

Planetary Science R&A Update

Jonathan A. R. Rall

Planetary Science Advisory Committee Meeting

February 21-23, 2018

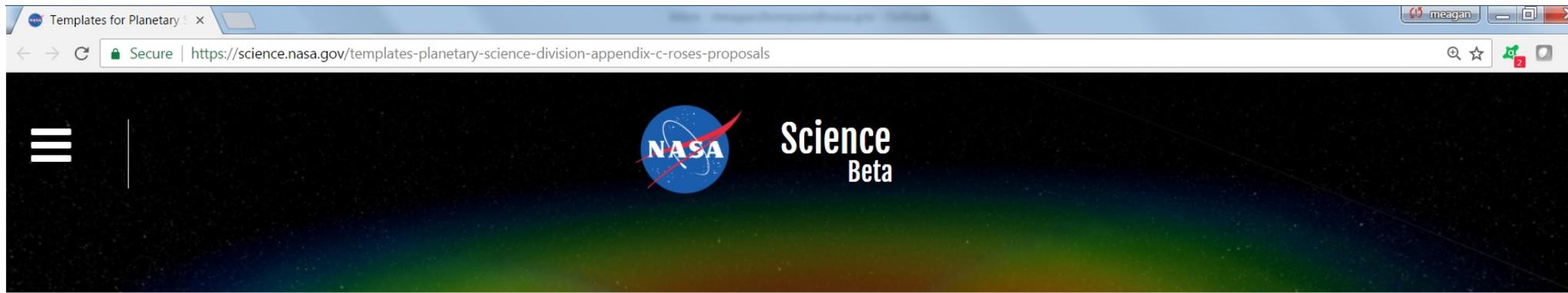


Research and Analysis Program - Outline

- Program Updates
- Templates
- Program Due Dates (ROSES 2017 & 2018)
- NESSF Update
- Selection Stats
- Speed of Money
- PESTO
- Key Word Analysis
- NASA's response to NAS R&A Report

General R&A Updates

- ROSES 2018 released on Feb 14, 2018!!
- Facilities Update – New CAN for Facilities on hold:
 - NASA has requested a National Academies study; *ad hoc* committee is working: Sample Analysis Future Investment Strategy
- National Academies Study on R&A Restructuring
 - Report completed
<https://www.nap.edu/catalog/24759/review-of-the-restructured-research-and-analysis-programs-of-nasas-planetary-science-division>
- Archiving manuscripts – new policy for all NASA funded work to be put into PubSpace (part of PubMed)
<https://www.nasa.gov/open/researchaccess/pubspace>



Templates for Planetary Science Division (Appendix C) ROSES proposals

New Templates for both Data Management Plan, and Table of Work Effort.

- Microsoft Word
- LaTeX

<https://science.nasa.gov/templates-planetary-science-division-appendix-c-roses-proposals>

ROSES 2017 - Program Name	Step-1 Due Date	Step-2 Due Date
Exoplanets (XRP)	<i>03/30/2017</i>	<i>05/25/2017</i>
Emerging Worlds (EW)	<i>03/30/2017</i>	<i>06/01/2017</i>
Cassini Data Analysis (CDAPS)	<i>04/06/2017</i>	<i>06/08/2017</i>
Solar System Obs. (SSO)	<i>04/06/2017</i>	<i>06/08/2017</i>
Laboratory Analysis of Returned Sample (LARS)	<i>04/26/2017</i>	<i>06/29/2017</i>
Planetary Data Archiving, Restoration, Tools (PDART)	<i>05/11/2017</i>	<i>07/12/2017</i>
OSIRIS REx Participating Scientist Program (ORPSP)	<i>05/04/2017</i>	<i>07/25/2017</i>
Planetary Protection Research (PPR)	<i>06/27/2017</i>	<i>09/28/2017</i>
Planetary Sci./Tech. Through Analog Research (PSTAR)	<i>07/25/2017</i>	<i>10/10/2017</i>
Exobiology (EXOB)	<i>08/17/2017</i>	<i>10/24/2017</i>
Mars Data Analysis (MDAP)	<i>08/24/2017</i>	<i>10/26/2017</i>
PICASSO	<i>09/22/2017</i>	<i>11/16/2017</i>
Discovery Data Analysis (DDAP)	<i>09/21/2017</i>	<i>11/21/2017</i>
Rosetta Data Analysis Program (RDAP)	<i>09/21/2017</i>	<i>11/21/2017</i>
Habitable Worlds (HW)	<i>11/16/2017</i>	<i>01/17/2018</i>
Solar System Workings (SSW)	<i>11/16/2017</i>	02/22/2018
Lunar Data Analysis (LDAP)	<i>11/30/2017</i>	03/01/2018
New Frontiers Data Analysis Program (NFDAP)	<i>Moved to ROSES18</i>	

