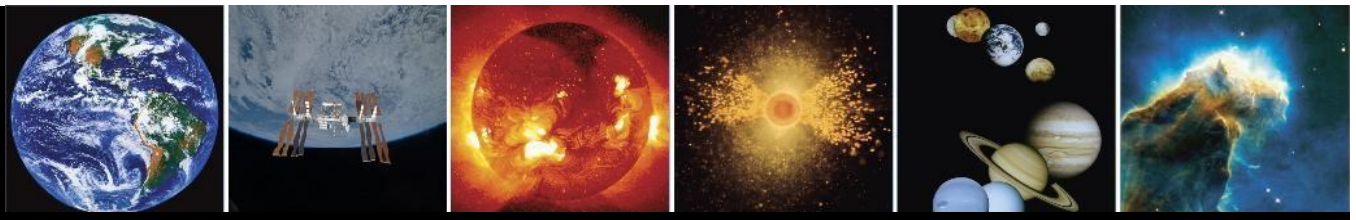
SPACE STUDIES BOARD NEWS



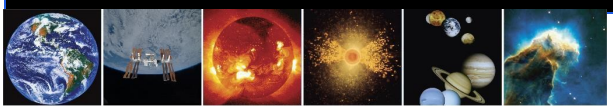
OCTOBER—DECEMBER 2013

Inside This Issue

"This spring, the Space Studies Board (SSB) and the Aeronautics and Space Engineering Board will together inaugurate a new standing committee, the NRC's *Committee on Biological and Physical Sciences in Space*. The new committee will not have much time to get its bearings, for odds are it will find itself faced with challenging issues from the get-go. "

—SSB Chair Charles F. Kennel

SPACE STUDIES BOARD NEWS



FROM THE CHAIR

This spring, the Space Studies Board (SSB) and the Aeronautics and Space Engineering Board will together inaugurate a new standing committee, the NRC's *Committee on Biological and Physical Sciences in Space (CBPSS)*. The new committee will not have much time to get its bearings, for odds are it will find itself faced with challenging issues from the get-go. Though its remit extends considerably beyond the International Space Station (ISS) science, one of the first questions it may be asked will be about the scientific implications of President Obama's recent decision to extend the Station's life from 2020 to 2024.

As many of you may recall, in 2009 the Augustine Commission (on which I served) recommended, and the President decided, that the Station's life be extended from 2015 to at least 2020, with the actual termination date to be decided later. One of the last Shuttle flights brought up to ISS large replacement parts that could not be carried by the smaller supply flights to follow. Science was not the sole reason for the ultimate decision on whether to extend the life of the International Space Station, but it will play an important role in the success of ISS operations. The central question will be, what are the likely benefits to U.S. science and technology of the four-year life extension? In other words, can we extrapolate from present experience and reasonable expectations what four years more work might achieve? How can the life extension incentivize new researchers with new ideas to take advantage of ISS access to low gravity, the space environment, and its vantage point in the heavens? How should the total of ten years' more operational, technological, and medical experience contribute to the goal of exploration beyond low Earth orbit?

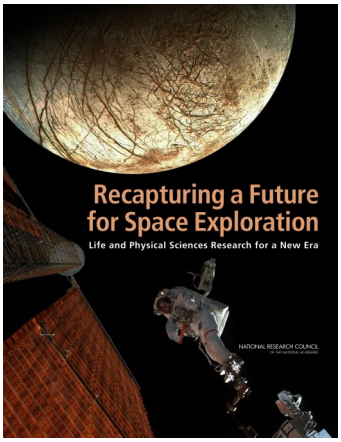
One can easily think up other equally interesting questions. My point is that it will be very hard for the U.S. ISS science community to answer the questions put to it, because of its lack of recent experience. The U.S. life and microgravity science community that had conducted research on Shuttle, and later ISS, was scattered to the four winds in the middle of the last decade. In the FY2008 NASA Appropriations Act, a concerned Congress asked the NRC for the first-ever decadal survey in this field, *Recapturing a Future for Space Exploration: Life and Physical Sciences Research for a New Era (2011).* This decadal survey focused on identifying the most relevant and valuable topics of research in low gravity, the criteria by which NASA could best prioritize that research, and the agency's support structural elements—such as an active research community—that would be required in order to meet NASA priorities.

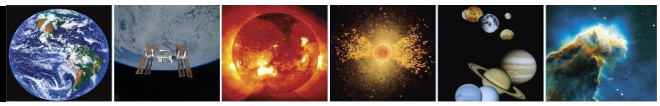
NASA has responded constructively, notably creating a new division to oversee and consolidate the direction of low gravity research, and there has been a definite uptick in ISS scientific utilization. Nonetheless, it will be necessary also to feature the results achieved by the international partners, who provided more consistent support for their science programs on ISS. Even so, extraordinary scientific, technical, and programmatic judgment will be required to create an achievable first-class program. Besides scientific prognostication,

(Continued on page 3)

Recapturing a Future for Space Exploration: Life and Physical Science Research for a New Era

Download a free copy via the National Academies Press at:
<http://www.nap.edu/catalog.php?record_id=13048>





SSB MEMBERSHIP

JULY 1, 2013—JUNE 30, 2014

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University of Michigan

LIAISON

LENNARD A. FISK
U.S. REPRESENTATIVE TO COSPAR

SSB STANDING COMMITTEES

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

Paul L. Schechter, MIT (Co-Chair)
David N. Spergel, Princeton University (Co-Chair)

Committee on Astrobiology and Planetary Science (CAPS)

Philip R. Christensen, Arizona State University (Co-Chair)
J. Gregory Ferry, Pennsylvania State University (Co-Chair)

Committee on Earth Science and Applications from Space (CESAS)

Mark R. Abbott, Oregon State University (Chair)
Joyce E. Penner, University of Michigan (Vice Chair)

Committee on Solar and Space Physics (CSSP)

J. Todd Hoeksema, Stanford University (Co-Chair)
Mary K. Hudson, Dartmouth College (Co-Chair)

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

(Continued from page 2)

there will be numerous non-scientific imponderables. For example, today's ISS-related programs and those after 2020 may not have the same scale; there could indeed be a greater scope for science and technology then; or the difficulties of operating an aging system could take away from science and technology, despite the best intentions.

