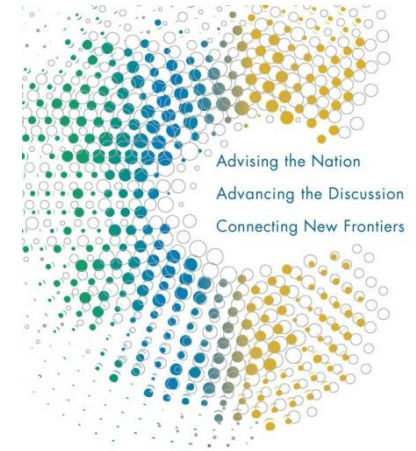


**Michael H Moloney  
Report to ESSC, November 2017**



- The National Academy of Sciences (NAS) was established on March 3 1863 by Act of Congress, signed into law by President Lincoln in the midst of the Civil War.
- NAS was established to "investigate, examine, experiment, and report upon any subject of science or art" whenever called upon to do so by any department of the government. The National Academy of Engineering (NAE) was established in 1964 and the Institute of Medicine (now the National Academy of Medicine) in 1970. We now call ourselves the **National Academies of Sciences, Engineering, and Medicine**.
- The National Academies provide independent, objective analysis and advice to the nation and conduct other activities to solve complex problems and inform public policy decisions. The National Academies also encourage education and research, recognize outstanding contributions to knowledge, and increase public understanding in matters of science, engineering, and medicine.

# Space and Aeronautics at the Academies

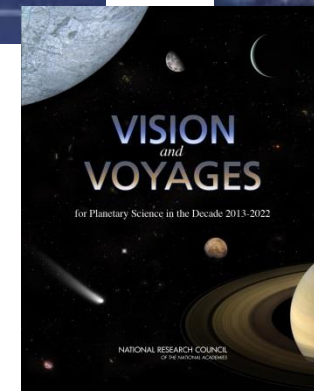
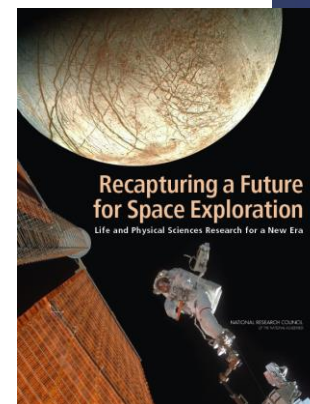
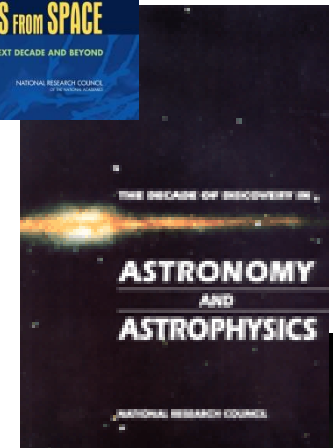
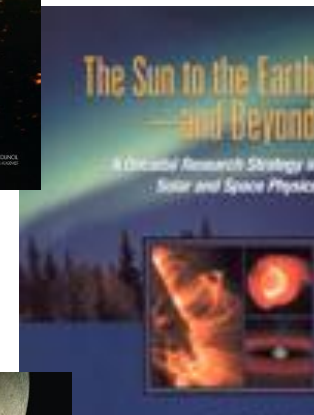
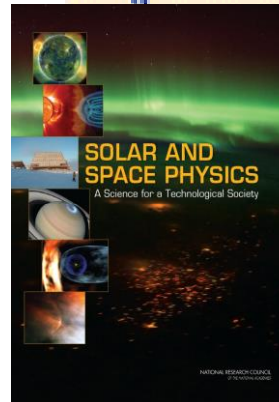
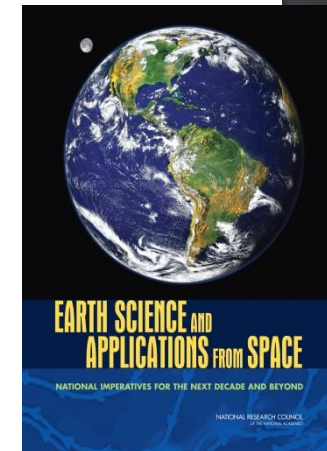
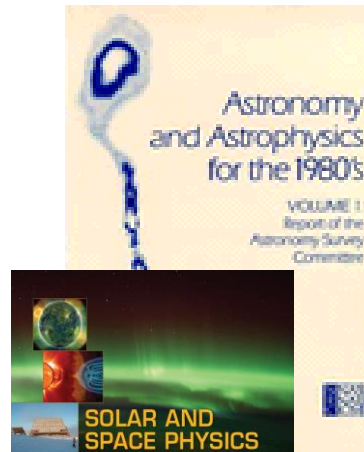
## Space Studies Board and the Aeronautics and Space Engineering Board

- One of the larger units in the Academies.
- Conduct studies for NASA, USGS, USAF, NOAA, FAA, etc.
- Encompasses all of Space Science, Space Engineering, and Aeronautics.
- SSB's Signature product are the **decadal surveys** in space science—including planetary science and life/physical sciences.
- ASEB reviews NASA's aeronautics and space technology programs.



# 55 Years of Decadal Surveys

- **Astronomy and Astrophysics**  
1963, 1973, 1982, 1991,  
2001, 2010, (2020)
- **Planetary Science**  
2003, 2011, (2022)
- **Solar and Space Physics**  
2003, 2012, (2024)
- **Earth Science and Applications  
from Space**  
2007, (2018)
- **Life and Physical Research  
in Space**  
2011



# SSB - Decadal Surveys

Among the ad hoc studies the SSB conducts, the **decadal surveys** stand out as the **signature products** of the SSB and its discipline committees.

The foundation of decadal surveys was the first astronomy decadal survey report in 1964. Now expanded to all of the space sciences and Earth science and applications from space and, most recently, the biological and physical sciences in space.

At the most fundamental level, decadal surveys are community-driven, **bottom-up studies** that aim to formulate a community consensus on the **most compelling science** questions for the decade ahead in each of the disciplines.

The studies also identify **prioritized lists of missions** and, in some cases, ground-based research activities that can address the highest-priority science.

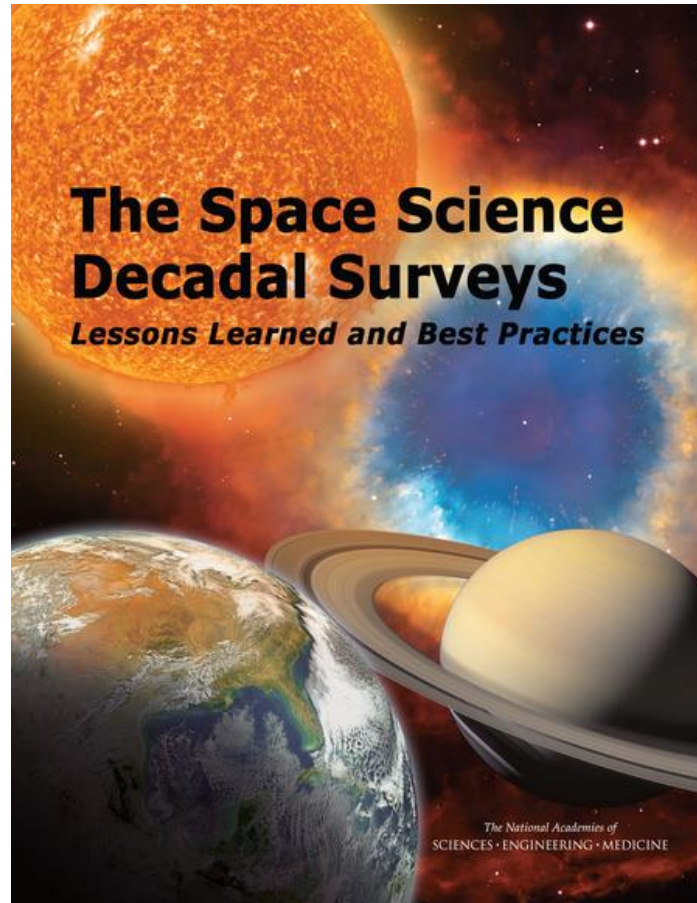
Involve the appointment of a steering committee and a set of 4-9 topical panels (no two surveys are the same) involving a total of up to 80-120 volunteers.

The studies involve **extensive community input** via hundreds of white papers, community forums, and other outreach activities, and the most recent round included an independent Cost Assessment and Technical Evaluation (the so-called CATE process) of proposed initiatives and recommendations made within defined budget scenarios.