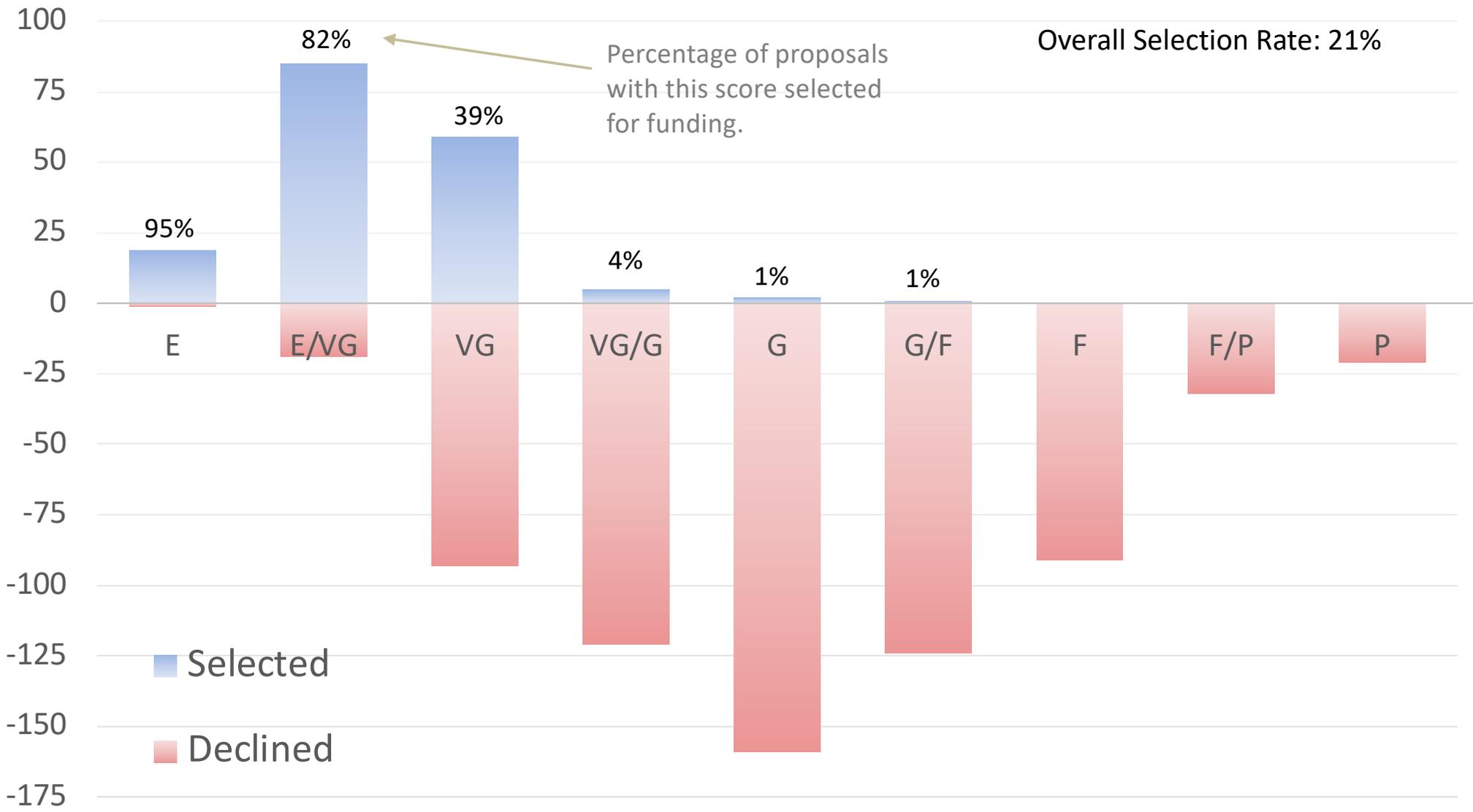
For updates to deadlines, see: <https://science.nasa.gov/researchers/sara/grant-solicitations/roses-2017/>

ROSES 2018 - Program Name	Step-1 Due Date	Step-2 Due Date
Exobiology (EXOB)	04/16/2018*	05/24/2018
Exoplanets (XRP)	03/29/2018	05/30/2018
Emerging Worlds (EW)	03/29/2018	06/01/2018
Development & Advance of Lunar Instruments (DALI)	04/03/2018	06/05/2018
Solar System Obs. (SSO)	04/05/2018	06/07/2018
MatISSE	04/18/2018	06/20/2018
Laboratory Analysis of Returned Sample (LARS)	04/26/2018	06/28/2018
Planetary Data Archiving, Restoration, Tools (PDART)	05/10/2018	07/12/2018
Planetary Major Equipment/Facilities (PME/F)	TBD	TBD
Cassini Data Analysis (CDAPS)	06/01/2018	08/01/2016
New Frontiers Data Analysis Program (NFDAP)	06/12/2018	08/23/2018
Planetary Sci./Tech. Through Analog Research (PSTAR)	07/25/2018	10/10/2018
Mars Data Analysis (MDAP)	08/23/2018	10/25/2018
Discovery Data Analysis (DDAP)	08/30/2018	11/01/2018
Rosetta Data Analysis Program (RDAP)	08/30/2018	11/01/2018
PICASSO	09/20/2018	11/20/2018
Habitable Worlds (HW)	11/15/2018	01/17/2019
Solar System Workings (SSW)	11/15/2018*	01/31/2019
Lunar Data Analysis (LDAP)	11/29/2018	02/28/2019

NESSF Changes

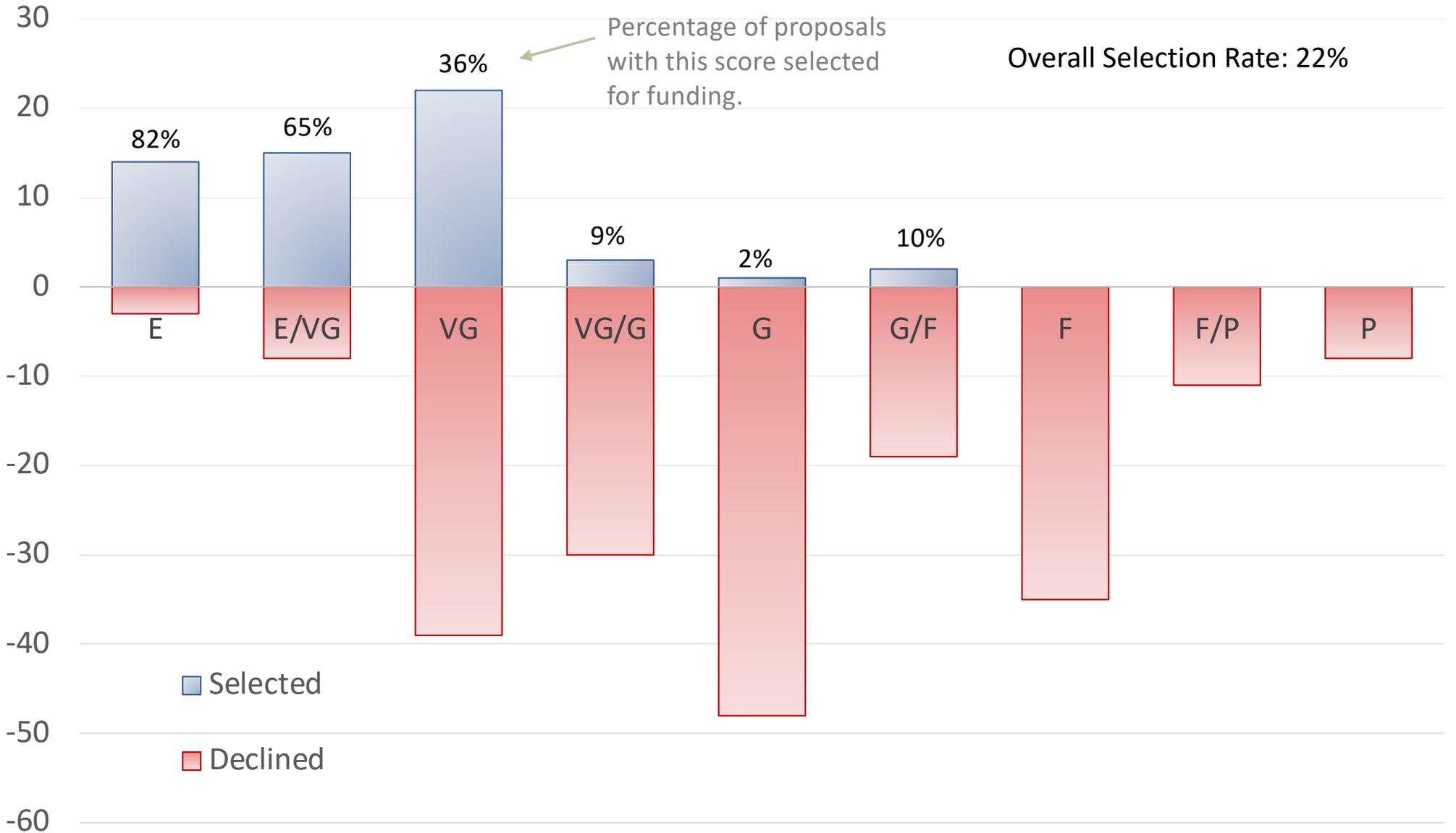
- Award amount increased to \$45K. (\$35K stipend + \$10K for travel to conferences and seminars, health insurance policy, books, tuition and fees, etc.
- New award amount more in line with other graduate research fellowships , NASA will be able to compete for the best students
- Change went into effect for ROSES17, and impacts existing renewal NESSF awards
- Overall budgets did not change