Why should the Earth and space science community consider ISS life extension a major concern? The answer lies in the history of Shuttle and Station science advocacy. Many of us believe that science was oversold in the early advocacy for the International Space Station. The question about the potential value of science aboard Station was asked then, and a chorus of advocates answered it. Many people at that time may have gotten the impression this chorus represented the expert community. However, the scientific community responsible for actually doing the work when formally consulted—for instance, by a series of SSB reports— provided a more measured and cautious assessment of the scientific potential of Station. It is important to note that many of the conditions they cited as important for fulfilling Station's considerable scientific potential have been met only recently, or have yet to be met.

The establishment of an advisory structure for NASA's Space Life and Physical Sciences Research and Applications Division both within the NASA Advisory Council and at the NRC provides two important forums for debating future Station science. This debate would benefit greatly from an organized formal evaluation. We at the Space Studies Board stand ready to contribute.

Charles F. Kennel
Chair, SSB

The views expressed here do not necessarily reflect those of the SSB or the National Research Council.

NRC Space Science Week 2014

March 3-5, 2014
Washington, DC

Join the standing committees of the Space Studies Board and Board on Physics and Astronomy at the National Academy of Sciences Building in Washington, DC, March 3-5, 2014 as they convene to discuss issues and advances in their fields:

Committee on Astronomy and Astrophysics (CAA)
Committee on Earth Science and Applications from Space (CESAS)
Committee on Astrobiology and Planetary Science (CAPS)
Committee on Solar and Space Physics (CSSP)

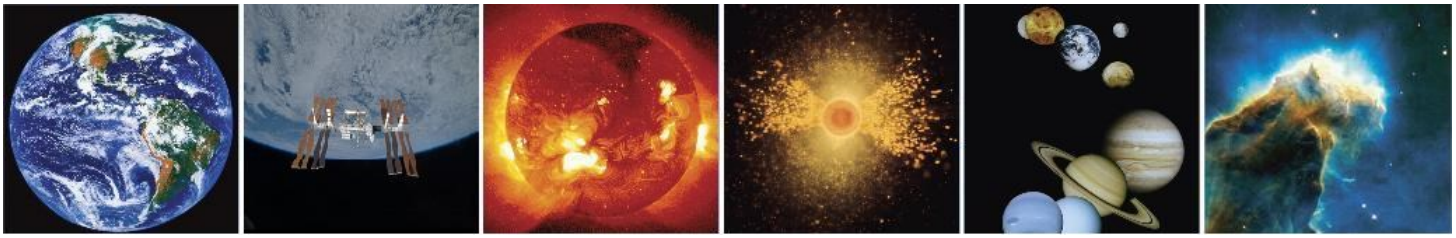
The standing committees will meet together and separately in public sessions to be announced shortly.

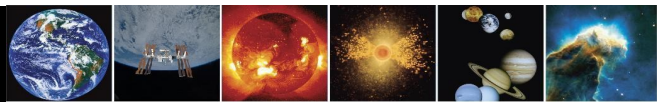
Please join us for a public presentation, **Exoplanets and the Real Search for Alien Life**, by Sara Seager, Professor of Planetary Science and Physics, MIT.

Tuesday, March 4th @ 6:30pm
National Academy of Sciences Building, Washington, DC

Astronomers have discovered over one thousand planets orbiting stars other than our Sun, with thousands more expected. Join Sara Seager of MIT as she explores the incredible diversity of these exoplanets and how further study could yield potential signs of life beyond Earth. This talk is open to the public and accessible to explorers of all ages.

For more information, please visit www.nationalacademies.org/spacescienceweek.





SSB ACTIVITIES

THE BOARD AND ITS STANDING COMMITTEES

The **Space Studies Board (SSB)** met November 7-8 at the National Academy of Sciences Building in Washington, DC. On the 7th the Board heard reports from the chairs of the standing committees they have oversight of, including CAA, CAPS, CESAS, and CSSP (see more information on the standing committees below) and then discussed the upcoming NRC Space Science Week (see more information on page 4). The Board then discussed several potential future activities, including the Board's 2014 workshop, tentatively titled *Sharing the Adventure with the Student* (including staff from the NRC's Board on Science Education); an activity on the Current State of Space Law (including staff from the NRC's Committee on Science Technology and Law); future SSB advice on mechanisms to improve decadal planning; an ad hoc study on NASA Science Flight Mission Management; and the new standing committee on Biological and Physical Sciences in Space. The Board also had a discussion with Sam Scimemi, NASA's ISS Director, on NASA's plans for ISS for 2014-2020 and beyond; received a briefing on the report *Landsat and Beyond: Sustaining and Enhancing the Nation's Land Imaging Program* from the committee chair, Jeff Dozier; and had a discussion with the chair of CESAS, Mark Abbott, on planning for the upcoming Earth Science decadal survey. The first day was capped off with a discussion on recent ESSC activities with Jean-Pierre Swings, ESSC Chair, and Jean Claude Worms, ESF. The second day of the meeting focused on Science at NASA with a discussion on the status of the Science Mission Directorate's (SMD) program and budget with Marc Allen (NASA/SMD) and remarks and discussion with Ellen Stofan, NASA's Chief Scientist. The Board's next meeting will be April 3 -4 in Washington, DC. The first day will be a joint session with the Aeronautics and Space Engineering Board. Visit <http://www.nas.edu/ssb> to stay up to date on board, workshop, and study committee meetings and developments.