# *Decadal Surveys – Lessons Learned*

<https://www.nap.edu/read/21788>



**National Academy of Engineering**  
C.D. (Dan) Mote, Jr., President

**National Academy of Sciences**  
Marcia McNutt, President

**National Academy of Medicine**  
Victor J. Dzau, President

**Executive Office**  
Bruce B. Darling, Executive Officer  
James F. Hinchman, Deputy Executive Officer & Chief Operating Officer

Program Units

**Division of Behavioral and Social Sciences and Education**

**Division on Earth and Life Sciences**

**Division on Engineering and Physical Sciences**

**Health and Medicine Division**

**Policy and Global Affairs Division**

**Transportation Research Board**

**Gulf Research Program**

**Division on Engineering and Physical Sciences**

Executive Director: Peter Blair  
Deputy Executive Directors: Joan Fuller and Scott Weidman

**Aeronautics and Space Engineering Board**

Director: Michael Moloney  
Chair: Alan Epstein

**Board on Mathematical Sciences and their Applications**

Director: Michelle Schwalbe  
Chair: Stephen Robinson

**National Materials and Manufacturing Board**

Director: James Lancaster  
Chair: Celia Merzbacher

**Air Force Studies Board**

Director: Joan Fuller  
Chair: Douglas Fraser

**Board on Physics and Astronomy**

Director: James Lancaster  
Chair: Barbara Jacak

**Naval Studies Board**

Director: Charles Draper  
Chair: Paul Schneider

**Board on Army Science and Technology**

Director: Bruce Braun  
Chair: David Maddox

**Computer Science and Telecommunications Board**

Director: Jon Eisenberg  
Chair: Farnam Jahanian

**Space Studies Board**

Director: Michael Moloney  
Chair: Fiona Harrison

**Board on Energy and Environmental Systems**

Director: Jim Zucchetto  
Chair: Andrew Brown

**Intelligence Community Studies Board**

Director: Alan Shaw  
Chair: Donald Kerr

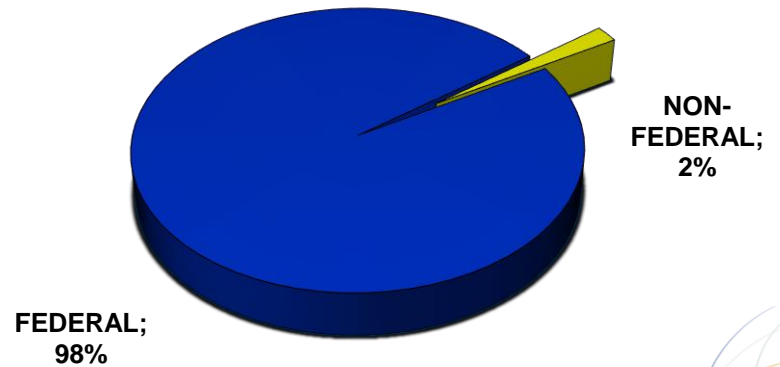
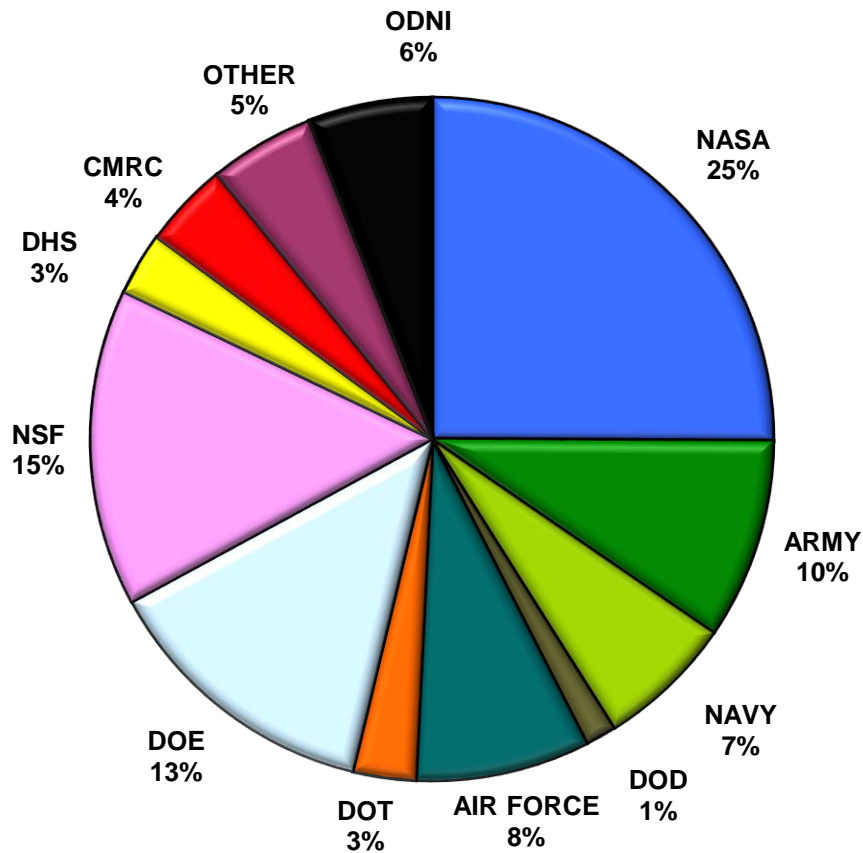
**Board on Infrastructure and the Constructed Environment**

Director: Cameron Oskvig  
Chair: James Whittaker

**Laboratory Assessments Board**

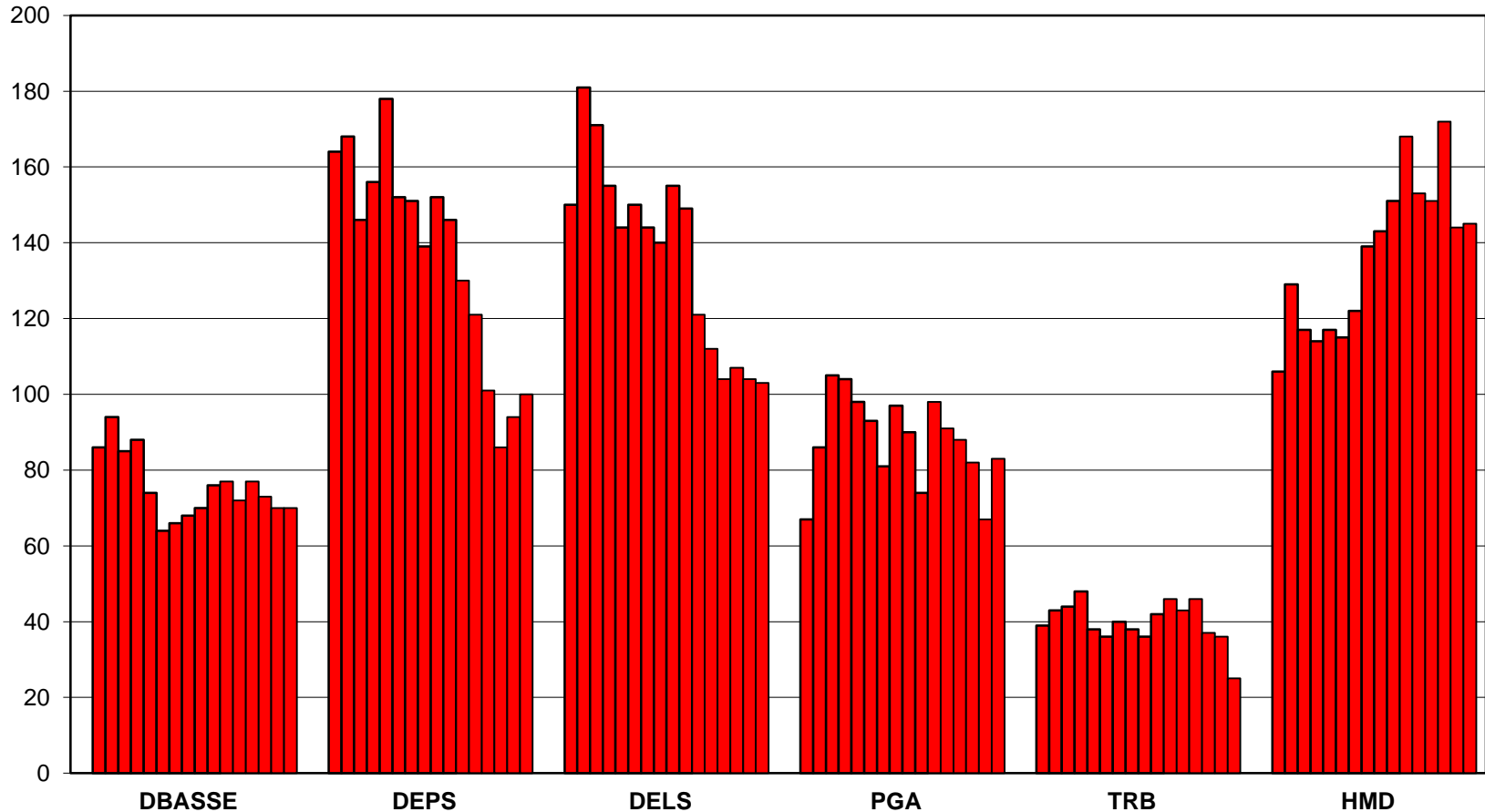
Director: Jim McGee  
Chair: John Lyons

# DEPS 2016 Total Program Support \$24.958M by Sponsor





# Academies Appointed Committees\* by Program Division 2001 – 2016



The Academies, in total, had over 500 active committees in 2016.



