committee, future projects, and the upcoming decadal survey. Committee members have also been working in this period to ensure that there is science community representation in the Administration's development of the National Microgravity Strategy. In July, co-chair Betsy Cantwell and staffer Sandra Graham both attended the COSPAR 2018 conference in Pasadena, CA, where Dr. Graham delivered a talk on evolving advice on the role of physical processes in exploration technology design and operation. The committee will meet as a standing committee Oct. 23-25, 2018 in Irvine, CA. It is anticipated that the members will be reappointed as discipline committee members before the end of 2018. More information on CBPSS is available at http://sites.nationalacademies.org/SSB/SSB_145312.

The **Committee on Earth Science and Applications from Space (CESAS)** did not meet this quarter. A number of committee members, including both co-chairs, rotated off the committee on June 30, 2018. The new committee co-chairs are Chelle Gentemann, Earth & Space Research and Steve Running, University of Montana (emeritus). As the quarter ended, the committee was preparing for its fall meeting, which will take place in Washington, DC from October 25-26. More information on CESAS is available at http://sites.nationalacademies.org/SSB/SSB_066587.

SSB MEMBERSHIP

JULY 1, 2018—JUNE 30, 2019

FIONA HARRISON, *Chair*
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

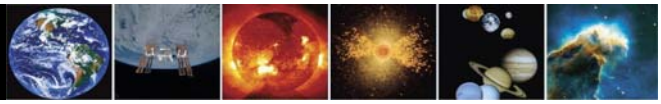
ERIKA WAGNER
Blue Origin, LLC

PAUL WOOSTER
Space Explorations Technologies

EDWARD L. WRIGHT
University of California, Los Angeles

LIAISON

CHARLES KENNEL
U.S. Representative TO COSPAR



The **Committee on Solar and Space Physics (CSSP)** did not meet in person this quarter but has held monthly teleconferences, July-September, to plan for their fall meeting which will take place in Irvine, CA, on October 16-17, 2018. The topics for the fall meeting include updates from NASA Heliophysics, NOAA Space Weather Prediction Center, NSF Geospace, and NSF Astronomy, as well as updates on recent results from NASA Heliophysics missions. The committee will also hold a short session on small spacecraft constellations. More information on CSSP is available at http://sites.nationalacademies.org/SSB/SSB_052324.

STUDY COMMITTEES

The consensus study report from 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, was briefed to NASA SMD senior staff on October 9 and publicly released on October 10. Briefings to staff of the House Science, Space, and Technology Committee, the House Appropriations Committee (Commerce Subcommittee Jurisdiction), and the Senate Committee on Commerce, Science, and Transportation (Subcommittee on Space, Science, and Competitiveness) were also conducted. The report is now available at https://www.nap.edu/catalog/25252.

The **Committee on Best Practices for a Future Open Code Policy for NASA Space Science** released the prepublication version of its report on September 25, 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.

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. Dissemination activities and editing of the pre-publication report continued to be the focus of the survey committee and staff during this quarter. Publication of the edited version of ESAS 2017 is expected by late October/early November. When published, the final report will be posted online and, like the pre-publication report, will be available for free download from National Academies Press (NAP) at https://www.nap.edu/catalog/24938. Hard copies of the report will also be available for purchase on the NAP site.

The **Committee on an Exoplanet Science Strategy** delivered the prepublication version of its report to NASA on August 31, and the co-chairs of the committee briefed the leadership of NASA's Science Mission Directorate on the report's conclusions and recommendations on September 4. The report was publicly released on September.5 The webcast of the public release is available at https://vimeo.com/288795711. Printed copies of the report will be available during the final quarter of 2018. More information about the project is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_180659.

The **Committee on Extraterrestrial Sample Analysis Facilities** is completing the response to the review of its report, and a prepublication release is expected in November 2018. More information about the project is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_178893.