The **Committee on Astronomy and Astrophysics (CAA)** met on November 4-5, 2013, in Washington, DC, and received briefings from the NASA Astrophysics Division, NSF Astronomy Division, NSF Antarctic astronomy and astrophysics program, Department of Energy High Energy Physics Office, and the James Webb Space Telescope Program Office. CAA also received overviews and updates from representatives of the SPICA, Gaia, and Euclid missions. The committee also held a discussion with the new chair of the AAAC, Andy Albrecht (UC-Davis).

On December 19, the committee held a telecon with the director of NASA Astrophysics Division, Paul Hertz; the chair of the X-ray Science Interest Group, Jay Bookbinder (Harvard Smithsonian CfA); and Tuck Stebbins (NASA Goddard Space Flight Center). The purpose of the telecon was to discuss the recent large-class "L2" and "L3" mission selections by the European Space Agency and their relevance to current and planned U.S. astronomy and astrophysics activities.

The next meeting of CAA will take place March 3-5, 2014 in Washington, DC, as part of the 2nd annual NRC Space Science Week (www.nationalacademies.org/spacescienceweek).

For more information about CAA and to learn about upcoming meetings, please visit <http://sites.nationalacademies.org/BPA/BPA_048755>.

A new standing committee of the Space Studies Board and the Aeronautics and Space Engineering Board, the **Committee on Biological and Physical Sciences in Space (CBPSS**), will get underway in 2014. The overarching purpose of the committee is to support scientific progress in space research in the biological, medical, and physical sciences and assist the federal government in integrating and planning programs in these fields. The CBPSS is expected to provide an independent, authoritative forum for identifying and discussing issues in space life and physical sciences between the research community, the federal government, and the interested public. The CBPSS will also monitor the progress in implementation of the recommendations of the decadal survey, *Recapturing a Future for Space Exploration: Life and Physical Sciences Research for a New Era.* Work has begun on seeking membership nominations for this new committee, and suggestions from the interested community are welcome.

The **Committee on Earth Science and Applications from Space** (CESAS) met on October 29-30, 2013 in Washington, DC. During the meeting, the committee received briefings from agency officials, including Michael Freilich, head of NASA's Earth Science Division, Mary Kicza, head of NOAA NESDIS, and Sarah Ryker, USGS. A briefing on the European Space Agency's (ESA) program in Earth observation science, technology, and applications was delivered by Maurice Borgeaud, Head, Earth Observation Science, Applications, and Future Technologies Department (EOP-S), ESA. The committee also received an update on the study "A Framework for Analyzing the Needs for Continuity of NASA-Sustained Remote Sensing Observations of the Earth from Space" by its chair, Byron Tapley, Univ. of Texas at Austin; a review of the 2012 report *Earth Science and Applications from Space: A Midterm Assessment of NASA's Implementation of the Decadal Survey* was given to the committee by the study chair, Dennis Hartmann, Univ. of Washington. Dr. Tapley also delivered a science talk to the committee on accomplishments of the GRACE mission, for which he is the principal investigator (information about GRACE is available at <http://www.csr.utexas.edu/grace/>.

The featured session of the meeting occurred on October 29 when agency representatives and other stakeholders met to discuss lessons learned and ideas for the organization of the next decadal survey in Earth science and applications from space. Planning for the next decadal, which will cover the approximate period of 2018-2028, will occur throughout 2014 to enable a formal start of the study in early 2015 and publication by mid-2017. As the quarter ended, the committee was planning its next in-person meeting, which will take place as part of the 2nd annual NRC Space Science Week in Washington, DC, on March 3-5, 2014. This meeting is expected to continue preparation for the next decadal survey; community representatives

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and invited guests representing U.S. international space agency partners are expected to attend. For more information about CESAS and to learn about upcoming meetings, please visit <http://sites.nationalacademies.org/SSB/SSB_066587>.

The **Committee on Astrobiology and Planetary Science (CAPS)** did not meet during this quarter. The committee did hold a series of semi-regular conference calls. The topics discussed in these calls included the planned reorganization of the research and analysis programs in NASA's Planetary Science Division, lessons learned during the development of the Mars Science Laboratory (MSL), and planetary protection activities associated with MSL. The first CAPS meeting of 2014 will take place March 3-5 as a part of the 2nd annual NRC Space Science Week. More information about CAPS is available at <http://sites.nationalacademies.org/SSB/SSB_067577>.

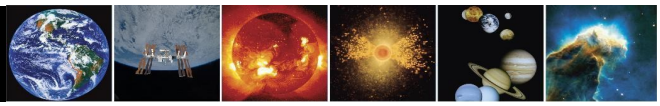
The **Committee on Solar and Space Physics (CSSP)** met from October 31-November 1, 2013, in Washington, DC. During the meeting, the committee received program updates, including progress in implementation of the recently completed decadal survey in Heliophysics (http://www.nap.edu/catalog.php?record_id=13060) from the newly appointed head of NASA's Heliophysics Division, David Chenette. The committee also received updates on NOAA NESDIS programs of interest from Thomas Burns and on space weather-related activities and NSF/GEO programs of interest, CubeSats, and the NASA HPD Roadmap, from Richard Behnke, Geospace Section Head, NSF; Therese Moretto-Jorgenson, NSF; and Maura Hagan, NCAR and chair of the NASA Heliophysics Subcommittee, respectively. Committee member Nathan Schwadron gave a science talk, "Has Voyager Entered the Interstellar Medium?"
The committee remains interested in assisting in organizing activities that could be useful to decision makers faced with tight budgets and increasing demands for information about Earth's space weather. The committee received an update on the National Space Weather Program from Michael Bonadonna of the Office of the Federal Coordinator for Meteorology and conducted a roundtable discussion with Mr. Bonadonna and invited guests on a variety of issues pertinent to this subject. Follow-up to these discussions occurred in subsequent committee teleconferences and is expected to continue at a focused session at the next committee meeting, which will take place as part of the 2nd annual NRC Space Science Week in Washington, DC, on March 3-5, 2014. For more information about CSSP and to learn about upcoming meetings, please visit <http://sites.nationalacademies.org/SSB/ssb_052324>.