# SSB Charge

- The SSB was established in 1958 to serve as the focus of the interests and responsibilities in space research for the National Academies of Sciences, Engineering, and Medicine.
- The SSB provides an independent, authoritative forum for information and advice on all aspects of space science and applications, and it serves as the focal point within the Academies for activities on space research. It oversees advisory studies and program assessments, facilitates international research coordination, and promotes communications on space science and science policy between the research community, the federal government, and the interested public.
- The SSB also serves as the U.S. National Committee for the International Council for Science Committee on Space Research (COSPAR).



# Standing Committees & Roundtables

- The boards devolve detailed oversight responsibilities to its **standing and discipline committees** that provide an **independent, authoritative forum** for identifying and discussing issues in space science between the research community, the federal government, and the interested public. The discipline committees **also monitor the progress in implementation of the recommendations of their respective decadal survey.**
- In fulfilling these responsibilities, the committee may **formulate and oversee ad-hoc studies** related to the implementation of the each survey and on issues in space science more broadly.
- **ASEB Roundtables** convene senior-most representatives from industry, universities, and government agencies to define and explore critical issues related to the space technology and aeronautics research agendas. Roundtables are designed to **facilitate candid dialogue** among participants.



# Current Membership

## SSB

Fiona Harrison, Chair, California Institute of Technology	XCOM
Robert D. Braun, Vice Chair, University of Colorado Boulder	XCOM
James G. Anderson, Harvard University (FINAL TERM ENDS JUNE 2018)	
Jeff M. Bingham, Consultant	XCOM
Jay C. Buckey, Geisel School of Medicine at Dartmouth	
Adam Burrows, Princeton University	
Mary Lynne Dittmar, Coalition for Deep Space Exploration	XCOM
Joseph Fuller Jr., Futron Corporation (start of final term)	
Thomas R. Gavin, California Institute of Technology (FINAL TERM ENDS JUNE 2018)	
Sarah Gibson, National Center for Atmospheric Research (start of final term)	XCOM
Victoria Hamilton, Southwest Research Institute	
Anthony C. Janetos, Boston University (FINAL TERM ENDS JUNE 2018)	XCOM
Chryssa Kouveliotou, The George Washington University	XCOM
Dennis P. Lettenmaier, University of California, Los Angeles	
Rosaly M. Lopes, Jet Propulsion Laboratory	XCOM
David J. McComas, Princeton University	
Larry Paxton, 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	
Meenakshi Wadhwa, Arizona State University (FINAL TERM ENDS JUNE 2018)	
Edward L. Wright, University of California, Los Angeles	



# Staffing at the SSB & ASEB

## The ASEB/SSB staff currently comprises:

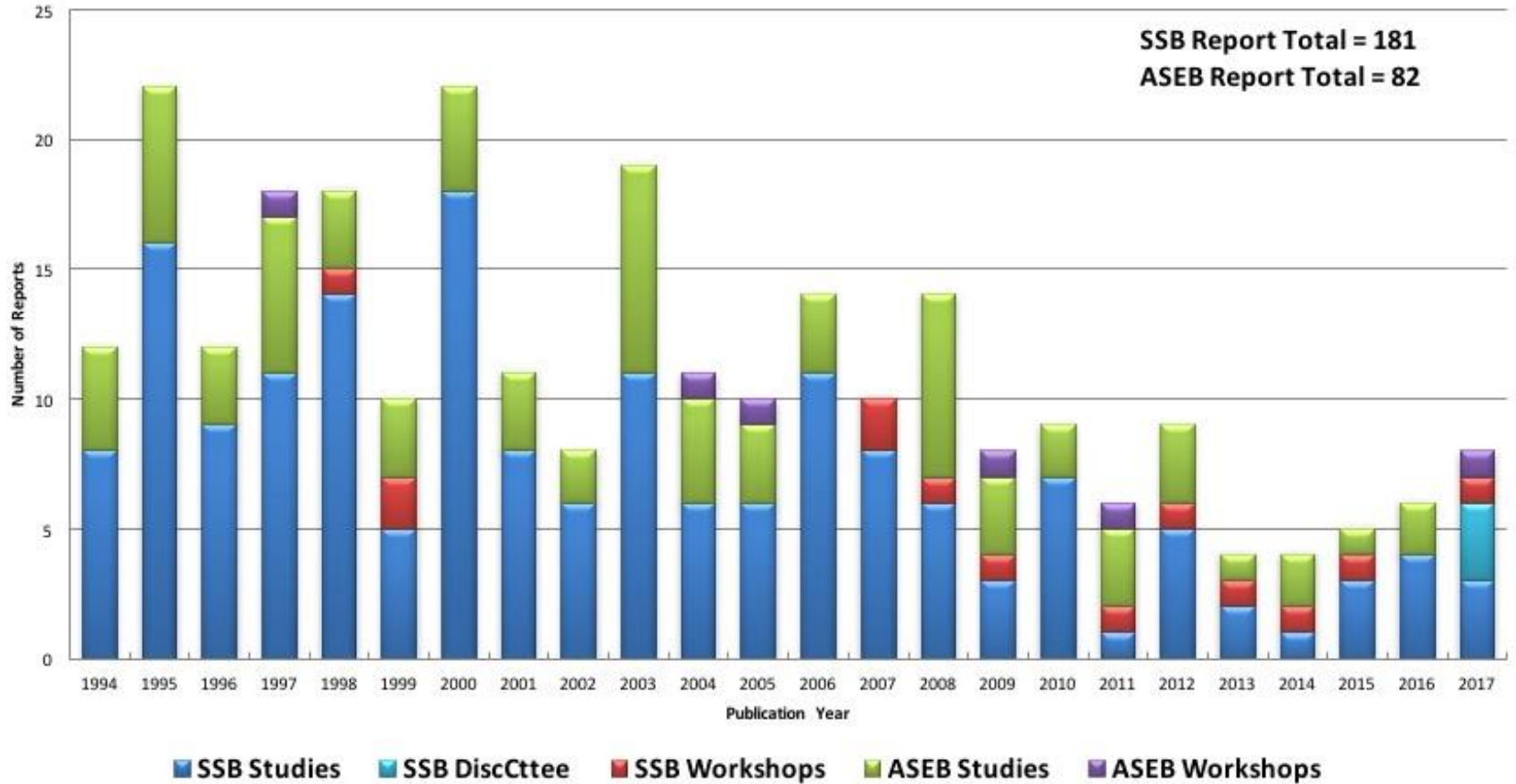
- Board Director,
- 2 ASEB study directors (one part time)
- 4 SSB study directors (all full time — also one additional shared with BPA)
- **2 SSB associate program officers**
- 2 Research Associates (shared between SSB & ASEB)
- 3 meeting and travel coordinator staff (shared by both boards)
- 5 administrative staff Program Manager, Administrative Coordinator, Information and Communications Manager, and two financial management officers (shared by both boards).
  
- Budget of ASEB/SSB was ~30% of DEPS in CY 2016. Staff is ~25% of DEPS. Processed 45% of DEPS travel claims.





## Number of ASEB & SSB Reports: 1994 - 2017

SSB Report Total = 181  
ASEB Report Total = 82



# Recent SSB Publications

- America's Future in Civil Space: Proceedings of a Workshop—in Brief (SSB & ASEB)
- Searching for Life Across Space and Time: Proceedings of a Workshop (SSB)
- Powering Science: NASA's Large Strategic Science Missions (SSB)
- Report Series: CAPS: Getting Ready for the Next Planetary Sciences Decadal Survey (SSB)
- The Goals, Rationales, and Definition of Planetary Protection: Interim Report (SSB)
- Report Series: CAA: Small Explorer Missions (SSB & BPA)
- Report Series: CSSP: Heliophysics Science Centers (SSB)
  
- Review of NASA's Planetary Science Division's Restructured Research & Analysis Programs (SSB)
- Assessment of the NSF's 2015 Geospace Portfolio Review (SSB)
- Extending Science—NASA's Space Science Mission Extensions & Senior Review Process (SSB)
  
- New Worlds, New Horizons: Midterm Assessment (SSB & BPA)
- Achieving Science with CubeSats: Thinking Inside the Box (SSB)
- Continuity of NASA Earth Observations from Space: A Value Framework (SSB)
- Review of the MEPAG Report on Mars Special Regions (SSB)
- The Space Science Decadal Surveys: Lessons Learned and Best Practices (SSB)
  
- Pathways to Exploration—Rationales and Approaches for a U.S. Program of Human Space Exploration (ASEB with SSB)
- NASA's Strategic Direction and the Need for a National Consensus (DEPS)

