

# SPACE STUDIES BOARD NEWS



APRIL — JUNE 2018

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Thank you from the staff of the SSB to board members, Bobby Braun, Jim Anderson, Jay Buckey, Tom Gavin, and Tony Janetos for their service to the board. New members have been added (see page 2).

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*The National Academies of*  
**SCIENCES • ENGINEERING • MEDICINE**

# SPACE STUDIES BOARD NEWS

## THE BOARD AND ITS DISCIPLINE/ STANDING COMMITTEES

The Space Studies Board (SSB) met May 1-3, 2018. The first day was a joint meeting with the Aero-nautics and Space Engineering Board. The boards were briefed by and had a discussion with the NASA Chiefs, Jim Green (chief scientist), Ralph Roe (chief engineer), and Doug Terrier (acting chief technolo-gist). They were then briefed by and had a discussion with the NASA associate administrator, Steve Jurczyk. The afternoon session focused on space technology, microgravity science, and human spaceflight at NASA. During that session the boards were briefed by Wanda Sigur, chair of the Academies' Space Technology Industry Govern-ment University Roundtable; Rob Ferl, co-chair of the Academies' Committee on Biological and Physi-ical Sciences in Space; Jim Reuter, acting associate administrator of Space Technology at NASA; and Mark Geyer, acting deputy associate administrator for Technical for the Human Explorations and Operations Mission Directorate (now the director of Johnson Space Center). The boards then had a focus session on Orbital Debris, moderated by Bhavya Lal, IDA/STPI; panelists included J.-C. Liou, NASA; Darren McKnight, Integrity Apps; Dan Oltrogge, AGL; and Brian Weeden, Secure World Foundation.

The second day began with reports from the SSB discipline committee chairs: Maura Hagan (CSSP); Michael King (CESAS); Chris House and Bill McKin-non (CAPS); and Marcia Rieke and Steve Ritz (CAA). The board then had a roundtable discussion with the Science Mission Directorate leadership which included an update from Thomas Zurbuchen, asso-ciate administrator for Science, and a panel discus-sion with Dr. Zurbuchen, and the division directors, Mike Freilich (Earth Science), Paul Hertz (Astrophysics), Lori Glaze (Planetary, acting), and Jim Spann (Heliophysics, acting). The board then heard a briefing on the decadal survey, *Thriving on Our Changing Planet: A Decadal Strategy for Earth Observation from Space* from co-chairs Waleed Abdalati and Bill Gail followed by agency responses to the report from Mike Freilich (NASA), Steve Volz (NOAA), and Tim Newman (USGS). The board then received an update on NSF-Geospace from Paul Shepson, an update on the European Space Sci-ences Committee from Athena Coustenis (ESSC Chair), and an update on COSPAR activities from Rosaly Lopes (board member) and David Smith (SSB staff). The final day included a focus session on the status of selected decadal priority missions, including Parker Solar Probe (Nicky Fox, JHU-APL), JWST (Eric

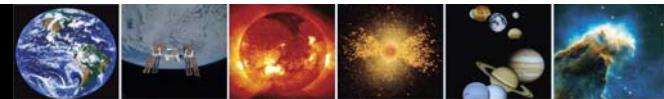
## SSB MEMBERSHIP

JULY 1, 2017—JUNE 30, 2018

**FIONA HARRISON**, *Chair*  
California Institute of Technology  
**ROBERT D. BRAUN**, *Vice Chair*  
University of Colorado, Boulder  
**JAMES ANDERSON**  
Harvard University  
**JEFF M. BINGHAM**  
Consultant  
**JAY C. BUCKEY**  
Geisel School of Medicine at Dartmouth  
**ADAM BURROWS**  
Princeton University  
**MARY LYNNE DITTMAR**  
Dittmar Associates, Inc.  
**JOSEPH FULLER, JR.**  
Futron Corporation  
**THOMAS R. GAVIN**  
Jet Propulsion Laboratory  
**SARAH GIBSON**  
National Center for Atmospheric Research  
**VICTORIA HAMILTON**  
Southwest Research Institute  
**ANTHONY C. JANETOS**  
Boston University  
**CHRYSSA KOUVELIOTOU**  
The George Washington University  
**DENNIS P. LETTENMAIER**  
University of California, Los Angeles  
**ROSALY M. LOPES**  
Jet Propulsion Laboratory  
**DAVID J. MCCOMAS**  
Princeton 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  
**EDWARD L. WRIGHT**  
University of California, Los Angeles  
LIAISON  
**CHARLES KENNEL**  
U.S. Representative to COSPAR