STUDY COMMITTEES

The ad hoc **Committee for an Assessment of the Astrophysics Focused Telescope Assets (AFTA) Mission Concepts** held its first and only in-person meeting January 12-14, 2014, in Washington, DC. The study was requested by NASA Science Mission Directorate (SMD) in order to "assess whether NASA's proposed Astrophysics Focused Telescope Assets (AFTA) design reference mission described in the April 30, 2013, report of the AFTA Science Definition Team (SDT), WFIRST-2.4, is responsive to the overall strategy to pursue the science objectives of New Worlds, New Horizons in Astronomy and Astrophysics (NWNH), and, in particular, the survey's top-ranked, large-scale, space-based priority: the Wide Field Infrared Survey Telescope (WFIRST)."
At the January 12-14 meeting, committee members heard from NASA SMD and the Astrophysics Division; representatives of the WFIRST-AFTA science definition team; representatives of the NASA-led WFIRST-AFTA project team; representatives of Aerospace Corporation, who conducted a technical evaluation of the WFIRST-AFTA concept; and representatives of the astronomy and astrophysics community who spoke about the proposed coronagraph, its scientific capabilities, and associated technical risk.
The committee is working to release its report in March 2014.
For more information about the AFTA study, please visithttp://sites.nationalacademies.org/SSB/CurrentProjects/SSB_086404.

The first in-person meeting of the ad hoc **Committee on a Framework for Analyzing the Needs for Continuity of NASA-Sustained Remote Sensing Observations of the Earth from Space** occurred on November 12-14, 2013, in Washington, DC. The committee's revised task statement is available at <http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_084713>. At the meeting, the committee had extensive discussions with Michael Freilich, Director, NASA Earth Science Division. The committee also heard presentations from Tom Karl, Director, NOAA National Climatic Data Center; Tim Newman, Acting Land Remote Sensing Program Coordinator, USGS; and Peter Colohan, Office of Science and Technology Policy. In closed session, the committee reviewed the task statement and developed a preliminary plan to address its elements. Several internal working groups were formed, which will report back to the full committee at its next in-person meeting, which will take place on January 29-31, 2014, in Washington, DC. A third and final meeting is tentatively scheduled for late April at the Academy's Beckman Center in Irvine, California. More information is available at <http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_084713>.

In December, the ad hoc **Committee on the Role of High-Power, High Frequency-Band Transmitters in Advancing Ionospheric/Thermospheric Research** delivered a prepublication version of its report, *Opportunities for High-Power, High-Frequency Transmitters to Advance Ionospheric/Thermospheric Research: A Workshop* to the study sponsors, DOD (Air Force Research Laboratory), and NSF (Directorate for Geosciences/Division of Atmospheric and Geospace Sciences). A final version of the report is expected in early 2014.
The committee's report summarizes discussions that occurred at a workshop on May 20-21, 2013, in Washington, DC. Traditionally, experimental geospace research, including probing of the atmosphere, the ionosphere, and the magnetosphere, has been conducted passively (i.e., no controlled input/response capability) using instruments located on the ground or on satellites. The May workshop provided a forum for information exchange between the comparatively small number of researchers engaged in programs of upper atmospheric research using high-power, high-frequency (HF) radar transmitters ("heaters") and the larger ITM (ionosphere-thermosphere-magnetosphere) research community. A particular



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focus of the workshop was on the future of the High Frequency Active Auroral Research Program (HAARP) and its high-power transmitter facility in Gakona, Alaska. Further information about the workshop, including a link to download a free PDF of the workshop report, is available at <http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_082082>.

During October, the ad hoc **Committee on Human Spaceflight** conducted an outreach event calling for tweets from the public in response to the question: What are your best ideas for creating a NASA human spaceflight program that is sustainable over the next several decades? The tweeted submissions can be viewed at https://twitter.com/search?q=%23HumansInSpace&src=typd. The committee met in Washington, DC, on October 21-23. During open sessions, the committee heard briefings regarding NASA's current human spaceflight plans and challenges, historical perspectives, and the benefits and tradeoffs from a sustained human spaceflight exploration program. The committee also reviewed reports and progress from both of its supporting panels at this meeting and continued preliminary report development. The Technical Panel held its final meeting in closed session on October 15-16 in Washington, DC. The panel delivered a summary of their findings to the committee at its October meeting. Meanwhile, the Public and Stakeholder Opinions Panel held its two final meetings on October 4 and December 12 in Washington, DC to conduct analysis and develop materials related to poll and survey results. During this period the panel completed its Stakeholder Survey and presented the results of its analysis to the committee during the panel's Dec. 12 meeting. The committee held its final meeting in closed session in Irvine, CA, on January 13-15. Additional information on this study, including committee and panel meetings, is available at <http://www.nationalacademies.org/humanspaceflight>.

Neil deGrasse Tyson, Hayden Planetarium speaking to the Committee on Human Spaceflight at their October meeting. *Photo courtesy of Dwayne Day.*

The ad hoc **Committee on the Assessment of the NASA Science Mission Directorate 2014 Science Plan** has completed its assigned task and disbanded on December 31. The committee's report, *Review of the Draft 2014 Science Mission Directorate Science Plan*, was delivered to NASA on November 22 and released to the public on December 2. Additional details concerning the committee, its membership, and its task is available at <http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_084584>.

OTHER ACTIVITIES

OUTREACH

In conjunction with the NRC's Division on Earth and Life Sciences, the SSB was represented at an exhibit booth at the **American Geophysical Union** Fall Conference in San Francisco, CA, on December 15-19. The AGU Fall conference was attended by more than 22,000 Earth and space scientists, educators, students, and other leaders. Our booth was visited by many, including former SSB board member, Warren Washington, who has been named Fellow of AGU (see picture below). This tremendous honor was given for fundamental contributions and leadership in the study of global climate and climate modeling and for his inspiring mentorship of our young future scientists.