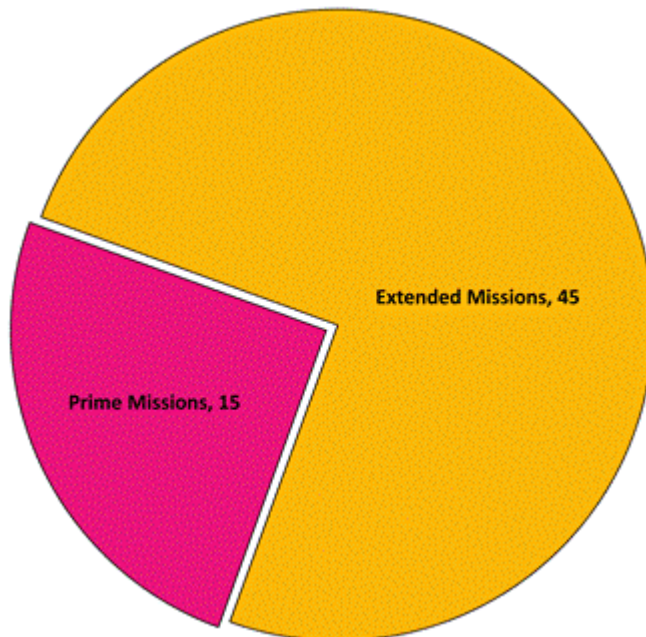
All these are accessible by going to [www.nationalacademies.org/spaceandaeronautics](http://www.nationalacademies.org/spaceandaeronautics)



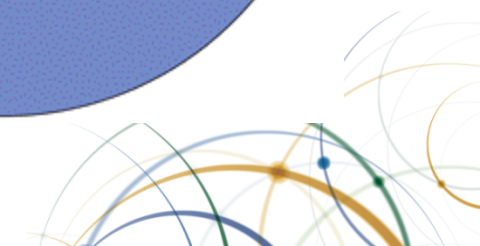
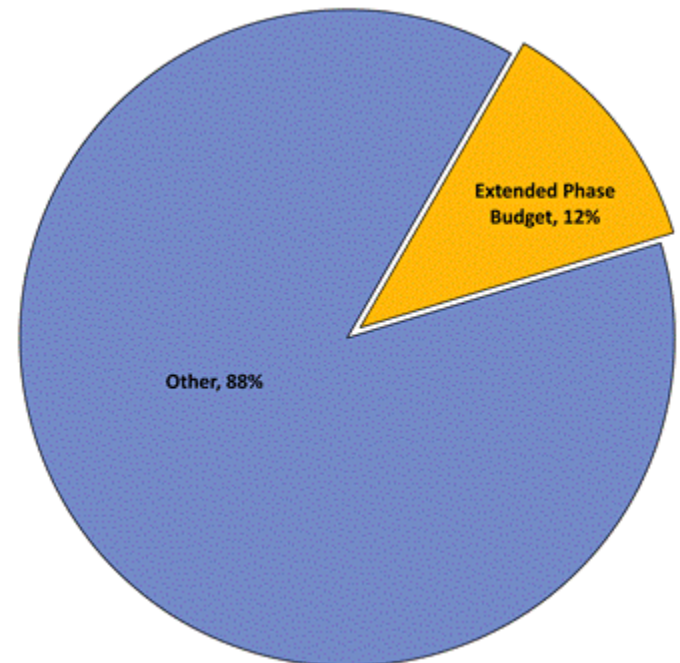
# Extended Mission Science is a Bargain

Approximately three quarters of the NASA science missions currently flying are in extended phase, but represent only about 12% of the Science Mission Directorate's 2016 budget

Active space science missions



SMD budget, including extended phase missions



# Large Strategic Missions are Essential

- Large strategic missions are critical for the conduct of space science in each of NASA's four divisions and are required for the pursuit of compelling scientific questions.
- Large strategic missions are essential to maintaining the global leadership of the United States in space exploration and in science.
- Large strategic science missions support large teams of scientists and graduate students and therefore support the development and the health of their respective scientific communities in ways that smaller missions cannot.
- Balance across the entire NASA science program includes an appropriate mix of small, medium-size, and large missions.



# Ongoing Subcommittee Activities

## Standing Activities

- Committee on Biological and Physical Sciences in Space (joint activity)

## Discipline Committees

- Committee on Astrobiology and Planetary Sciences – CAPS
- Committee on Astronomy and Astrophysics – CAA
- Committee on Earth Science and Applications from Space – CESAS
- Committee on Solar and Space Physics – CSSP
  
- Space Studies Board also acts as US National Committee for COSPAR
- Space Studies Board also exchanges participants with the European Space Sciences Committee
- Invited to participate as “private partner” in US delegation to COPUOS.



# Ongoing SSB Activities

1. State of the Science of Astrobiology
2. Exoplanet Science Strategy
3. Committee on Best Practices for a Future Open Code Policy for NASA Space Science
4. Extraterrestrial Sample Analysis Facilities
5. Review of Progress Toward Implementing the Decadal Survey Vision and Voyages for Planetary Sciences
6. Planetary Protection Requirements for Sample-Return Missions from Martian Moons (Joint Activity with ESF/ESSC)
7. Review of Planetary Protection Policy Development Processes
8. Decadal Survey for Earth Science and Applications from Space
9. A Midterm Assessment of Implementation of the Decadal Survey on Life and Physical Sciences Research at NASA (joint with ASEB)
10. NASA's Innovation Ecosystem – meetings of experts and a workshop (ASEB)
11. CAS-NAS Forum for New Leaders in Space Science



# Upcoming or Possible SSB Study Activities

- NOAA Weather Satellite Study (congressionally mandated)--- likely to be joint with DELS/BASC
- Astro 2020 Decadal Survey
- Planetary 2022 Decadal Survey
- Heliophysics Mid-decadal Review
- 2018 SSB Workshop
- Space Weather Activities?



# AND NOW WHAT?



# NASA Budget

## Space Policy Online Budget Fact Sheet

**Table 1: NASA's FY2018 Budget Request**  
(in \$ millions, see notes below)

Account	FY2016 Approps	FY2017 Approps	FY2018 Request	Authorization			Appropriations		
				House	Senate	Final	House passed	Senate Cmte	Final
<b>Science</b>	<b>5,589.4</b>	<b>5,764.9</b>	<b>5,771.8</b>				<b>5,858.5</b>	<b>5,571.8</b>	
<i>Earth Science</i>	<i>1,921.0</i>	<i>1,921.0</i>	<i>1,754.1</i>				<i>1,704.0</i>	<i>1,921.0</i>	
<i>Planetary Science</i>	<i>1,631.0</i>	<i>1,846.0</i>	<i>1,929.5</i>				<i>2,120.9</i>	<i>1,611.9</i>	
<i>Astrophysics</i>	<i>730.6</i>	<i>750.0</i>	<i>816.7</i>				<i>822.0</i>	<i>816.7</i>	
<i>JWST</i>	<i>620.0</i>	<i>569.4</i>	<i>533.7</i>				<i>533.7</i>	<i>533.7</i>	
<i>Heliophysics</i>	<i>649.8</i>	<i>678.4</i>	<i>677.8</i>				<i>677.9</i>	<i>688.5</i>	
<i>Education</i>	<i>note 3 37.0</i>	<i>note 3</i>	<i>note 3</i>				<i>note 3</i>	<i>note 3 [44.0]</i>	
<b>Aeronautics</b>	<b>640.0</b>	<b>660.0</b>	<b>624.0</b>				<b>660.0</b>	<b>650.0</b>	
<b>Space Technology</b>	<b>686.5</b>	<b>686.5</b>	<b>678.6</b>				<b>686.5</b>	<b>700.0</b>	
<b>Exploration</b>	<b>4,030.0</b>	<b>4,324.0</b>	<b>3,934.1</b>				<b>4,550.0</b>	<b>4,395.0</b>	
<i>Expl Sys Dev</i>	<i>3,680.0</i>	<i>3,929.0</i>	<i>3,584.1</i>				<i>4,100.0</i>	<i>4,045.0</i>	
<i>(Orion)</i>	<i>(1,270.0)</i>	<i>(1,350.0)</i>	<i>(1,186.0)</i>				<i>(1,350.0)</i>	<i>(1,350.0)</i>	
<i>(SLS)</i>	<i>(2,000.0)</i>	<i>(2,150.0)</i>	<i>(1,937.8)</i>				<i>(2,150.0)</i>	<i>(2,150.0)</i>	
<i>(Expl Ground Sys)</i>	<i>(410.0)</i>	<i>(429.0)</i>	<i>(460.4)</i>				<i>(600.0)</i>	<i>(545.0)</i>	
<i>Expl R&amp;D</i>	<i>350.0</i>	<i>395.0</i>	<i>350.0</i>				<i>450.0</i>	<i>350.0</i>	
<b>Space Operations</b>	<b>5,029.2</b>	<b>4,950.7</b>	<b>4,740.8</b>				<b>4,676.6</b>	<b>4,751.5</b>	
<i>ISS</i>	<i>N/A</i>	<i>N/A</i>	<i>1,490.6</i>				<i>N/A</i>	<i>N/A</i>	
<i>Space Trans</i>	<i>N/A</i>	<i>N/A</i>	<i>2,415.1</i>				<i>N/A</i>	<i>N/A</i>	
<i>(Cmrcr Crew)</i>	<i>(1,243.9)</i>	<i>(1,184.8)</i>	<i>(731.9)</i>				<i>N/A</i>	<i>note 4 732.00</i>	
<i>(Crew and Cargo)</i>	<i>N/A</i>	<i>(1,028.0)</i>	<i>(1,683.2)</i>				<i>N/A</i>	<i>1,683.2</i>	
<i>Space &amp; Flt Sprt</i>	<i>N/A</i>	<i>N/A</i>	<i>835.0</i>				<i>N/A</i>	<i>N/A</i>	
<b>Education</b>	<b>115.0</b>	<b>100.0</b>	<b>37.3</b>				<b>90.0</b>	<b>100.0</b>	
<b>Safety/Security/MS</b>	<b>2,768.6</b>	<b>2,768.6</b>	<b>2,830.2</b>				<b>2,826.2</b>	<b>2,826.9</b>	
<b>CECR</b>	<b>388.9</b>	<b>360.7</b>	<b>496.1</b>				<b>486.1</b>	<b>496.1</b>	
<b>Inspector General</b>	<b>37.4</b>	<b>37.9</b>	<b>39.3</b>				<b>37.9</b>	<b>38.0</b>	
<b>TOTAL</b>	<b>19,285.0</b>	<b>19,653.3</b>	<b>19,092.2</b>				<b>19,871.8</b>	<b>19,529.3</b>	