JULY 1, 2018—JUNE 30, 2019

**FIONA HARRISON**, *Chair*  
California Institute of Technology  
**JAMES H. CROCKER** *Vice Chair*  
Lockheed Martin Space Systems Compa-ny (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



Smith, NASA), Mars 2020 (Ken Farley, CalTech), Europa Clipper (Bob Pappalardo and Barry Goldstein, JPL), PACE (Lorraine Remer, UMBC), and WFIRST (Jeff Kruk and Kevin Grady, NASA). More information on the board is available at [http://sites.nationalacademies.org/SSB/SSB\\_052281](http://sites.nationalacademies.org/SSB/SSB_052281).

The **Committee on Astrobiology and Planetary Science (CAPS)** will meet this fall (September 11-13, 2018) in Irvine, CA. During that meeting, they will hear from commercial companies developing lunar landers and rovers to fly NASA science payloads to the moon under the new Commercial Lunar Payloads Services program. They will author a short report on plausible, near-term opportunities for lunar science based upon the information they receive. More information on CAPS is available at [http://sites.nationalacademies.org/SSB/SSB\\_067577](http://sites.nationalacademies.org/SSB/SSB_067577).

The **Committee on Astronomy and Astrophysics (CAA)** continued to work on its report from the spring 2018 meeting, NASA Mission Concept Studies. The report is in review and is expected to be released in early August. The committee's next meeting is scheduled to take place at the Beckman Center in the fall of 2018. More information on CAA is available at [http://sites.nationalacademies.org/BPA/BPA\\_048755](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 continued with NASA regarding future projects as well as plans to convert the committee to a discipline committee that will be able to write short reports on topics closely related to the decadal survey. A new committee statement of task was agreed upon for this approach, and approved by the Academies leadership in June. If implemented, a new committee will be nominated

Also during this period, committee co-chair Betsy Cantwell gave invited testimony on May 17 in front of the House science committee regarding the ISS transition, a topic on which the committee has held numerous focus sessions over the last three years. Following the hearing, Dr. Cantwell also received a large number of additional questions from the House committee members and provided written responses to those. Co-chair Rob Ferl also represented CBPSS at a session on microgravity and space technology at the May 1 joint meeting of the Space Studies Board and Aeronautics and Space Engineering Board.

The committee is scheduled to hold its next meeting Oct. 23-25, 2018 in Irvine, CA. More information on CBPSS can be found at [http://sites.nationalacademies.org/SSB/SSB\\_145312](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. Nominations for new members are underway with approvals expected later this summer. Upon approval, the new co-chairs and committee members will determine the dates for the fall meeting and begin discussions for potential agenda items. The reconstituted committee is also expected to continue work on development of a popularization of the recently issued decadal survey for Earth science and applications from space. More information on CESAS is available at [http://sites.nationalacademies.org/SSB/SSB\\_066587](http://sites.nationalacademies.org/SSB/SSB_066587).

The **Committee on Solar and Space Physics (CSSP)** held its spring meeting as part of Space Science Week on March 27-29, 2018, in Washington, DC. The committee has held monthly teleconferences, May-June, to plan for their fall meeting that will take place in Irvine, CA, on October 16-18, 2018. More information on CSSP is available at [http://sites.nationalacademies.org/SSB/SSB\\_052324](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, is in review. The report is on schedule to be delivered to NASA by the end of August 2018. More information about this committee can be found at [http://sites.nationalacademies.org/SSB/CurrentProjects/SSB\\_180812](http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_180812).

The **Committee on Best Practices for a Future Open Code Policy for NASA Space Science** completed the drafting of its report, which entered into review in June 2018. The report is expected to reach pre-publication release by the end of August 2018. More information about the project is available at [http://sites.nationalacademies.org/SSB/CurrentProjects/SSB\\_178892](http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_178892).