PSD R&A SELECTIONS - ROSES 2016



Metrics for proposals submitted to ROSES 2016, including all core programs (EW, SSW, HW, SSO, EXO) and all DAPs (MDAP, DDAP, LDAP, CDAPS).

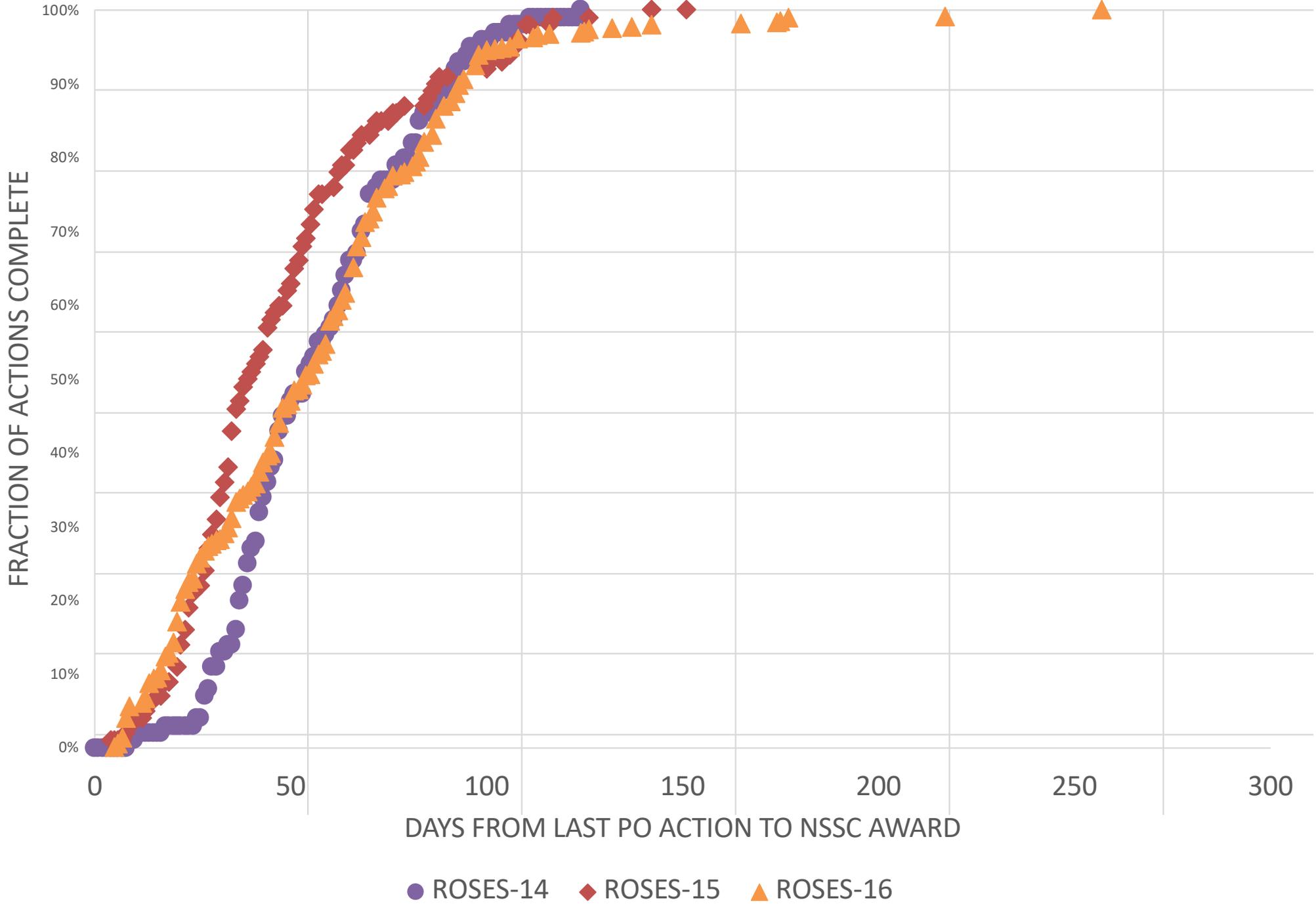
PSD R&A TECHNOLOGY SELECTIONS - ROSES 2016



Metrics for technology proposals submitted to ROSES 2016, including MatisSE, PICASSO, COLDTech, HOTTech.

The awards below VG reflect descopes that were not re-voted and hence scores remain low

SPEED OF MONEY



Planetary Exploration Science Technology Office (PESTO)

New HQ office managed at GRC to:

Recommend technology investment strategy for future planetary science missions

- Instruments
- Spacecraft Technology
- Mission Support Technology

Manage PSD technology development (non-mission specific, non-nuclear)

- PICASSO, MatisSE, HotTech, ColdTech, ...