**Note 1:** Columns may not add due to rounding. Text and numbers in *italics* are subtotals. Text and numbers in *italics in parentheses* are sub-subtotals. N/A = not applicable or not available. FY2016 and FY2017 appropriations figures are from the congressional appropriations documents. They often are adjusted by



## ***Some NASA Slides from November SSB Meeting.....***

- **[Thomas Zurbuchen Report to SSB](#)**
- **[Big Data and NASA Space Sciences](#)**

***All other presentations at [http://sites.nationalacademies.org/SSB/SSB\\_054577#nov\\_2017](http://sites.nationalacademies.org/SSB/SSB_054577#nov_2017)***





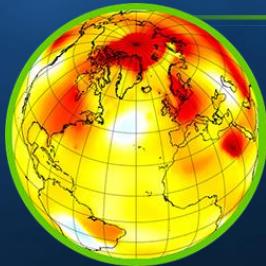
# KEY SCIENCE THEMES



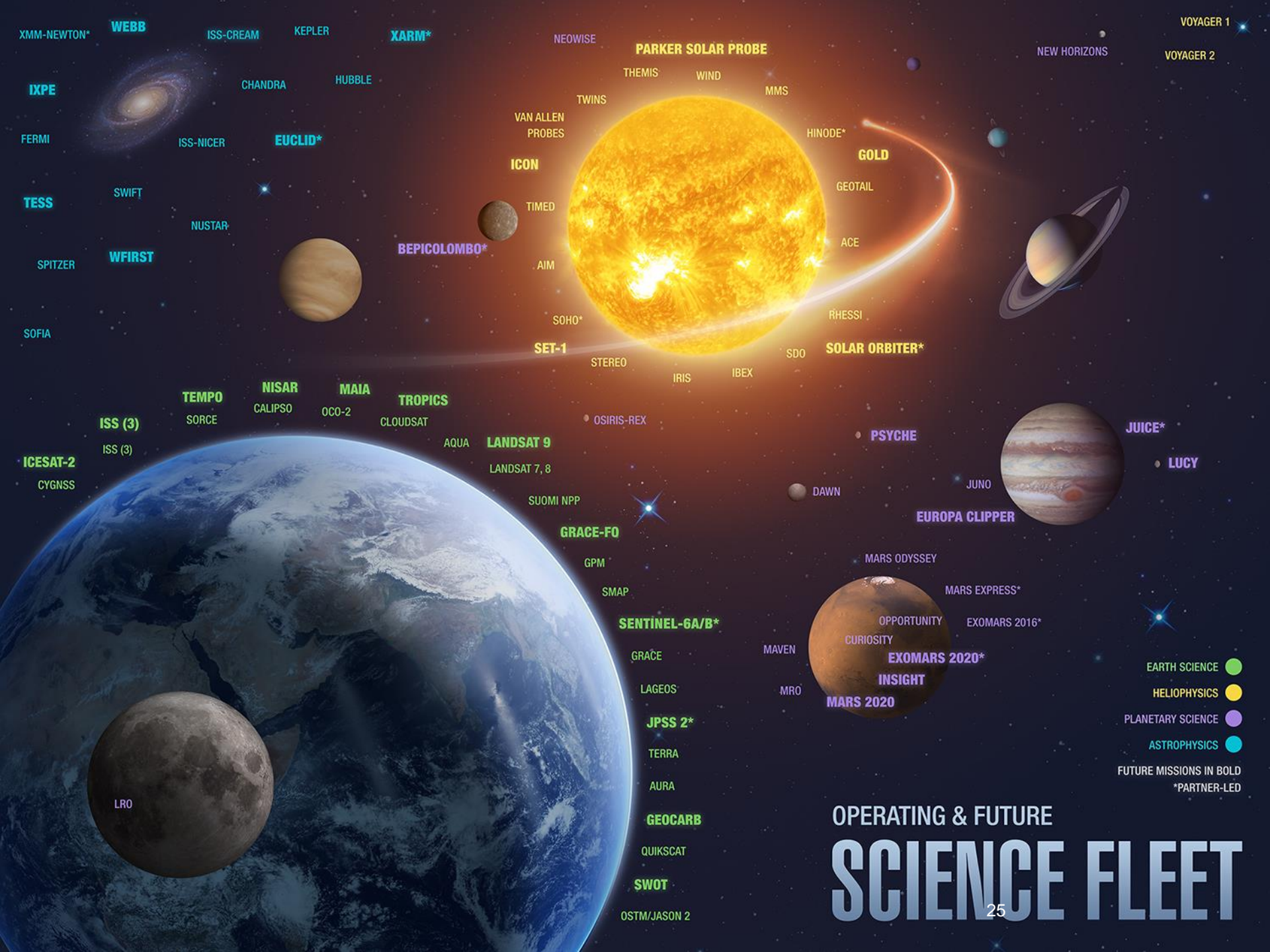
**Discovering the  
Secrets of the Universe**



**Searching for  
Life Elsewhere**



**Safeguarding and  
Improving Life on Earth**



**OPERATING & FUTURE SCIENCE FLEET**

**Legend:**  
 EARTH SCIENCE (Green)  
 HELIOPHYSICS (Yellow)  
 PLANETARY SCIENCE (Purple)  
 ASTROPHYSICS (Cyan)  
 FUTURE MISSIONS IN BOLD  
 \*PARTNER-LED

**Operating Missions:**  
 XMM-NEWTON\* (Astrophysics)  
 WEBB (Astrophysics)  
 ISS-CREAM (Earth Science)  
 KEPLER (Astrophysics)  
 XARM\* (Astrophysics)  
 NEOWISE (Astrophysics)  
 PARKER SOLAR PROBE (Heliophysics)  
 VOYAGER 1 (Planetary Science)  
 VOYAGER 2 (Planetary Science)  
 NEW HORIZONS (Planetary Science)  
 IXPE (Astrophysics)  
 CHANDRA (Astrophysics)  
 HUBBLE (Astrophysics)  
 THEMIS (Heliophysics)  
 WIND (Heliophysics)  
 MMS (Heliophysics)  
 FERMI (Astrophysics)  
 ISS-NICER (Astrophysics)  
 EUCLID\* (Astrophysics)  
 VAN ALLEN PROBES (Heliophysics)  
 TWINS (Heliophysics)  
 HINODE\* (Heliophysics)  
 TESS (Astrophysics)  
 SWIFT (Astrophysics)  
 NUSTAR (Astrophysics)  
 ICON (Heliophysics)  
 TIMED (Heliophysics)  
 GOLD (Heliophysics)  
 SPITZER (Astrophysics)  
 WFIRST (Astrophysics)  
 BEPICOLOMBO\* (Planetary Science)  
 AIM (Heliophysics)  
 ACE (Heliophysics)  
 SOFIA (Astrophysics)  
 SOHO\* (Heliophysics)  
 SET-1 (Heliophysics)  
 STEREO (Heliophysics)  
 IRIS (Heliophysics)  
 IBEX (Heliophysics)  
 SDO (Heliophysics)  
 SOLAR ORBITER\* (Heliophysics)  
 RHESI (Heliophysics)  
 SDO (Heliophysics)  
 ISS (3) (Earth Science)  
 TEMPO (Earth Science)  
 NISAR (Earth Science)  
 MAIA (Earth Science)  
 TROPICS (Earth Science)  
 SORCE (Earth Science)  
 CALIPSO (Earth Science)  
 OCO-2 (Earth Science)  
 CLOUDSAT (Earth Science)  
 OSIRIS-REX (Planetary Science)  
 PSYCHE (Planetary Science)  
 ICESAT-2 (Earth Science)  
 CYGNSS (Earth Science)  
 AQUA (Earth Science)  
 LANDSAT 9 (Earth Science)  
 LANDSAT 7, 8 (Earth Science)  
 SUOMI NPP (Earth Science)  
 GRACE-FO (Earth Science)  
 GPM (Earth Science)  
 SMAP (Earth Science)  
 SENTINEL-6A/B\* (Earth Science)  
 GRACE (Earth Science)  
 LAGEOS (Earth Science)  
 JPSS 2\* (Earth Science)  
 TERRA (Earth Science)  
 AURA (Earth Science)  
 GEOCARB (Earth Science)  
 QUIKSCAT (Earth Science)  
 SWOT (Earth Science)  
 OSTM/JASON 2 (Earth Science)  
 DAWN (Planetary Science)  
 JUNO (Planetary Science)  
 EUROPA CLIPPER (Planetary Science)  
 MARS ODYSSEY (Planetary Science)  
 MARS EXPRESS\* (Planetary Science)  
 OPPORTUNITY (Planetary Science)  
 EXOMARS 2016\* (Planetary Science)  
 MAVEN (Planetary Science)  
 MRO (Planetary Science)  
 MARS 2020 (Planetary Science)  
 CURIOUSITY (Planetary Science)  
 EXOMARS 2020\* (Planetary Science)  
 INSIGHT (Planetary Science)  
 LUCY (Planetary Science)  
 JUICE\* (Planetary Science)