2013 AGU fellow and former SSB member Warren Washington visiting the SSB exhibit booth. *Photo courtesy of Celeste Naylor.*

The SSB is on Twitter and has tweeted on topics such as new membership, exhibits, agenda changes, newsletter releases and we have even participated in a twitter event for the Committee on Human Spaceflight.

Follow us on Twitter @SSB_ASEB_News

OTHER ACTIVITIES (CONTINUED)

COSPAR successfully held its first off-year symposium in Bangkok, Thailand on November 11-15. The symposia were initiated so that small-to-medium size COSPAR member countries can host an international gathering of space scientists without the complications and expense associated with the 30-plus parallel sessions now common at the organization's biennial scientific assemblies. The topical foci of the Bangkok symposium were planetary systems of the Sun and other stars and the future of space astronomy. COSPAR will hold its annual business meetings in Paris on March 17-20. These meetings will include the second and final gathering of the Science Program Committee for the 40th COSPAR Scientific Assembly, to be held in Moscow, Russia, on August 2-10 (see more information on page 9); and the first meeting of the Science Program Committee for the 2015 COSPAR Symposium (location TBD). The COSPAR Scientific Advisory Committee and the COSPAR Bureau will also hold their annual meetings during the same week. COSPAR has also announced a new journal, *Life Sciences in Space Research,* see more information below.

During breaks in the scientific discussions, participants at the first COSPAR Symposium used a combination of ferries, water taxis, and tuk-tuks to evade roadblocks, barricades, and demonstrations in central Bangkok and view important Thai cultural and religious sites such as the Temple of Dawn (background), the Grand Palace, and the Temple of the Reclining Buddha . *Photos courtesy of David Smith.*

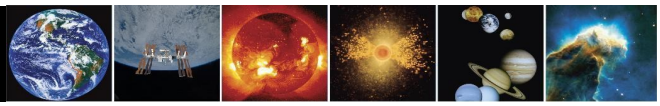
COSPAR, the Committee on Space Research of the International Council for Science Announces a New Journal: Life Sciences in Space Research

***Life Sciences in Space Research* will publish high-quality original research and state-of-the-art review articles in areas covered by Commission F (life sciences) of COSPAR. The new journal will replace the LS section of *Advances in Space Research*. Manuscripts in the following areas will be considered:**

- Effects of space radiation in living organisms at the cellular and molecular levels
- Gravitational effects in biological systems
- Space radiation dosimetry— measurements, modeling and detector development
- Space Radiation risk assessment and countermeasures
- Non-cancer health effects of space radiation, space flight
- Astrobiology
- Prebiotic chemistry and origin of life
- Life in extreme environments
- Habitability in the solar system and beyond
- Ecological life support and sustainability
- Functionality, monitoring and control of ecosystem in space environment
- Animal models in space research
- Effects of space flight conditions on human bodies

Coming April 1, 2014, for more information go to <https://cosparhq.cnes.fr/content/cospar-launches-new-journal>.

COMMITTEE ON SPACE RESEARCH (COSPAR)
Expanding the knowledge frontier of space for the benefit of humankind



The Committee on Space Research Welcomes You to Moscow

COSPAR MOSCOW 2014

COSMOS

40th SCIENTIFIC ASSEMBLY

Russia, Moscow, 2-10 August 2014

www.cospar2014moscow.com

MOSCOW CITY IN THE CENTER OF SCIENCE, CULTURE AND EDUCATION

ASSEMBLY VENUE LOMONOSOV MOSCOW STATE UNIVERSITY

Abstract submission deadline: 14 February 2014

DEADLINE FOR EARLY REGISTRATION: 16 MAY 2014

The address for submission of abstracts:
https://www.cospar-assembly.org/

The Ministry of Education and Science of the Russian Federation | Moscow City Government | Lomonosov Moscow State University | The Russian Academy of Sciences | Space Research Institute of the Russian Academy of Sciences (IKI RAS) | Federal Space Agency of the Russian Federation (Roscosmos) | LSR Group | Skolkovo Innovation Center Space and Telecommunications Technologies Cluster | SkyTeam Alliance | DAURIA AEROSPACE | Professional Congress Organizer «CTO EVENTS» Agency Ltd | Center of Applied Space Technology and Microgravity | Committee on Space Research

NEW RELEASES

Opportunities for High-Power, High-Frequency Transmitters to Advance Ionospheric/Thermospheric Research: Report of a Workshop

This report is the summary of a workshop convened by the Space Studies Board of the National Research Council in May 2013. The request for this workshop was informed by the sponsors' awareness of the possibility that tight budgets would result in the Department of Defense's curtailment or even termination1 of support for the High Frequency Active Auroral Research Program (HAARP), which includes the world's highest-power and most capable high-frequency transmitter - "heater" - for ionospheric research. Although the workshop was organized to consider the utility of heaters in upper atmospheric research in general, it had a specific focus on the HAARP transmitter facility, which is located in a remote part of southeastern Alaska.

Research conducted by the ionospheric modifications community - a community that uses high-frequency transmitters to inject energy in the ionosphere and measure its effects using ground and space-based diagnostics - is focused on understanding the interaction of radio waves with the ionospheric plasma, the local consequences of heating in the ionosphere, and studies of non-linear plasma physics processes. The workshop provided a forum for information exchange between the comparatively small group of scientists engaged in programs of upper atmospheric research using high-power high-frequency radar transmitters and the larger ionospherethermosphere-magnetosphere research community.

This report examines the state of the art in active ionospheric and thermospheric research; considers the fundamental research areas in ionospheric science that can be addressed using high-power high-frequency-band transmitters; discusses emerging science questions that might benefit from active ionospheric experiments in the sub-auroral zone; and considers ways to combine similar facilities to perform global ionospheric science. The report also examines research opportunities that might arise from the relocation of the AMISR incoherent scatter radar from the Poker Flat Research Facility in Poker Flat, AK to Gakona, AK, the location of the HAARP facility.