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. Following the committee's first meeting in November, 2017, NASA requested that the committee delay the completion of its report, expand the scope of its task, and schedule a second meeting to consider new experimental and modelling results that would become available in the third quarter of 2018. The expanded scope of the study necessitated the appointment of five new committee members: one from Canada, three from Europe, and one from Japan. The joint committee held its second and final planned meeting in London on September 11-13, 2018. The committee aims to deliver its report to NASA, ESA, and JAXA in December 2018. 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** was disestablished 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. Following briefings at NASA headquarters and Congressional staff in late June, the report was presented at the COSPAR Scientific Assembly in Pasadena in mid-July. A special panel discussion of issues identified in the report is scheduled to be held at the International Astronautical Congress in Bremen in October. Additional information about the committee, its activities, and its report is available at http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_175768.

The **Committee on the Review of Progress Toward Implementing the Decadal Survey - Solar and Space Physics: A Science for a Technological Society** was funded in July 2018. Staff are working on nominations for the committee.

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 and it went public in early August. 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 Astrobi-

ology and Planetary Sciences. The committee is also planning to brief NASA Chief Scientist Jim Green. The report presented a positive assessment of the overall NASA planetary science program and noted that it achieved many of the goals of the planetary science decadal survey. It made several recommendations about program management, balance, and preparing for the next decadal survey. 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.

Louise Prockter, co-chair of the Committee on the Review of Progress Toward Implementing the Decadal Survey Vision and Voyages for Planetary Sciences briefing the committee's report to the Outer Planets Advisory Group. *Photo courtesy of Dwayne Day.*

OTHER ACTIVITIES

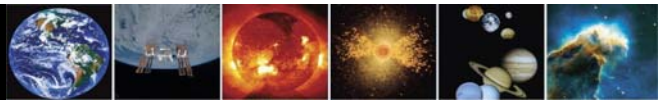
COSPAR held its 42nd Scientific Assembly in Pasadena, California on July 14-21, 2018. Preliminary results given by the chair of the Local Organizing Committee indicated that 4285 abstracts were submitted for consideration and 2845 oral presentations were made during the assembly. Preliminary attendance statistics indicate that 2285 ordinary, 419 student, and 251 complimentary registrations were issued; making this one of the best, if not the best, attended COSPAR assemblies. The two most important actions undertaken by the COSPAR Council during its biennial meeting were the election of principal COSPAR officers for the period 2018-2022 and the selection of the location for the 44th Scientific Assembly to be held in 2022. Incumbent COSPAR President Lennard Fisk was elected to a second term and Karl-Heinz Glassmeier (Germany) and Mikhail Panasyuk (Russia) were newly elected as vice presidents. In addition, Catherine Césarsky (France), Masaki Fujimoto (Japan), Manuel Grande (UK), Charles Kennel (USA), Pietro Ubertini (Italy), and Wang Chi (China) where elected to at-large seats on the Bureau. Four cities—Athens, Greece; Lausanne, Switzerland; Prague, Czech Republic; and Warsaw, Poland—were contending to host the 44th Scientific Assembly, and the Council selected Athens. The Athens assembly is currently scheduled to be held on 16-24 July, 2022.

The next major COSPAR events are as follows: the annual meetings of COSPAR's Scientific Advisory Committee, Bureau and assembly/symposia science program committees will take place in Paris on March 18-21, 2019; the 4th COSPAR Symposium—whose theme will be "Small Satellites for Sustainable Science and Development"—will take place in Herzliya, Israel, on November 4-8, 2019; and the 43rd Scientific Assembly will be held in Sydney, Australia on August 15-23, 2020. 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 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' Work-Packages 3 and 5. The meetings associated with Work-Package 5—a review of the current planetary protection regulation for the icy bodies of the outer solar system—concluded with a workshop held in Florence, Italy, on September 6-7, 2018. Two US experts supported by the SSB—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. 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). 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 ExoOceans activities. The group held its second scheduled meeting at ISSI in Bern, Switzerland on June 18-22. A third and final meeting will also be held at ISSI at a date to be determined. The outcome of this activity will be a book in the ISSI Space Science Series, published by Springer. 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. Continuing support for this activity from CAS and the National Academies Presidents' Committee will permit the recruitment of a fifth cohort of young U.S. and Chinese scientists to begin during the final quarter of 2018. The fifth cohort, drawn from the planetary science and Earth-observation from space communities, will meet 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, is available at http://sites.nationalacademies.org/SSB/SSB_086017.