*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** ("ESAS 2017" [www.nas.edu/esas2017](http://www.nas.edu/esas2017)), was released in pre-publication format in January 2018. Dissemination activities and editing of the pre-publication report were the focus of the survey committee and staff during this quarter. Publication of the edited version of ESAS 2017 is expected later this summer; it will be followed by a short

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

### Committee on Astrobiology and Planetary Science (CAPS)

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

### Committee on Astronomy and Astrophysics (CAA) (joint with the Board on Physics and Astronomy)

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

### Committee on Biological and Physical Sciences in Space (CBPSS) (joint with the Aeronautics and Space Engineering Board)

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

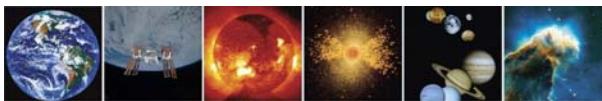
### Committee on Earth Science and Applications from Space (CESAS)

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

### Committee on Solar and Space Physics (CSSP)

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

For more information, go to <[http://sites.nationalacademies.org/SSB/ssb\\_052296](http://sites.nationalacademies.org/SSB/ssb_052296)>.



brochure that will serve as a popularization of the report. When published, the final report will be posted online and, like the pre-publication report, will be available for free download via a link on the survey website, or directly from National Academies Press (NAP) at <https://www.nap.edu/catalog/24938/thriving-on-our-changing-planet-a-decadal-strategy-for-earth>. Hard copies of the report will also be available for purchase on the NAP site. As the quarter ended, preparations were underway for a decadal survey presentation on July 16, 2018 at the 42nd COSPAR Scientific Assembly, which is being held in the Pasadena Convention Center, Pasadena, CA.

The **Committee on an Exoplanet Science Strategy** held its second meeting on April 19-20, 2018 in Irvine, CA. During this meeting, the committee received presentations from the leadership of current and planned exoplanet-related missions, as well as from public and private organizations that support research in the field. The committee also held its third and final meeting on June 5-6, 2018 in Washington, DC. This meeting was focused on drafting the committee's report, which was completed and submitted for review in June 2018. The final report is due to NASA by late August 2018.

More information about the project is available at [http://sites.nationalacademies.org/SSB/CurrentProjects/SSB\\_180659](http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_180659).

The **Committee on Extraterrestrial Sample Analysis Facilities** is drafting its report, which is expected to enter review in July 2018, and a prepublication release is expected in August 2018. More information about the project is available at [http://sites.nationalacademies.org/SSB/CurrentProjects/SSB\\_178893](http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_178893).

The **Committee on a Midterm Assessment of Implementation of the Decadal Survey on Life and Physical Sciences Research at NASA** continued final editing work on its report, *A Midterm Assessment of Implementation of the Decadal Survey on Life and Physical Sciences Research at NASA* during this period.

With the final publication of the report on May 9, 2018, the committee's work is now complete.

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

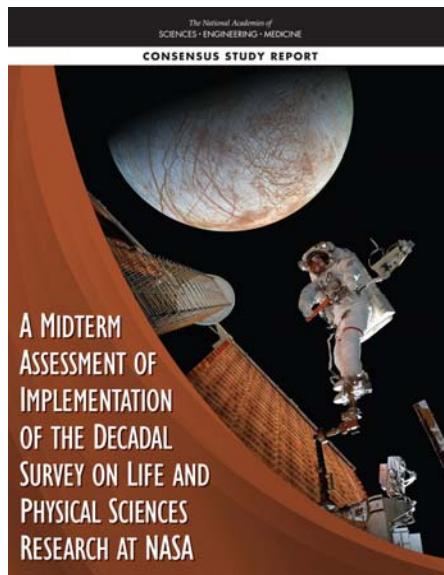
The joint committee held its first planned meeting in London on November 7-9, 2017. Since the first meeting, NASA has requested that the committee consider several additional questions. To undertake this expanded task, the committee will hold a second meeting in London on September 18-20. More information on the project is available at [http://sites.nationalacademies.org/SSB/CurrentProjects/SSB\\_181912](http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_181912).