Authors include the Committee on the Role of High-Power, High-Frequency-Band Transmitters in Advancing Ionospheric/ Thermospheric Research: A Workshop and study director Art Charo. *Other staff are listed in the report.*

Copies of this report are available at <www.nap.edu/catalog.php?record_id=18620>.

Review of the Draft 2014 Science Mission Directorate Science Plan

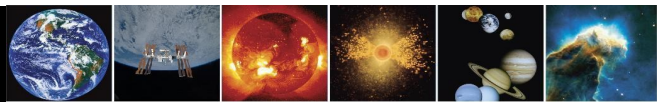
NASA's Science Mission Directorate (SMD) is engaged in the final stages of a comprehensive, agency-wide effort to develop a new strategic plan at a time when its budget is under considerable stress. SMD's Science Plan serves to provide more detail on its four traditional science disciplines - astronomy and astrophysics, solar and space physics (also called heliophysics), planetary science, and Earth remote sensing and related activities - than is possible in the agency-wide Strategic Plan.

Review of the Draft 2014 Science Mission Directorate Science Plan comments on the responsiveness of SMD's Science Plan to the National Research Council's guidance on key science issues and opportunities in recent NRC decadal reports. This study focuses on attention to interdisciplinary aspects and overall scientific balance; identification and exposition of important opportunities for partnerships as well as education and public outreach; and integration of technology development with the science program. The report provides detailed findings and recommendations relating to the draft Science Plan.

Authors include the Committee on the Assessment of the NASA Science Mission Directorate 2014 Science Plan and study director David Smith. *Other staff are listed in the report.*

Copies of this report are available at <www.nap.edu/catalog.php?record_id=18609>.

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



STAFF NEWS

Christine Mirzayan Science and Technology Policy Graduate Fellowship Program

Over the years, the SSB has participated in the Christine Mirzayan Science and Technology Policy Graduate Fellowship Program. This winter we are joined by Padmashri Suresh.

Padmashri Suresh (SSB/ DEPS) is currently finishing her PhD in electrical engineering at Utah State University. She is a NASA Earth and Space Science Fellow working on understanding the effects of space weather. Her dissertation focuses on studying the effects of solar storms on the Earth's upper atmosphere. Her other research interests include instrumentation for CubeSats and sounding rocket missions. She is also a member of the student government working as the graduate research director and serving as the graduate student liaison across various research and student welfare committees. Padmashri's interest in the Mirzayan fellowship stems from her interest to pursue a career in space program management. As a Mirzayan fellow, she hopes to learn how the different stakeholders of the space industry interface when deciding system-level problems and making enterprise-level decisions. Originally from Bangalore, India, Padmashri obtained her BS in electrical engineering from Visveswaraiah Technological University. Following which, she worked with IBM as a systems engineer and architect for 2 years and then moved to Utah to pursue a master's with a focus on space systems. While not working in the lab, she loves to hike the national parks. She is also an amateur astronomer and an avid photographer.

More information on the fellowship can be found at <http://sites.nationalacademies.org/PGA/policyfellows/index.htm>.

Lloyd V. Berkner Space Policy Internship

In December, interns Jinni Meehan and Sierra Smith completed their sessions as the SSB's Lloyd V. Berkner Space Policy Internship. Their reflections on their experiences with the SSB appear below.

Applications for the program's summer-2014 session are being accepted between September 1, 2013, and February 7, 2014. Selections will be made no later than March 7. Details concerning the program can be found at <http://sites.nationalacademies.org/SSB/ssb_052239>.

***Jinni Meehan** is a Ph.D. student at Utah State University in the Department of Physics. Her research is directed toward alleviating space weather effects on the Global Navigation Satellite System (GNSS) by better characterizing the ionosphere, which can improve forecast models.*

I must say how invaluable my experience was with the Space Studies Board. Prior to serving this internship, I had some experience in the world of science policy thanks to a science policy fellowship with the American Meteorology Society. I applied for the Lloyd V. Berkner internship to broaden my science policy knowledge, and this internship went above and beyond what I imagined. Science policy is a sensitive subject to scientists, and it is something that is often overlooked in my field, so seeing science policy from a new perspective really opened my eyes. It also helped to start the internship just as the government shutdown for 16 days —to see how it crippled several science projects and affected numerous agencies in several ways.

Better understanding of how science and government works, hand in hand, is something I set out to achieve with this internship, and I couldn't have been happier with the experience. The internship exposed me to the ins and outs of the National Academy of Sciences by the exposure to several committee meetings, technical panels, and the annual SSB fall meeting. Also, I got to meet a diverse range of scientists from several fields, which is very valuable as I further my career.

Something I found most interesting is the relationship between the Academies and NASA as well as other agencies. I never quite understood how significant the reports produced by the NRC were until I saw how the reports serve as the backbone of many agency decisions, not only in this country but in the world.

I am very thankful to have served as a 2013 Autumn Lloyd V. Berkner intern for the Space Studies Board and would like to acknowledge the staff for their excellent mentorship and knowledge that really made my experience extremely beneficial and something that has benefited my career.

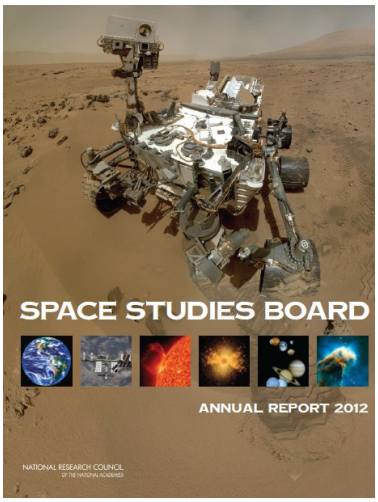
***Sierra Smith** recently graduated from James Madison University with an MA in history. The research for her master's thesis focused on the sociopolitical context of the search for extraterrestrial Intelligence and its broader relationship to space sciences.*

As an historian of modern sciences, the Lloyd V. Berkner Space Policy Internship gave me the opportunity to see the historical process of constructing space policy in action. During my time at the Space Studies Board, I attended meetings of every standing committee and the Board. These meetings introduced me to a broad array of the communities, interests, and issues that fall under the umbrella of space sciences. It was clear that the sponsoring agencies highly value the input they receive from the committees.