Coordinate planetary science-relevant technologies

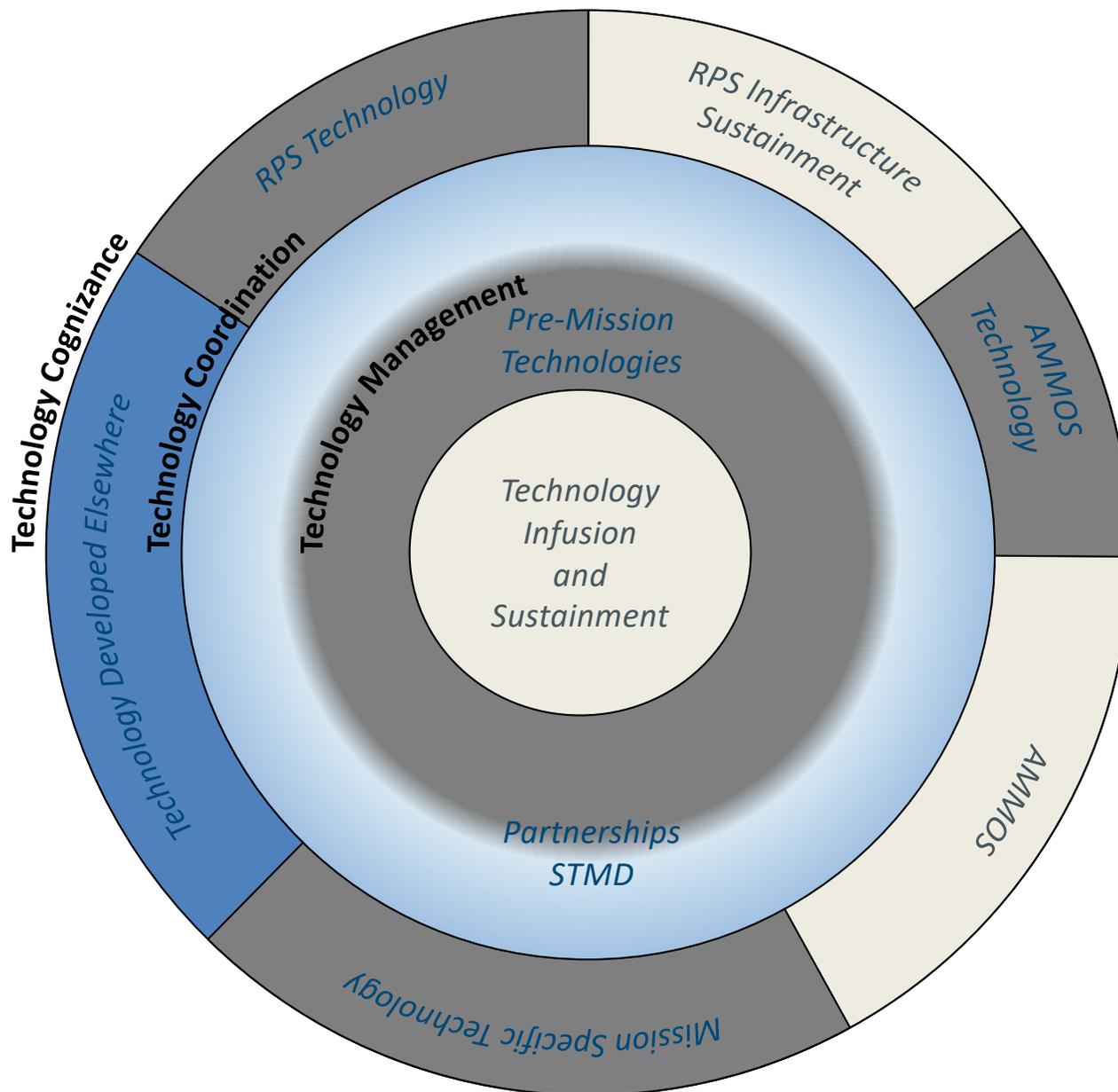
- Within PSD, SMD, STMD, ...

Promote technology infusion

- Infusion starts before solicitations are written, ends with mission adoption

Technology Investment Goal: Per the Decadal, 6-8% of Planetary Science Division budget \$110-150M per year for technology, excluding infrastructure investments or sustainment

Planetary Exploration Science Technology Office (PESTO)



Circle of Influence

Manages,

Coordinates, and

Infuses technology needed for future planetary science missions

- Instruments
- Spacecraft Technology
- Mission Support Technology



David Schurr
PSD Deputy Division Chief

Tibor Kremic
GRC Science Office Chief

Len Dudzinski
PSD Chief Technologist

Jonathan Rall
PSD R&A Director

Planetary Exploration Science Technology Office

New office – these roles may change!

Carolyn Mercer – Propulsion, Autonomy
Jim Gaier – Instruments
Ryan Stephan – Heat Shields, ColdTech
Viet Nguyen – HotTech, Precision Landing
Pat Beauchamp – Mars, Assessment Reports
Dave Anderson – Structures/Materials, Financial
Rainee Simons – Instruments, Communications

Ad Hoc members for Strategy
Florence Tan
Stephanie Getty

PICASSO
Jim Gaier

Matisse
Rainee Simons

HotTech
Viet Nguyen

ColdTech
Ryan Stephan

TBD?

Existing program managers remain managing the existing programs

Planetary Exploration Science Technology Office

What have they been up to?

Management

- PICASSO & MatISSE
- HotTech
 - Integrating the 8 tasks
- ColdTech
 - Technical oversight
 - Requirements for ice penetrator testbed
- Icy Satellites – nano-vacuum electronics
 - Teamed Ames with GRC to build devices by year's end

Coordination

- SBIR subtopics
- Early Stage Innovation topics
 - Electric Propulsion Modeling for SmallSats
- Space Technology Research Institute
 - Extreme temperature materials modeling and tribology
 - System Autonomy
- STMD Small Spacecraft Program

Strategy

Draft Investment Strategy

45 Technology Goals

25 Investment Strategies

Technology Reviews

Icy Satellites Investment

Nano-vacuum electronics

Vet strategy with the community – top level

OPAG 9/6/17, VEXAG 11/14/17, SBAG 1/18/18

Assessing Costs

Infusion

- Infusion begins before the solicitation is written
- More steps: tbd

Planetary Exploration Science Technology Office

Next Steps

Management

- Manage PICASSO, MatISSE, HotTech, and ColdTech
- Conduct studies, hold workshops as necessary to inform strategy
- PICASSO/MatISSE planning workshop