The **Committee on the Review of Planetary Protection Policy Development Processes** did not meet during this quarter. The committee released its prepublication report at the end of June. Additional information about the committee and its activities is available at [http://sites.nationalacademies.org/SSB/CurrentProjects/SSB\\_175768](http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_175768).

The **Committee on the Review of Progress Toward Implementing the Decadal Survey Vision and Voyages for Planetary Sciences** submitted its draft report to review and received sign-off in late June. The committee delivered its report to NASA on July 24. Additional information about this project is available at [http://sites.nationalacademies.org/SSB/CurrentProjects/SSB\\_177619](http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_177619).

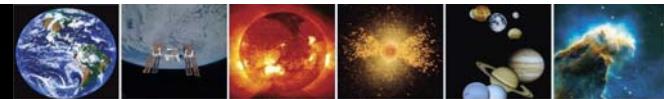
## OTHER ACTIVITIES

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



Available at <https://www.nap.edu/catalog/24966>

**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' so-called Work-Packages 3 and 5. Activities associated with Work-Package 5—a review of the current planetary protection regulation for the icy bodies of the outer solar system—



commenced at a meeting held at Imperial College in London on February 7-9, 2018. A member of the SSB staff and two US experts—Geoffrey Collins (Wheaton College, Massachusetts) and Mark Saunders (NASA Langley Research Center, retired)—participated in the meeting in their own capacity as subject matter experts. The second and final planned meeting associated with Work-Package 5 will take place in Florence, Italy, on September 6-7. Additional information about PPOSS can be found at <http://pposs.org/>.

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

The **Forum for New Leaders in Space Science**, a cooperative activity between the National Academies of Sciences, Engineering, and Medicine and the Chinese Academy of Sciences (CAS), is designed to provide opportunities for a highly select group of young space scientists from China and the United States to discuss their research activities in an intimate and collegial environment. Continuing support for this activity from CAS and the National Academies Presidents' Committee permitted the recruitment of a fourth cohort of young U.S. and Chinese scientists to begin during the third quarter of 2017. The fourth cohort, drawn from the space astronomy and astrophysics and solar and space physics communities, met in Guangzhou in southern China on January 23-24, 2018 and in Pasadena, California on July 12-13, 2018, immediately prior to the July 14-21 COSPAR Scientific Assembly. Additional details concerning this activity can be found at [http://sites.nationalacademies.org/SSB/SSB\\_086017](http://sites.nationalacademies.org/SSB/SSB_086017).



The 8<sup>th</sup> CAS-NAS Forum for New Leaders in Space Science  
July 12-13, 2018, Pasadena, CA.

## NEW RELEASE

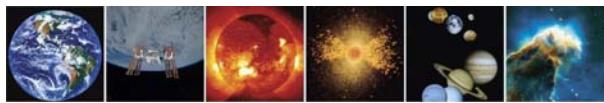
Copies of reports are available from the SSB office at 202-334-3477 or at <https://www.nap.edu/author/SSB>.

### 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>



## SSB Staff

**RICHARD ROWBERG**

Interim Director (from March 5, 2018)

**ARTHUR A. CHARO**

Senior Program Officer

**SANDRA J. GRAHAM**

Senior Program Officer

**DAVID H. SMITH**

Senior Program Officer

**DWAYNE A. DAY\***

Senior Program Officer

**DAVID LANG\***

Senior Program Officer (through May 4, 2018)

**ABIGAIL SHEFFER**

Program Officer

**NATHAN BOLL**

Associate Program Officer

**SARAH BROTHERS**

Associate Program Officer

**MA BROWN**

Research Associate

**MARCHEL HOLLE**

Research Associate

**ANDREA REBOLZ\***

Program Associate

**ANESIA WILKS**

Senior Program Assistant

**DIONNA WISE**

Program Associate

**CARMELA J. CHAMBERLAIN**

Administrative Coordinator (through June 28, 2018)

**MEG KNEMEYER**

Financial Officer

**CELESTE A. NAYLOR**

Information Management Associate

**TANJA E. PILZAK**

Manager, Program Operations

**EMILY MORAVEC**

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

**CARSON BULLOCK**

Lloyd V. Berkner Space Policy Intern

**LAURA CUMMINGS**

Lloyd V. Berkner Space Policy Intern

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

## SSB Staff News

This quarter saw the departure of 2 staff members. Carmela Chamberlain and David Lang (Board on Physics and Astronomy).