My time at the SSB also provided invaluable insight into the NRC report-writing process. Though I had some familiarity with NRC reports through my own research, my experience at the SSB showed just how much time and effort it takes to produce well-researched and nuanced studies. My future research will certainly be positively impacted by my time at the SSB.

The most valuable take-away from my time as an intern at the Space Studies Board will be the advice I've received and the contacts I have made. The staff always had an open door to discuss ongoing NRC work, my future career, and the not-to-be-missed places in DC. Committee meeting dinners provided an informal way to connect to senior people in the space community. Overall, the Lloyd V. Berkner Internship is a fantastic introduction to the world of space policy.

Space Studies Board Annual Report—2012



The *Space Studies Board Annual Report* summarizes the activities of the Board and its committees, including summaries of regular reports released during the year. Other features include an overview of the structure and operations of the Board, a cumulative bibliography since 1958, and a DVD Compilation of SSB Reports. The report is posted at <http://www.nationalacademies.org/ssb/ssb.html>. Limited copies are available. See the last page of this newsletter to order a copy.

Space Studies Board Annual Report—2013 will be released in the 2nd quarter of 2014.

More information on the SSB and ASEB Board Meetings is at <http://sites.nationalacademies.org/SSB/SSB_054577 >(SSB) and <http://sites.nationalacademies.org/DEPS/ASEB/DEPS_058923> (ASEB)

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Financial Officer	Senior Financial Assistant
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Associate Program Officer	Lloyd V. Berkner Space Policy Intern
LEWIS GROSWALD	**SIERRA SMITH**
Associate Program Officer	Lloyd V. Berkner Space Policy Intern

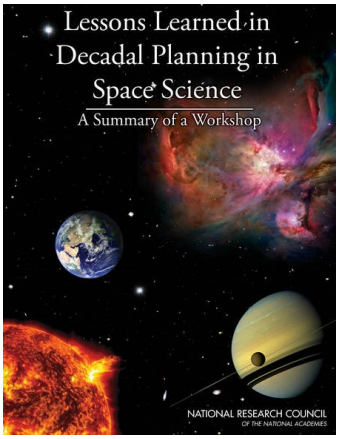
* Staff of other NRC boards who are shared with the SSB.

View video and presentations of the recently released workshop summary

Lesson Learned in Decadal Planning in Space Science: A Summary of a Workshop

Download a free copy via the National Academies Press at: <http://www.nap.edu/catalog.php?record_id=18434>

Videos of the workshop speakers are available for viewing at: <http://nrc51/SSB/CompletedProjects/SSB_070954>



News from the National Academies

Remembering Chuck Vest, past President of the National Academy of Engineering

After a courageous battle with pancreatic cancer, Chuck Vest, president of the National Academy of Engineering from 2007-2013, passed away at his home on Dec. 12. "Chuck's vigorous and remarkably productive life was cut much too short, but nonetheless it was full and deeply appreciated, and his impact on our nation and people will be lasting," said NAE president C. Dan Mote, noting that Dr. Vest's counsel was sought at the highest levels of government, academia, and the nonprofit sector. Under his leadership, NAE began and strengthened many of its strategic programs, including the Grand Challenges for Engineering, a set of 14 critical challenges for engineers in the 21st century, which, if achieved, will improve the quality of life for humankind. NAE also expanded its Frontiers of Engineering program internationally and undertook a novel partnership with the U.S. Institute of Peace to consider how engineering, science, and technology can contribute to conflict prevention and peacemaking. In addition, Dr. Vest became a spokesperson for engineering by illuminating the national and global forces reshaping the discipline, including its practice, education, and future.

Board Member News

Photo courtesy of Ryan K Morris; National Science and Technology Medals Foundation

AIAA is seeking nominations for the Yvonne C. Brill Lectureship in Aerospace Engineering

In memory of Yvonne C. Brill, the American Institute of Aeronautics and Astronautics is establishing the Yvonne C. Brill Lectureship in Aerospace Engineering. Nominations are being solicited for the inaugural lectureship to be held September 2014. Nominations are due to the AIAA on January 31, 2014 (a nomination form can be obtained by contacting Carol Stewart at carols@aiaa.org). Dr. Brill was a pioneering rocket scientist, Space Studies Board member, NAE member, AIAA Honorary Fellow, and National Science and Technology Medal recipient.

AIAA Announces 2014 Fellows and Honorary Fellows

Steve Battel, president of Battel Engineering, former member of the Space Studies Board and current member of the Aeronautics and Space Engineering Board, was named an 2014 AIAA Fellow. AIAA President Mike Griffin stated "The title of AIAA Fellow is among the highest honors that one can earn in the aerospace community. It represents the acknowledgement of peers that one's work is truly outstanding, and that you have made lasting contributions to significantly advancing the state-of-the art of aerospace science and technology."

NASA Science Mission Directorate News

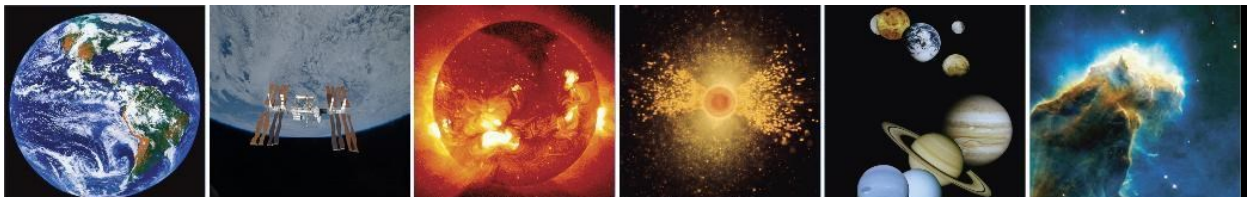
NASA's Science Mission Directorate (SMD) Seeks Public Policy Expert

SMD's Strategic Integration and Management Division (SIMD) is looking for a Public Policy Expert to join our staff under an Intergovernmental Personnel Act (IPA) appointment. The initial IPA appointment will be for up to 2 years, with the possibility of reappointment up to a total of 6 years; all applicants must be from an IPA-eligible organization (e.g., state and local governments, colleges and universities, Indian tribal governments, federally funded research and development centers, and non-profit organizations).