# SCIENCE BY THE NUMBERS



**Spacecraft**  
105 missions  
88 spacecraft



**CubeSats**  
17 science missions  
11 technology demonstrations



**Balloon Payloads**  
13 science payloads  
1 HASP with up to  
12 student experiments



**Sounding Rocket Flights**  
16 science missions  
3 technology/  
student missions



**Earth-Based Investigations**  
25 major airborne missions  
8 global networks



**Technology Development**  
~\$400M invested annually



**Research**  
10,000+ U.S. scientists funded  
3,000+ competitively  
selected awards  
~\$600M awarded annually



# UPCOMING OPPORTUNITIES

## FY 2017

- AO, New Frontiers (Proposals in review)
- ROSES NRA, February 2017 (Released)
- SALMON-3 AO (Released)
- AO, Martian Moons eXploration (MMX) Instrument (Proposals in review)
- AO, STP-5 (IMAP) and Missions of Opportunity, Heliophysics (Released)
- NRA, Earth Venture Suborbital-3, Q4
- PEA (SALMON-3), SIMPLEx-2 for SmallSat Missions of Opportunity, Q4

## FY 2018 Planned

- ROSES NRA, February 2018
- AO, STP Missions of Opportunity, Heliophysics, NET Q1
- AO, Heliophysics Explorers (MIDEX) and Missions of Opportunity, NET Q2
- AO, Earth Venture Instrument-5, NET Q2
- NRA, SOFIA Next Generation Instrumentation, NET Q2

## FY 2019 Planned

- ROSES NRA, February 2019
- AO, Discovery, Q2
- AO, Living With a Star (Geospace Dynamics Constellation) and Missions of Opportunity, NET Q2
- AO, Astrophysics Small Explorer (SMEX) Missions & Missions of Opportunity, NET Q3

# Issues Before our Discipline Committees

Slides from our various committees are available by visiting:

[http://sites.nationalacademies.org/SSB/SSB\\_052296](http://sites.nationalacademies.org/SSB/SSB_052296)

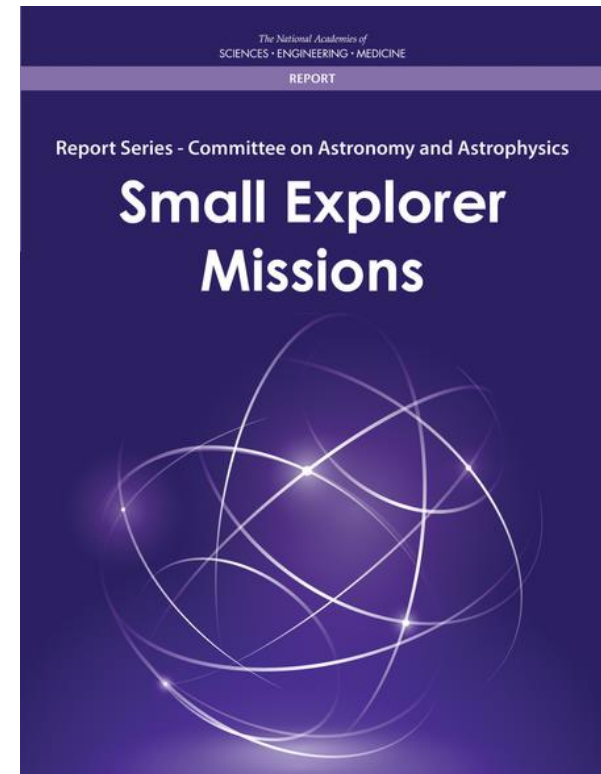
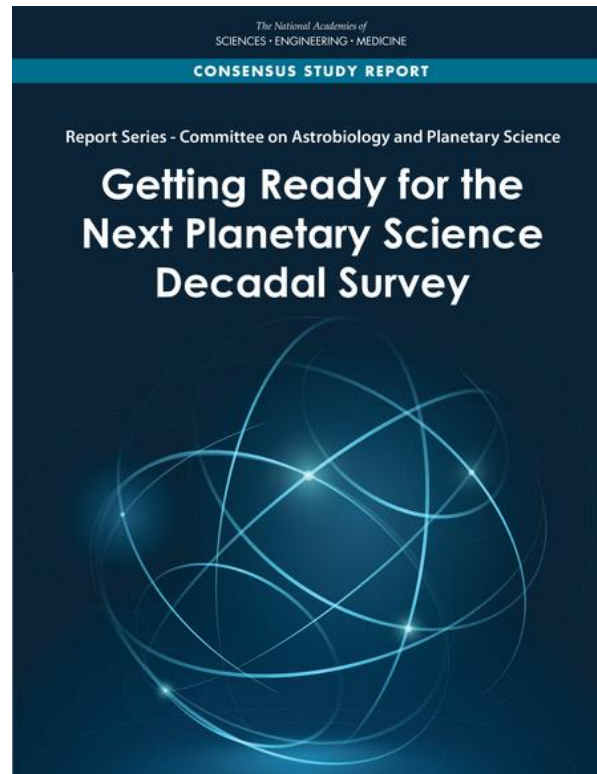
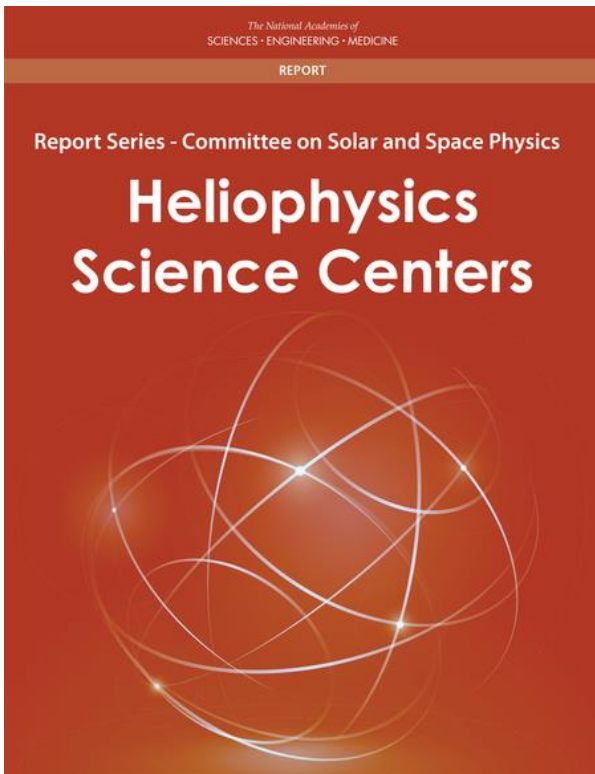
Of particular interest may be:

- [Update on JWST- Eric Smith, NASA](#)
- [WFIRST Independent External Technical/Management/Cost Review \(WIETR\) -- Peter Michelson and Orlando Figueroa](#)
- [WFIRST Independent External Technical/Management/Cost Review \(WIETR\) – Full Report](#)
- [Space Life and Physical Sciences Research & Applications Division Overview and Status](#)
- [ISS Transition and Deep Space Gateway Concept](#)
- [NASA Earth Science Overview](#)
- [Zurbuchen: Mars Exploration Program](#)
  
- [ALL REPORTS FROM SSB](#)