**Carmela Chamberlain**, the SSB's (and ASEB's) wonder woman, retired on June 28 after 43 years with the SSB (and the last 12 with the ASEB/SSB joint staff). The staff couldn't let her leave without a big send off, which included a myriad of current and former Academies' staff. Including 2 former board directors (Michael Moloney and Marc Allen, with well wishes sent from Marcia Smith and Joe Alexander), two former/current interim board directors (Dick Rowberg and Tammy Dickinson) and many former study directors and administrative staff. We will all miss Carmela dearly, but know that retirement will bring many more adventures for her.

**David Lang**, study director for the CAA (joint with the Board on Physics and Astronomy) and numerous astronomy and astrophysics related studies, left the National Academies in May to become the Senior Director of Government Relations at The Optical Society (OSA). We wish David well in his new position.

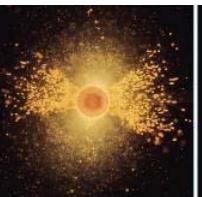
This quarter we were also joined by 2 new Lloyd V. Berkner Space Policy Interns, Carson Bullock and Laura Cummings.



**Carson Bullock** is a rising senior pursuing a double major in physics and comparative politics at the College of Wooster in Ohio. Carson studies collective action problems and commons management, specifically the responses of state space agencies to the orbital debris proliferation crisis. Outside of their major fields of study, Carson's academic interests range broadly from applied mathematics to phonology, and from cartography to gender studies. Originally from Toledo, Ohio, Carson spends much time hiking in the city's metroparks, and enjoys identifying trees and wildflowers native to the Oak Openings region. Carson is thrilled to intern at the Space Studies Board, in no small part due to the strength of its connections to the many scientific and bureaucratic organizations in Washington. The interdisciplinary nature of the Space Policy Internship represents a perfect intersection of Carson's interests, and will be a unique jumping-off point into their senior thesis and future career.



**Laura Cummings** is a soon-to-be graduate student, with the goal of earning a dual Law degree and Masters in International Affairs. Laura comes from the University of Colorado in Boulder, where she earned B.A.s in Astronomy and International Affairs. While at CU, she had the opportunity to study abroad in 4 different countries - France, Russia, Kyrgyzstan, and Tanzania. This sparked her interest in the aspirations and interconnections of the space programs of different nations. For her undergraduate general honors thesis, Laura wrote a proposal for an internationally-funded solar shade to mitigate global warming. Laura hopes to go on to practice in the growing field of space law.



## SSB Meetings Calendar

A U G U S T						
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12	13	14	15	16	17	18
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S E P T E M B E R						
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						30

O C T O B E R						
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28	29	30	31			

N O V E M B E R						
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18	19	20	21	22	23	24
25	26	27	28	29	30	

- September 11-13 Committee on Astrobiology and Planetary Science Irvine, CA
- September 18-20 Committee on Planetary Protection Requirements for Sample-Return Missions from Martian Moons London, England
- October 16-18 Committee on Solar and Space Physics Irvine, CA
- October 23-25 Committee on Biological and Physical Sciences Irvine, CA
- November 5-6 Committee on Astronomy and Astrophysics Irvine, CA  
(tentative)
- November 7-9 Space Studies Board Irvine, CA

## Upcoming Events

- March 26-28, 2019 SSW Washington, DC
- April 30-May 2, 2019 Space Studies Board Washington, DC
- November 6-8, 2019 Space Studies Board

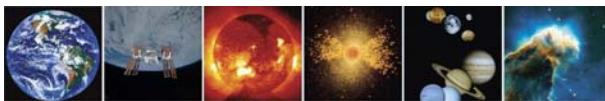


National Academy of Sciences  
Building  
2101 Constitution Ave NW  
Washington, DC

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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