Ideal candidates would have an advanced degree in Public Policy or a related field, and have multiple years of experience working in public policy implementation. All candidates must possess excellent policy analysis, writing and editing skills. Prior experience working on space policy is desirable, but not required.

The individual selected would join a 7-person team focused on providing policy support to SMD's 95 missions that span Astrophysics, Earth Science, Heliophysics, Planetary Science, and various reimbursable projects for other agencies. The specific responsibilities of the policy team include developing and coordinating documents for Congress (testimony, correspondence, white papers, briefings, and responses to questions for the record), interagency partners (inter-agency agreements, interagency meetings, and coordination with OSTP and OMB), international partners (international policy, agreement tracking, export control, and international meetings), external advisory groups (NASA Advisory Council's Science Committee and subcommittees, as well as committees of the National Research Council), auditors, and leading SMD's strategic planning activities.

Applicants should forward their resume or Curriculum Vita to Dr. T. Jens Feeley at jens.feeley@nasa.gov or 202.358.1714.



SSB Calendar

January

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January 12-14	Committee on An Assessment of the Astrophysics Focused Telescope Assets (AFTA) Mission Concepts	Washington, DC
January 13-15	Committee on Human Spaceflight	Irvine, CA
January 29-31	Committee on A Framework for Analyzing the Needs for Continuity of NASA-Sustained Remote Sensing Observations of the Earth from Space	Washington, DC
March 3-5	NRC's Space Science Week Committee on Astronomy and Astrophysics (CAA) Committee on Astrobiology and Planetary Science (CAPS) Committee on Earth Science and Applications from Space (CESAS) Committee on Solar and Space Physics (CSSP)	Washington, DC
April 3-4	Space Studies Board (joint with the ASEB on April 3)	Washington, DC
April 23-25	Committee on A Framework for Analyzing the Needs for Continuity of NASA-Sustained Remote Sensing Observations of the Earth from Space	Irvine, CA

Future Meetings

November 5-7, 2014, SSB Fall Meeting, Irvine, CA

Our meeting facilities

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

Keck Center of the National Academies
500 Fifth St NW,
Washington, DC

Arnold and Mabel Beckman Center of the National Academies
100 Academy Drive
Irvine, CA

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

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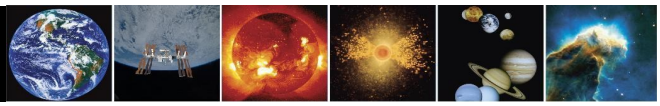

SELECTED REPORTS AVAILABLE FROM THE SPACE STUDIES BOARD

For a complete list of titles visit our website at <http://sites.nationalacademies.org/SSB/ssb_051650>

Free PDF versions of all SSB reports are available online at <http://www.nap.edu> and on the DVD (listed below)

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.

- ☐ **Review of the Draft 2014 Science Mission Directorate Science Plan**
- ☐ **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)** Book and CD
- ☐ **Landsat and Beyond: Sustaining and Enhancing the Nations Land Imaging Program (2013)** (Pre-Order)
- ☐ **Space Studies Board Annual Report 2012 (2013)** Book and CD
- ☐ **The Space Studies Board 1958-2012: Compilation of Reports (2013)** DVD
- ☐ **Solar and Space Physics: A Science for a Technological Society (2013)** Book and CD
- ☐ **NASA's Strategic Direction and the Need for a National Consensus (2012)**
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- ☐ **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)** Book and CD
- ☐ **Assessment of Planetary Protection Requirements for Spacecraft Missions to Icy Solar System Bodies (2012)**
- ☐ **Assessment of a Plan for U.S. Participation in Euclid** CD Only
- ☐ **Technical Evaluation of the NASA Model for Cancer Risk to Astronauts Due to Space Radiation**
- ☐ **Report of the Panel on Implementing Recommendations from the New Worlds, New Horizons Decadal Survey (2012)**
- ☐ **Sharing the Adventure with the Public—The Value of Excitement: Summary of a Workshop (2011)**
- ☐ **Recapturing a Future for Space Exploration: Life and Physical Sciences Research for a New Era (2011)** Book and CD
- ☐ **Visions and Voyages for Planetary Science in the Decade 2013-2022 (2011)** Book and CD
- ☐ **Assessment of Impediments to Interagency Collaboration on Space and Earth Science Missions (2011)**
- ☐ **Forging the Future of Space Science: The Next 50 Years (2010)** CD Only
- ☐ **Panel Reports—New Worlds, New Horizons in Astronomy and Astrophysics (2011)**
- ☐ **New Worlds, New Horizons in Astronomy and Astrophysics (2010)**
- ☐ **Controlling Cost Growth of NASA Earth and Space Science Missions (2010)** CD Only
- ☐ **Capabilities for the Future: An Assessment of NASA Laboratories for Basic Research (2010)** CD Only
- ☐ **Revitalizing NASA's Suborbital Program: Advancing Science, Driving Innovation, and Developing a Workforce (2010)**
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- ☐ **Approaches to Future Space Cooperation and Competition in a Globalizing World: Summary of a Workshop (2009)**
- ☐ **Radioisotope Power Systems: An Imperative for Maintaining U.S. Leadership in Space Exploration (2009)** CD Only
- ☐ **Assessment of Planetary Protection Requirements for Mars Sample Return Missions (2009)**
- ☐ **Severe Space Weather Events—Understanding Societal and Economic Impacts: A Workshop Report (2008)** CD or Executive Summary

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