Coordination

- Planetary Science
- Earth Science
- Heliophysics
- Astrophysics
- STMD
- HEOMD

Strategy

Draft Investment Strategy

Review with Planetary Science Division

Vet strategy with the community

Planetary Science Community Groups

MEPAG, LEAG

STMD PTs

Center Chief Technologists

Capability Leadership Team

Centers

Industry

Complete cost estimates

Infusion

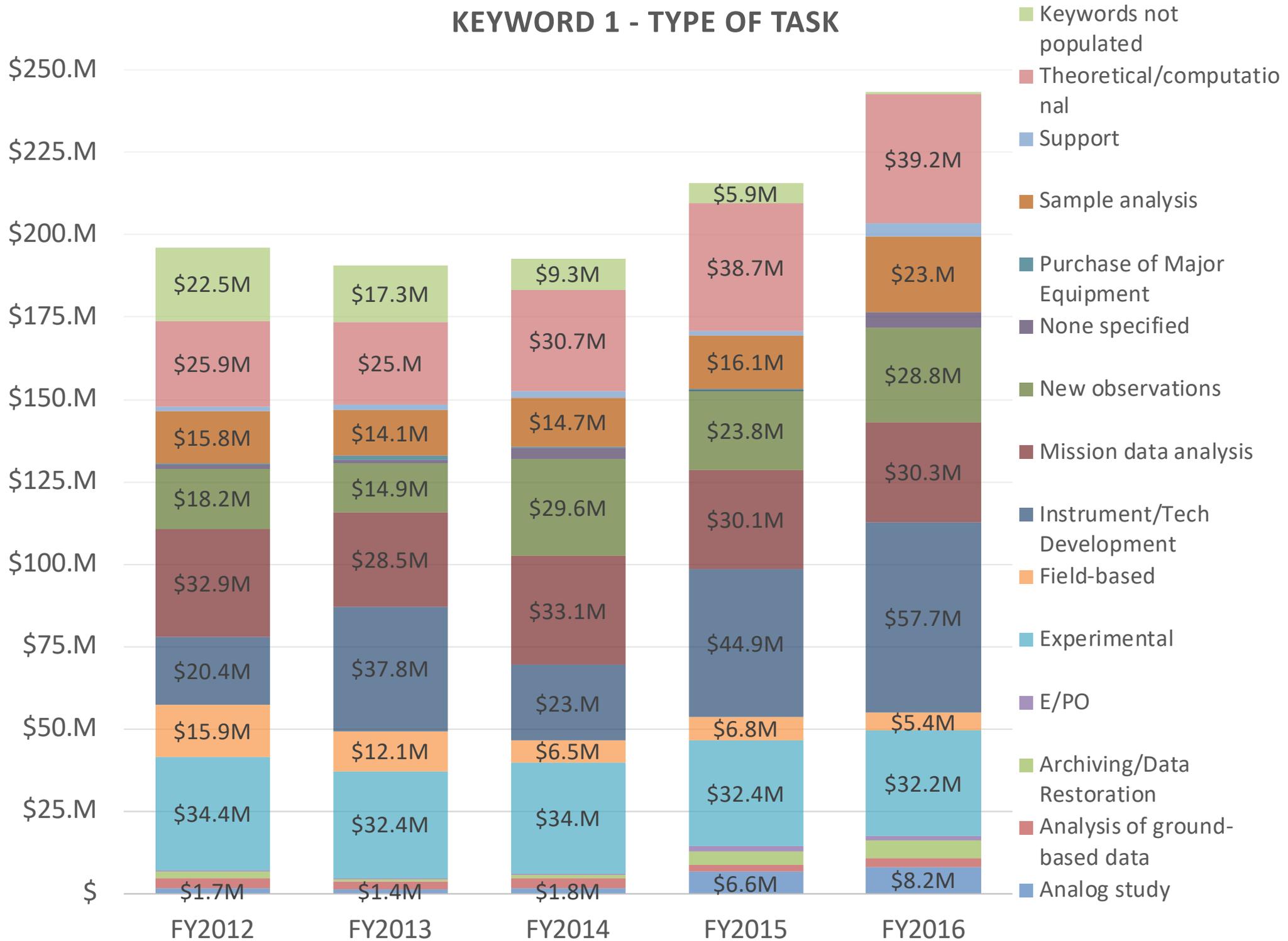
- Link mission personnel, scientists, and technologists
- Host technical reviews
- Sponsor conference special sessions

The community is enthusiastic about this new office
We're excited to begin!