# Issues Before our Discipline Committees



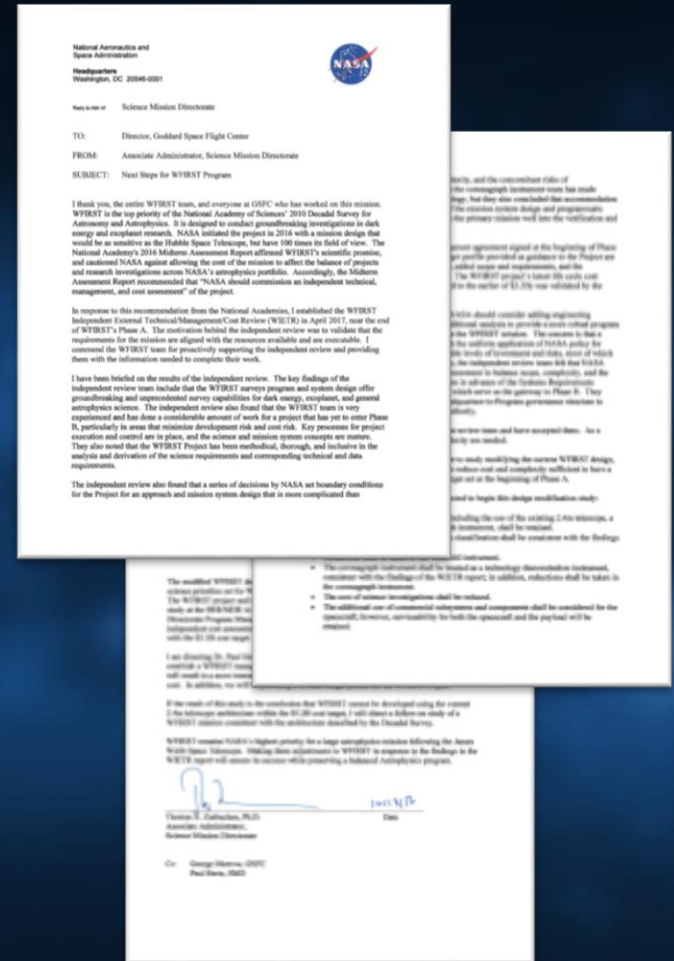
# CAA

- Report on Small Explorers (SMEX) Opportunities released June 8
- Discussions with Agencies on a variety of topics, including Decadal Survey Timing and Scope -- Survey preparation is the main ongoing CAA focus
- WFIRST Independent External Technical/ Management/Cost Review (WIETR) Report presentation and discussion
  - See Zurbuchen memo. NASA HQ directed the Project to undertake a design modification study to reduce mission cost and complexity, while still meeting/exceeding science priorities in the 2010 Decadal (NWNH), and to report out in February. The coronagraph will be classified as a technology demonstration.
  - The CAA anticipates hearing from the WFIRST Project and NASA HQ about proposed changes and science capabilities at, or prior to, its March meeting.



# WFIRST DIRECTION

- SMD Associate Administrator directed Goddard Space Flight Center to study modifying the current WFIRST design, the design that was reviewed by the WIETR, to reduce cost and complexity sufficient to have a cost estimate consistent with the \$3.2B cost target set at the beginning of Phase A
- The following constraints and changes are directed to begin this design modification study *as noted in the next two charts*



## WFIRST DIRECTION (CONT'D)

- The basic architecture of the mission, including the use of the existing 2.4m telescope, a widefield instrument, and a coronagraph instrument, shall be retained
- The implementation of the mission risk classification shall be consistent with the findings of the WIETR report
- Reductions shall be taken in the widefield instrument
- The coronagraph instrument shall be treated as a technology demonstration instrument, consistent with the findings of the WIETR report; in addition, reductions shall be taken in the coronagraph instrument
- The cost of science investigations shall be reduced
- The additional use of commercial subsystems and components shall be considered for the spacecraft; however, serviceability for both the spacecraft and the payload will be retained

# WFIRST DIRECTION (CONT'D)

- The modified WFIRST design being studied will still be capable of meeting and exceeding the science priorities set for WFIRST by the 2010 Decadal Survey in Astronomy and Astrophysics
- The WFIRST project and GSFC Center management should plan to report the results of this study at the SRRIMDR in February 2018, in time to support a Key Decision Point-B (KDP-B) Directorate Program Management Council in March or April 2018
- In advance of KDP-B, an independent cost assessment will be conducted to validate the estimated cost as being consistent with the \$3.2B cost target
- Dr. Paul Hertz, the Director of the Astrophysics Division, will work with GSFC to establish a WFIRST management process consistent with the findings of the WIETR report, that will result in a more interactive relationship, shortening the time to make decisions and reduce cost; will provide a revised budget profile for the WFIRST Project
- If the result of this study is the conclusion that WFIRST cannot be developed using the current 2.4m telescope architecture within the \$3.2B cost target, SMD/AA will direct a follow-on study of a WFIRST mission consistent with architecture described by the Decadal Survey



# CAPS

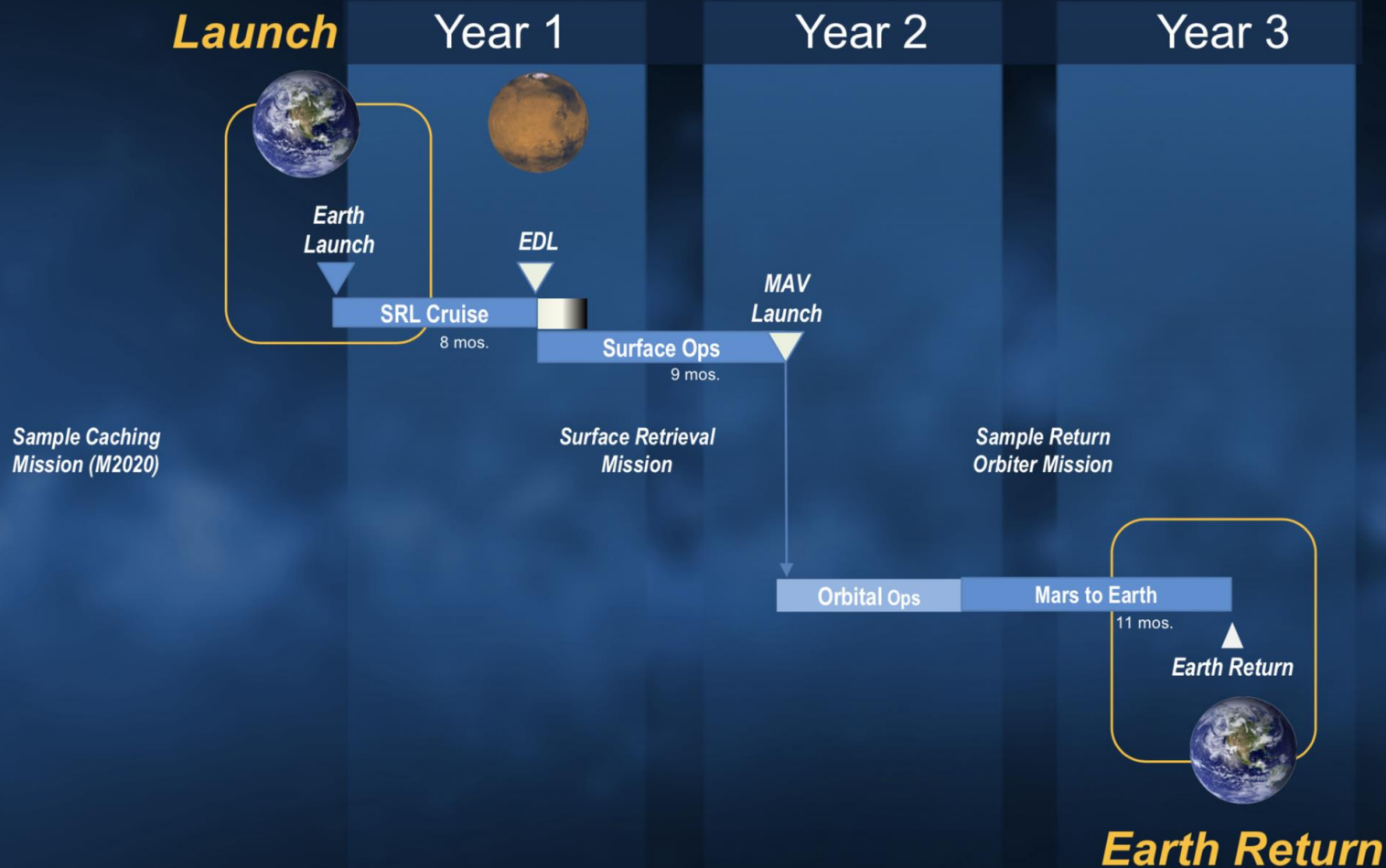
Overall, NASA's Planetary Science Division is on track

- Mars 2020 sample caching mission continues its development
- Europa mission is moving forward in Phase B (design phase)
- Two Discovery missions selected (Psyche (M-type asteroid orbiter) and Lucy (multi-Trojan asteroid flyby), one in extended phase A (NEOCam)
- Fourth New Frontiers mission down-select imminent (before Christmas)
- Ocean Worlds program is part of the recent Presidential budget request

Discussion points to further consider

- All of these program developments are highly responsive to the Decadal Survey
- NASA directed to launch Europa Clipper on SLS and a lander soon thereafter. Europa Lander is not in the President's most recent budget request.
- NASA has begun to speak about steps in a Mars sample-return campaign beyond Mars 2020.
- Movement of the Planetary Protection Office from SMD to OSMA and continuing discussion on planetary protection issues in general
- The timing of next planetary decadal survey given JWST launch slippage. Currently still targeting Spring 2020 with no more than 6 month delay.