NEW RELEASES

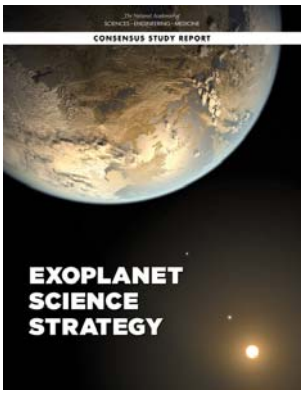
Copies of reports are available from the SSB office at 202-334-3477 or at https://www.nap.edu/author/SSB.

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 Science 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.

Available at: https://www.nap.edu/catalog/25252



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.

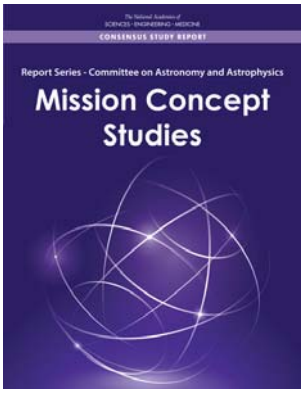
Available at: https://www.nap.edu/catalog/25187

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



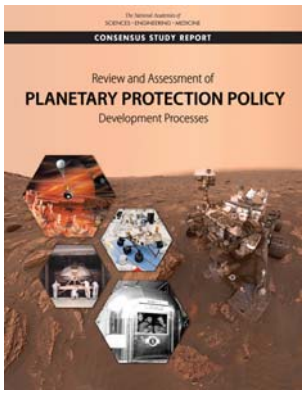
Report Series: Committee on Astronomy and Astrophysics: Mission Concept Studies

The Committee on Astronomy and Astrophysics (CAA) is tasked with monitoring the progress of the recommended priorities of the astronomy and astrophysics decadal survey of the National Academies of Sciences, Engineering, and Medicine and providing an independent, authoritative forum for identifying and discussing issues in astronomy and astrophysics between the research community, the federal government, and the interested public. This publication reviews NASA's plans for delivering mission concept studies (large and medium) to the Decadal Survey Committee. The CAA assessed the appropriateness of NASA's plans and provided findings for the purpose of improving the value of NASA's preparations to the Decadal Survey Committee.

Available at: https://www.nap.edu/catalog/25212

NEW RELEASES (CONTINUED)

Review and Assessment of Planetary Protection Policy Development Processes



Protecting Earth's environment and other solar system bodies from harmful contamination has been an important principle throughout the history of space exploration. For decades, the scientific, political, and economic conditions of space exploration converged in ways that contributed to effective development and implementation of planetary protection policies at national and international levels. However, the future of space exploration faces serious challenges to the development and implementation of planetary protection policy. The most disruptive changes are associated with (1) sample return from, and human missions to, Mars; and (2) missions to those bodies in the outer solar system possessing water oceans beneath their icy surfaces.

Review and Assessment of Planetary Protection Policy Development Processes addresses the implications of changes in the complexion of solar system exploration as they apply to the process of developing planetary protection policy. Specifically, this report examines the history of planetary protection policy, assesses the current policy development process, and recommends actions to improve the policy development process in the future.

Available at: https://www.nap.edu/catalog/25172

Visions into Voyages for Planetary Sciences in the Decade 2013-2022: A Midterm Review

In spring 2011 the National Academies of Sciences, Engineering, and Medicine produced a report outlining the next decade in planetary sciences. That report, titled *Vision and Voyages for Planetary Science in the Decade 2013-2022*, and popularly referred to as the "decadal survey," has provided high-level prioritization and guidance for NASA's Planetary Science Division. Other considerations, such as budget realities, congressional language in authorization and appropriations bills, administration requirements, and cross-division and cross-directorate requirements (notably in retiring risk or providing needed information for the human program) are also necessary inputs to how NASA develops its planetary science program.