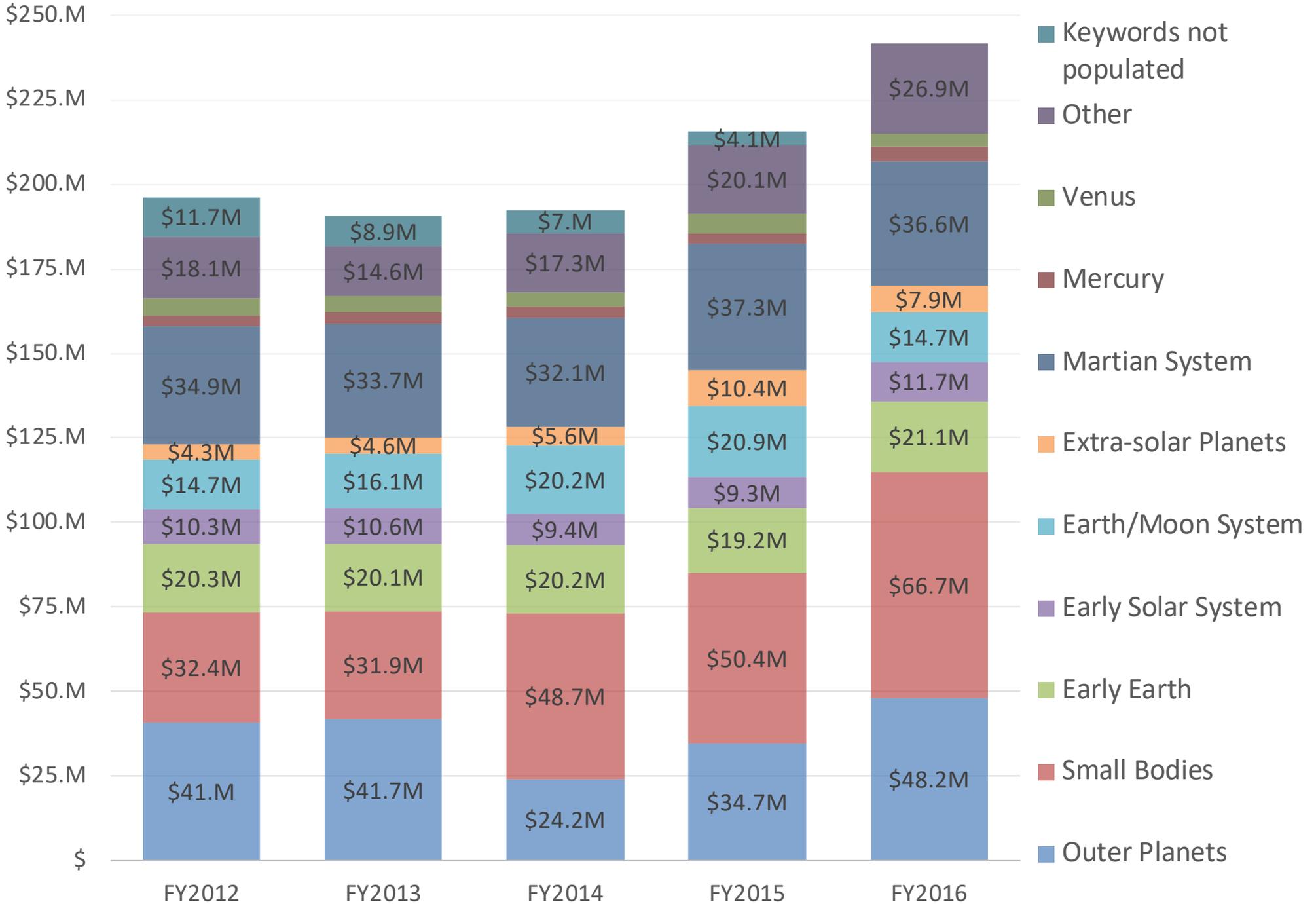
Keyword Analysis

- Analysis of keyword distribution, 2012-2016 for categories:
 - Type of Task (keyword category 1)
 - Object(s) of Study (keyword category 2)
- Analysis includes:
 - R&A awards, including NAI CAN awards
 - Data Analysis Programs
 - Participating Scientist and Guest Investigator Programs
- Analysis excludes:
 - Support activities
 - Facilities (e.g. RPIFs, AVGR, GEER, PAL, RELAB, ...)
- Caveats
 - If more than one keyword was used within any category, approved amount was equally divided between keywords
 - Return rate varied from year to year, portfolio to portfolio, and keyword category to keyword category
 - Keywords might have been used inconsistently between program officers