# NOTIONAL MSR TIMELINE





# SAMPLE RETURN: KEY REQUIREMENTS

## LAND in the right place

Land in small landing error ellipse ( $\leq 10$  km) to access M2020 sites



## COLLECT samples fast

Long traverse with tight timeline



- 130 sols for driving km (rover odometry)
- 20 sols for tube pickup (1 tube/sol)
- 90 sols for faults/anomalies/engineering activities



## Get it BACK

Launch, rendezvous and return



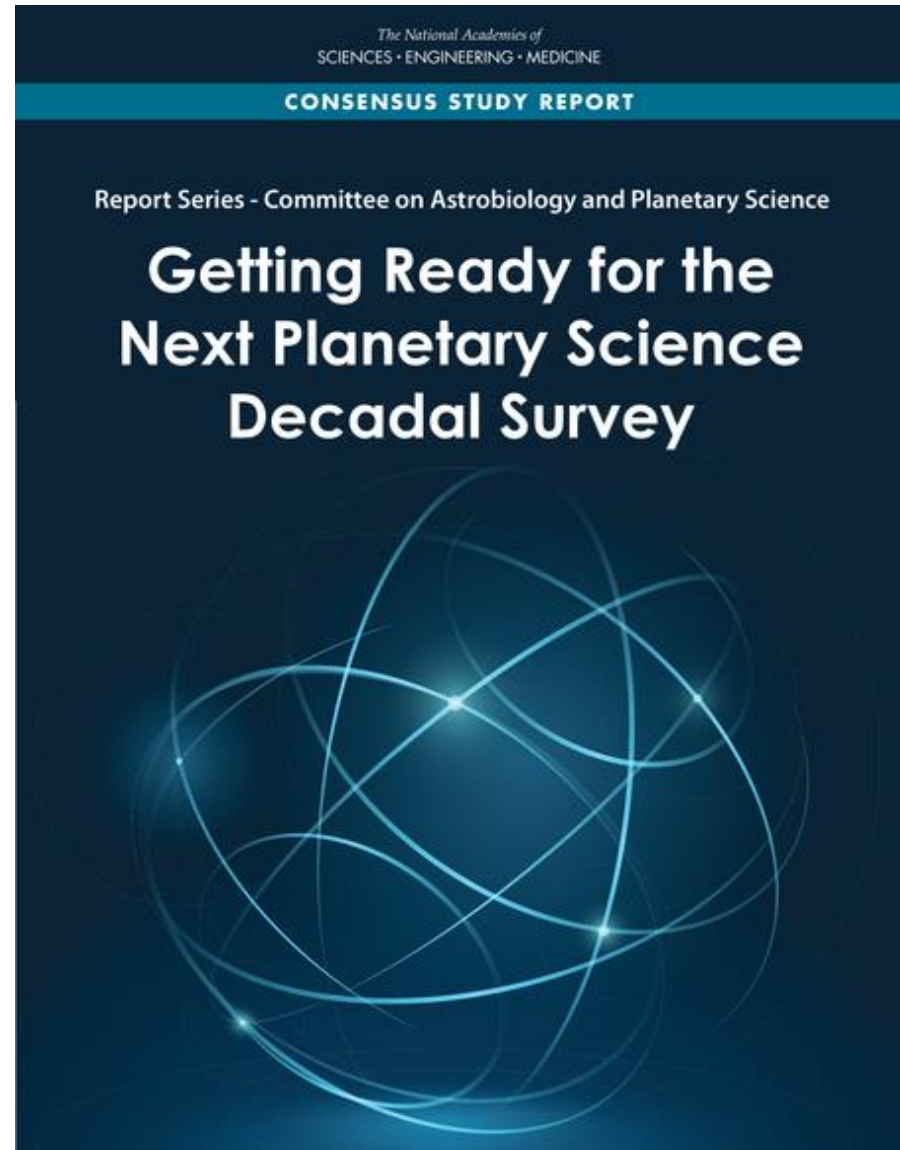
# CAPS: Getting Ready for the Next PSDS

CAPS asked by NASA to:

1. List recent mission studies;
2. Define priority areas for new studies;
3. Outline mechanisms for conducting studies; and
4. Identify additional activities to optimize and/or expedite next PSDS.

In addressing these four topics CAPS identified the following:

- Mission options for Venus, the Moon, Mars, Dwarf planets, Saturn system, and Io. Plus the need for a dedicated space telescope for synoptic observations of solar system bodies
- Key enabling and enhancing technologies



# CBPSS

- American Society for Gravitational and Space Research Oct 27, Seattle, community discussion of supporting next microgravity decadal
- CBPSS met on Oct. 31-Nov. 1 in Irvine
  - NASA Microgravity Synergies with Other Agencies: Roundtable
  - Panel on Aerospace Perspectives on Microgravity Science
    - Sierra Nevada, Paragon Space Development, Southwest Research Development, United Launch Alliance
    - Strong recognition of need for microgravity science knowledge as input to developers
    - Expectation that only government will conduct basic research needed
    - Dependence on fragile networks of government and NASA scientists
  - Program Science briefings from NASA on status of physical sciences, fundamental physics, space biology and human research programs
  - NASA presentation on ISS transition and Gateway planning
  - Space Science Week symposium topic planning – possible Neurolab anniversary as keynote
- Status of Mid-term review of decadal study
  - Report currently in review
  - Delivery planned late December/early January



# CESAS

- At Fall Meeting CESAS Reviewed Potential Activities
  - Workshop with NRC Mathematics Board: Novel techniques and applications for data analytics on Earth Observational Data
  - NRC Study Called for in Weather Modernization Act of 2017 (and its relation to a BASC study, “Building a Community-Driven Vision for the Next Generation U.S. Weather Enterprise: Discussion of a Proposed Study”)
- Briefings from UCAR (Tony Busalacchi), NOAA (Karen St. Germain), and NASA (Mike Freilich)
- Closed Session Discussions with the ESAS 2017 Co-Chairs
- Discussion of 1st draft of ESAS 2017 “Popularization”
- Planning for March 2018 meeting during SSW
  - Discussion of Decadal Survey with ESD Director and Colleagues
  - Support the start of a series of survey-related implementation studies by the ESD Director
  - Presenters to support one or both of the potential ad hoc studies/workshops
  - Other survey-related implementation issues—all TBD as survey has not been completed and briefed to the agencies. However, some committee ideas include:
    - Technology on-ramps to facilitate the NOAA recommendations
    - Examination of the survey Venture-class recommendations



# CSSP

- NASA Heliophysics Division personnel change -- Steve Clarke on detail to OSTP, Peg Luce is Acting Heliophysics Division Director -- Search for IPA or detailee to fill Heliophysics Division Director underway
- What can the community and NASA do to encourage more diversity among mission proposers to Heliophysics? What can NASA HPD do to get the community more engaged in the R&A review process? What suggestions does the CSSP have regarding the R&A review process? Follow-on discussion about diversity challenges with Thomas Zurbuchen
  - Absence of diversity in solar and space physics is a problem that can & should be addressed
  - Problem is bigger than solar and space physics
  - Issue extends beyond science teams, includes engineering, program management, etc.
  - Need to make a commitment as a community current situation is not acceptable
  - Be suspicious of easy solutions
  - Absence of workplace climate data specific to solar and space physics
  - May not be positioned to fix ourselves - engage sociological researchers - bias issues
  - Encouragement of leadership experience at right level
  - Engage effective role models and mentorship
  - Female pool requirement possibilities incentives for diversification (e.g., as in industry)
  - Provide opportunities to experience what it's like to be part of a mission





# Space Science Week

**March 27-29, 2018**

- Five Discipline Committees will meet in plenary and parallel sessions.
- Around 150-200 attend the meeting
- Plenary session focus will be on international collaboration
- Fifth Annual Space Science Week Public Lecture?
- ESSC liaison members attended since 2015 and hope we can continue having a liaison to each of the standing committees attend future SSW's
- **More Information at [www.nas.edu/ssw](http://www.nas.edu/ssw)**



[View Webcast](#)

THE 2017 SPACE SCIENCE WEEK PUBLIC LECTURE

The Search for

**LIFE**  
in **OCEANS**  
BEYOND EARTH



# Upcoming Meetings

***60th Anniversary Celebration of Explorer I:  
January 31, 2018, Washington DC***

## ***SSB Meetings***

***May 1-3, 2018, Washington DC***

***November 7-9, 2018, Irvine, CA***

***April 30 - May 2, 2019, Washington DC***

***November 6-8, 2019, Irvine, CA***

## ***Space Science Week***

***March 27-29, 2018, NAS Building Wash DC***

***March 26-28, 2019, NAS Building Wash DC***