In 2016 NASA asked the National Academies to undertake a study assessing NASA's progress at meeting the objectives of the decadal survey. After the study was underway, Congress passed the National Aeronautics and Space Administration Transition Authorization Act of 2017 which called for NASA to engage the National Academies in a review of NASA's Mars Exploration Program. NASA and the Academies agreed to incorporate that review into the midterm study. That study has produced this report, which serves as a midterm assessment and provides guidance on achieving the goals in the remaining years covered by the decadal survey as well as preparing for the next decadal survey, currently scheduled to begin in 2020.

Available at: https://www.nap.edu/catalog/25186

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>.

SSB Staff News

This quarter we welcomed a new Lloyd V. Berkner Space Policy Intern, Jonathan Lutz. And our summer interns returned to school.

Jonathan Lutz is a senior at the University of Colorado Boulder. He will graduate in May 2019 with a degree in Astrophysics. His academic interests include the search for extraterrestrial life, electromagnetism, programming, and physics applications. He is very excited to work with the National Academies and the Space Studies Board. Jonathan comes from a primarily science background including lab work, data analysis, and CubeSat development. He is looking forward to learning as much as he can about the policy-side of space science. He is also excited to be in the country's capital surrounded by politics and influential decision-making. Originally from Boulder, Colorado, Jonathan enjoys skiing in the winter and cycling and camping in the summer. After graduation, he hopes to go into the aerospace industry-- utilizing the diverse knowledge gained from his time at the Academies. Jonathan would like to thank everyone on the ASEB and SSB for the impactful experience and learning opportunity.

Carson Bullock: My summer Space Policy Internship with the Space Studies Board has been, without a doubt, the most fulfilling position I've yet held in my early career, and I am filled with gratitude for the opportunity to work here. The SSB staff and program coordinators were great coworkers who never failed to keep me busy with engaging tasks. The staff were also expressly invested in my personal and professional development, and encouraged me to attend events around the city such as Congressional hearings, press interviews, and scientist panels. These events were perhaps the highlight of my internship, providing practice in detailed notetaking, networking, and wrapping my head around the balancing act between competing stakeholder needs. Relatedly, as my first experience living in a city of any substantial size, I found it rewarding to move beyond my comfort zone and into a much more fast-paced working world. This was especially true at such a unique moment in space history, with the beginning of Jim Bridenstine's tenure as NASA administrator, talks of ISS commercialization and transition, and even the Administration's proposal of a Space Force. I felt the National Academies were a very interesting hub, connecting academicians, government officials, and commercial actors to one another behind the same goals of prioritizing policies that are informed by science. Moreover, the work of the Academies was at the root of many of the issues I had been hearing about, and it was exciting to trace back the history of missions like JWST to the SSB decadal survey process. I did not just learn about these processes from afar, I was able to directly participate in them. This fall, I return to Wooster, Ohio to complete my senior thesis on orbital debris and earn my Bachelor's degree, but my time at the Academies will stick firmly in my mind as I continue to plan my future.

Laura Cummings: The lessons and experiences from my time as a Lloyd V. Berkner Space Policy Intern are something that I will always carry with me, and look back fondly upon. The opportunity to take part in the report creation process opened my eyes to the true art of collaboration, especially when you're trying to get 12 committee members to come to agreement over something. As entertaining as telecons are, I also enjoyed being out in the field. Through attending events, I gained exposure to top executives and top policy makers throughout the country. This level of exposure and positive networking has inspired me to create a Space Law organization at the University of Denver, where I will begin my JD/MA program this fall. The freedom to attend space events all over the city was one of the true highlights of the program. I cannot speak highly enough of the work environment at the National Academies. Everyone is positive, upbeat, helpful, and seems sincerely happy with their jobs. This type of atmosphere is infectious, and it makes doing citations for five days straight not seem that bad. I will truly miss my little corner of the Space Studies Board, as well as the automatic coffee machine. I could not have asked for a better internship, nor better coworkers and mentors, to nurture my growth in the science policy realm.