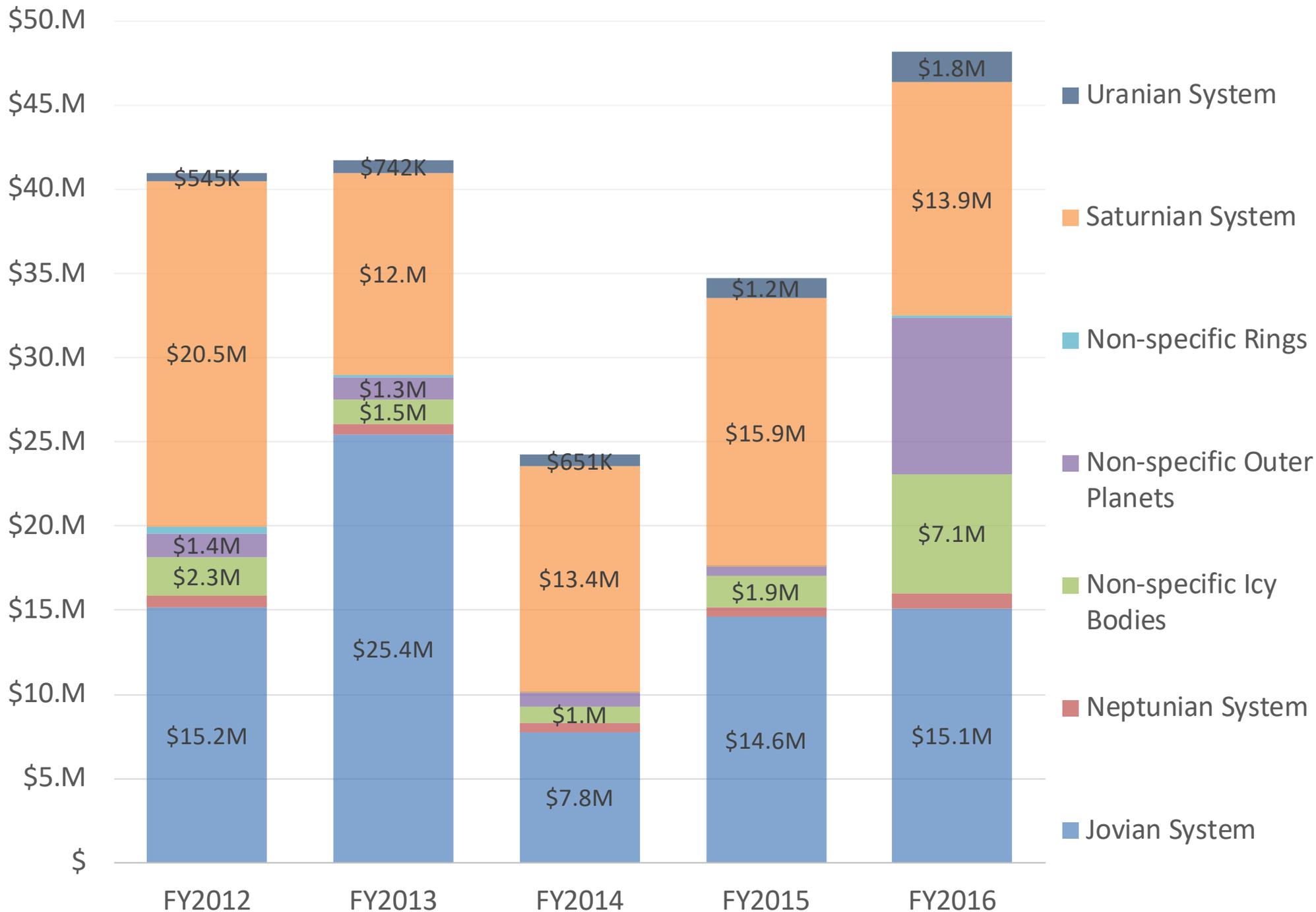
KEYWORD 1 - TYPE OF TASK



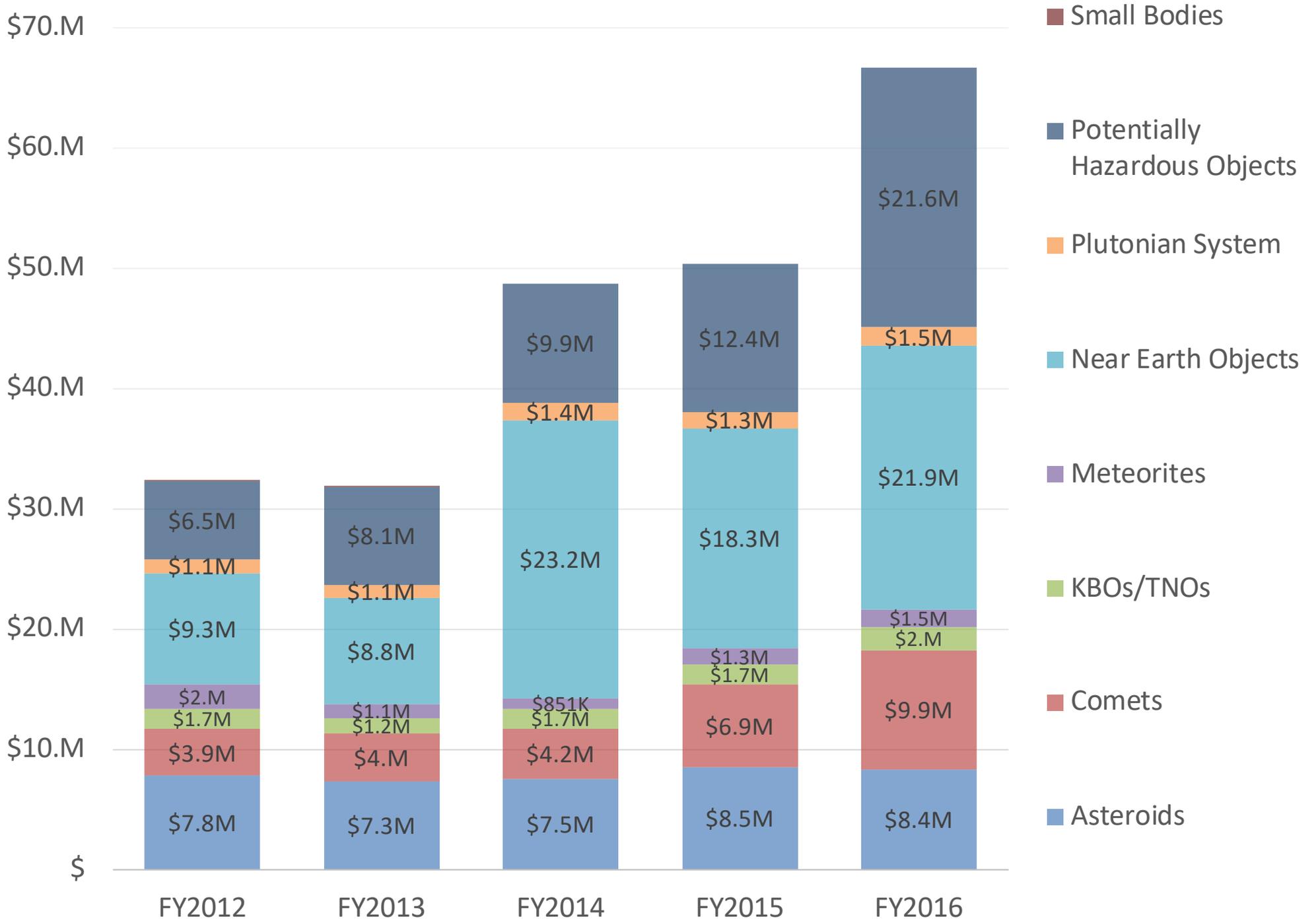
KEYWORD 2 - TARGET BODY OVERVIEW



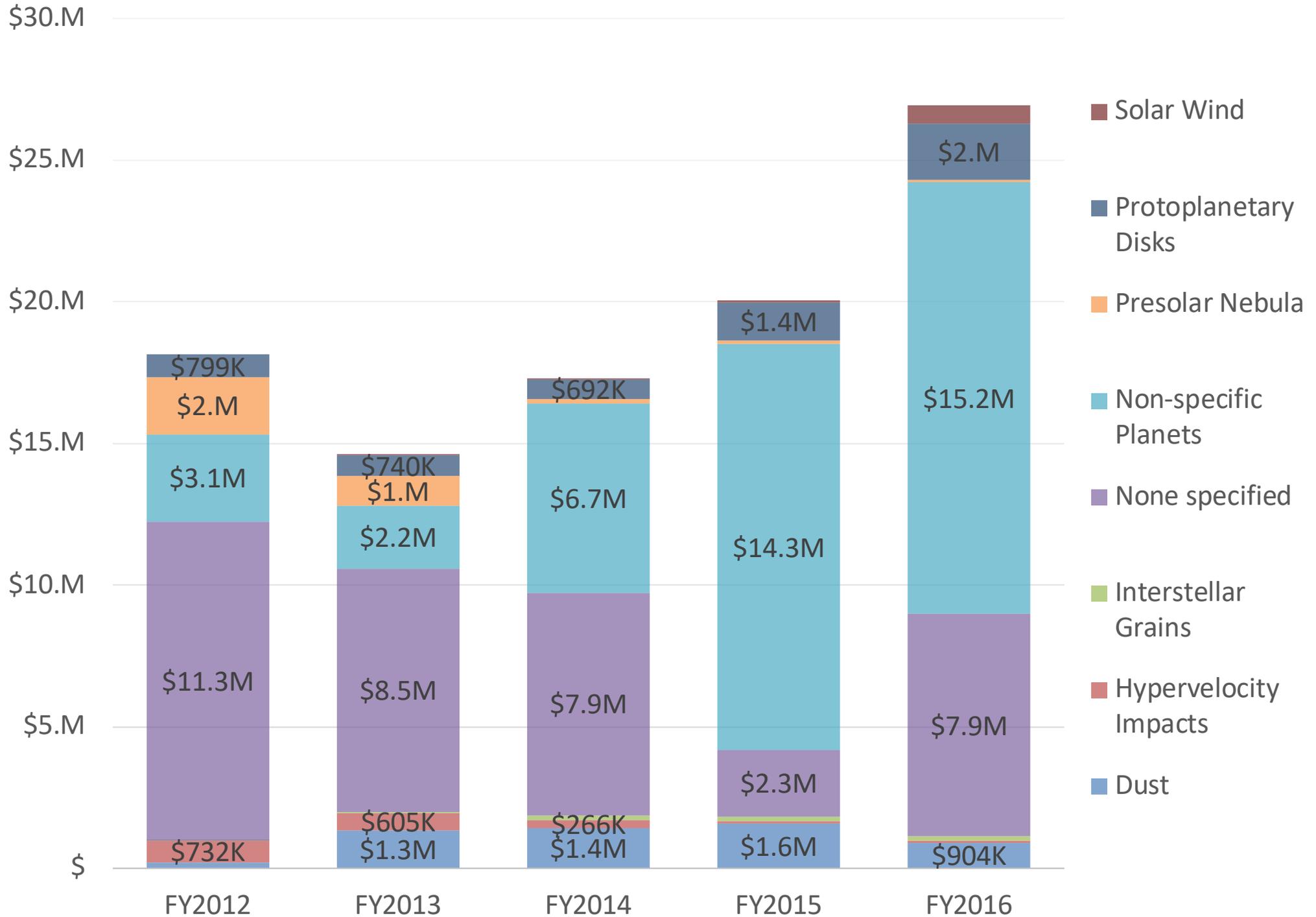
KEYWORD 2 - OUTER PLANETS BREAKOUT



KEYWORD 2 - SMALL BODIES BREAKOUT



KEYWORD 2 - OTHER BODY BREAKOUT



SMD's response to the National
Academies Review of the
Restructured R&A Programs of
NASA's Planetary Science Division

On the use of “external” reviewers in peer reviews

Recommendation 1: In conducting scientific peer reviews of research proposals, NASA’s Planetary Science Division should **engage the services of several (at least two or three) external (mail) reviewers well in advance** of panel reviews. These reviews are critical to a fair and effective proposal evaluation process, particularly when the review panels have a more interdisciplinary character. The panel chair and group chiefs, if recruited early, can take the lead in identification of appropriate external reviewers. (Additional details may be found in section “Proposal Submission and Review” in Chapter 2.)