SSB Staff

COLLEEN HARTMAN
Director (from August 6, 2018)

RICHARD ROWBERG
Interim Director (through August 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

ABIGAIL SHEFFER
Program Officer

NATHAN BOLL
Associate Program Officer

SARAH BROTHERS
Associate Program Officer

MA BROWN
Research Associate

ANDREA REBHOLZ*
Program Associate

ANESIA WILKS
Senior Program Assistant

DIONNA WISE
Program Associate

MEG KNEMEYER
Financial Officer

CELESTE A. NAYLOR
Information Management Associate

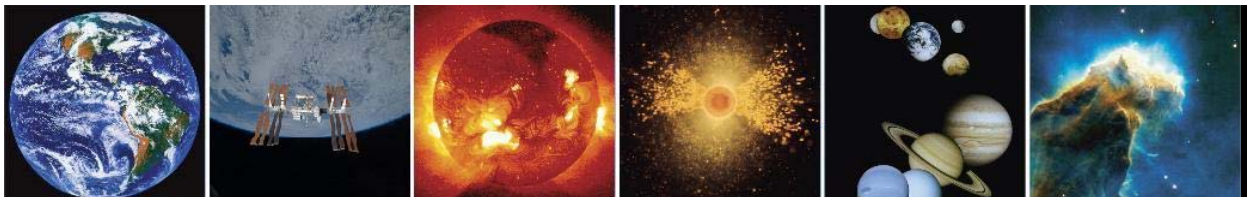
TANJA E. PILZAK
Manager, Program Operations

JONATHAN LUTZ
Lloyd V. Berkner Space Policy Intern (from September 10, 2018)

CARSON BULLOCK
Lloyd V. Berkner Space Policy Intern (through August 14, 2018)

LAURA CUMMINGS
Lloyd V. Berkner Space Policy Intern (through August 3, 2018)

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



SSB Meetings Calendar

October

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	20
21	22	23	24	25	26	27
28	29	30	31			

November

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	20	21	22	23	24
25	26	27	28	29	30	

December

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	20	21	22
23	24	25	26	27	28	29
30	31					

January

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
20	21	22	23	24	25	26
27	28	29	30	31		

October 16-17	Committee on Solar and Space Physics	Irvine, CA
October 23-25	Committee on Biological and Physical Sciences	Irvine, CA
October 25-26	Committee on Earth Science and Applications from Space	Washington, DC
October 29-30	Committee on Astronomy and Astrophysics	Irvine, CA
November 7-9	Space Studies Board	Irvine, CA
December TBD	Near Earth Object Observations in the Infrared and Visible Wavelengths	Washington, DC

Upcoming Events

March 26-28, 2019	Space Science Week	Washington, DC
April 30-May 2, 2019	Space Studies Board	Washington, DC
November 6-8, 2019	Space Studies Board	Irvine, CA

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

SELECTED REPORTS AVAILABLE FROM THE SPACE STUDIES BOARD

For a complete list of titles and free PDF versions of our reports visit https://www.nap.edu/author/SSB

Hardcopy versions of all SSB reports are available free of charge from the SSB while supplies last.
To request a hardcopy of a report, send an email to ssb@nas.edu and include your name, affiliation, mailing address, and the name and quantity of each report that you are requesting.

- ☐ 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)

If you are unable to email your request, please send a copy of this form to the address or fax number below. Remember to enter the number of reports you wish to receive in the space to the left of each report.

Space Studies Board
The National Academies
500 Fifth Street, NW
Washington, DC 20001
or fax a copy to: 202-334-3701

Name **E-mail**

Affiliation

Address **City/State/Zip**