Response 1: NASA concurs with the recommendation. It is indeed current Planetary Science Division practice to **request multiple external reviews** for each proposal in addition to the individual panel reviews. PSD will work more closely with its community to **ensure** that this occurs and **the external reviewers have sufficient time** to deliver a complete and in-depth review for their assigned proposals. However, as demonstrated in Dr. Rall’s presentation to the *ad hoc* committee on May 12, 2016, although the **restructured programs are more interdisciplinary** than the old ones, the **subpanels are more focused** as there are more proposals in any given subtopic from which to construct these subpanels. Moreover, the response rate to requests for external reviews varies quite widely between programs and can drop below 20%. Finally, **the depth and rigor of external reviews often falls well below the quality expected.** In the future, PSD intends to **explore methods of improving the response rate and quality of external reviews.**

On the reconsideration of proposal selection decisions

Recommendation 2: NASA's Planetary Science Division should expeditiously complete **establishment of the process for reconsideration of proposal selection decisions**, develop and implement a **formal mechanism to track debriefing and reconsideration requests** across program elements, and inform the community about the process. More transparency in this area can provide the planetary science community with greater confidence that NASA has appropriate checks and balances in the selection process. (Additional details may be found in the section "Proposal Decision Reconsideration" in Chapter 2.)

Response 2: NASA concurs with the recommendation. The Planetary Science Division has now fully implemented the new, restructured programs and a **revision to the SMD Policy Document 09 (SPD 09) *Requesting Reconsideration of NRA Proposal Declination*** is underway. This revision will include a **formal mechanism to track reconsideration requests** not just across Planetary Science Division programs but across all SMD programs.

On the solicitation, evaluation, and selection of high-risk/high-impact research

Recommendation 3: NASA needs to **investigate appropriate mechanisms to ensure that high-risk/high-payoff** fundamental research and advanced technology-development activities **receive appropriate consideration during the review process.** (Additional details may be found in the section “High-Risk/High-Payoff Research Activities and Advanced Technology” in Chapter 3.)

Response 3: NASA concurs with this recommendation. The Planetary Science Division is working with the Science Mission Directorate’s front office on a directorate-wide assessment of whether the SMD R&A program has an effective process in place to most effectively solicit, review and select evolutionary vs. revolutionary projects, *i.e.*, high-impact but speculative work vs. more gradual work in which there is high confidence that it will succeed. The goal is to assess if the **current practice of soliciting by topic and evaluation for merit** followed by **flagging high-risk/high-impact projects for the selection official is adequate**, or should SMD consider other practices. **PSD will work with its Advisory Committee to develop functional definitions of “High Risk” and “High Payoff”** and then apply them to assess the adequacy of current practices of solicitation, evaluation & selection. **In addition, SMD and the Division Directors have tasked the NAC Science Committee and the four science advisory committees to provide NASA with advice in this area.**

On the alignment of R&A program structure and funding with the Planetary Science Division's science goals

Recommendation 4: A formal assessment by NASA of **how well the program structure and funding are aligned with the Planetary Science Division's science goals** should be conducted at least **every 5 years**, appropriately phased to the cycle of decadal surveys and midterm reviews. (Additional details may be found in the section “Funding Distribution Among Program Elements” in Chapter 3).

Response 4: NASA concurs with this recommendation. We charge our **advisory committee to conduct an annual review of our accomplishments against the Planetary Science Division's science goals** through the annual Government Performance and Results Act/Modernization Act (**GPRAMA**) report. This report is reviewed and graded by the division's advisory committee (formerly the Planetary Science Subcommittee (PSS) of the NASA Advisory Council, now replaced by the Planetary Science Advisory Committee (PAC)). Further, **the NASA Science Plan is typically updated every three to four years** and while the planetary science goals and objectives are durable and do not change significantly, that does **provide an opportunity to tweak the R&A structure or change priorities**. We do not ask our advisory committee to comment on the alignment of the R&A program structure or funding against these science goals, though. **It is NASA's intention to include an assessment of this alignment in the charge to the next decadal survey committee.**

On the efficacy with which the current R&A program supports existing and future missions

Recommendation 5: NASA should support the **development of the technologies required to return astrobiological and cryogenic samples to Earth and the appropriate containment, curation, and characterization facilities** consistent with the Planetary Science Division’s science goals and planetary protection requirements. (Additional details may be found in the section “Enable New Spaceflight Missions” in Chapter 4).

Response 5: NASA concurs with this recommendation. The **Planetary Science Division has investments in various instrument development and technology programs** such as are MatISSE (Maturation of Instruments for Solar System Exploration) and PICASSO (Planetary Instrument Concepts for Advancement of Solar System Observations), for both high and low technology readiness levels, respectively. Program elements also exist for the **development of instrument technology for future New Frontiers missions** (Homesteader), **future astrobiological instrumentation for Europa and other ocean world missions** (COLDTech – Concepts for Ocean worlds Life Detection Technology), **missions to study the interiors of the gas giants and the surface of Venus and Mercury** (HOTTech – Hot Operating Temperature Technology), planetary studies through **emerging platforms such as CubeSats** (SIMPLEx – Small, Innovative Missions for Planetary Explorations; PSDS3 – Planetary Science Deep Space SmallSat Studies), and **research activities in extreme environments on Earth** (PSTAR – Planetary Science & Technology through Analog Research). The Planetary Science Division will continue to **work closely with the Astromaterials Curation Facility** to upgrade existing curation facilities and develop new ones as needed. Additionally, the **Planetary Science Division will investigate establishing a new program to solicit development of spacecraft technology for the return of cryogenic and astrobiological samples.**

On sustaining critical scientific and technical expertise

Recommendation 6: In making funding decisions for the various research and analysis program elements, NASA should consider the need to sustain critical scientific and technical expertise and the instrumental and facility capabilities required for scientific return on future missions, as discussed in the 2011 planetary science decadal survey. (Additional details may be found in the section “Enable New Spaceflight Missions” in Chapter 4.)

Response 6: NASA concurs with this recommendation. In the coming decades, NASA and its international partners will develop and operate an **increasing number of sample return missions** (*e.g.*, Hayabusa-2, OSIRIS-REx, Mars Sample Return, Martian Moons eXploration). In order to be fully and adequately prepared for this future, PSD has acknowledged that information is needed to **understand the planetary community’s laboratory capabilities and challenges, and to define the magnitude of the stress on research and training needs**. In preparation for the next Decadal Survey in Planetary Science, NASA requested that the National Academies of Science perform a study addressing the following questions:

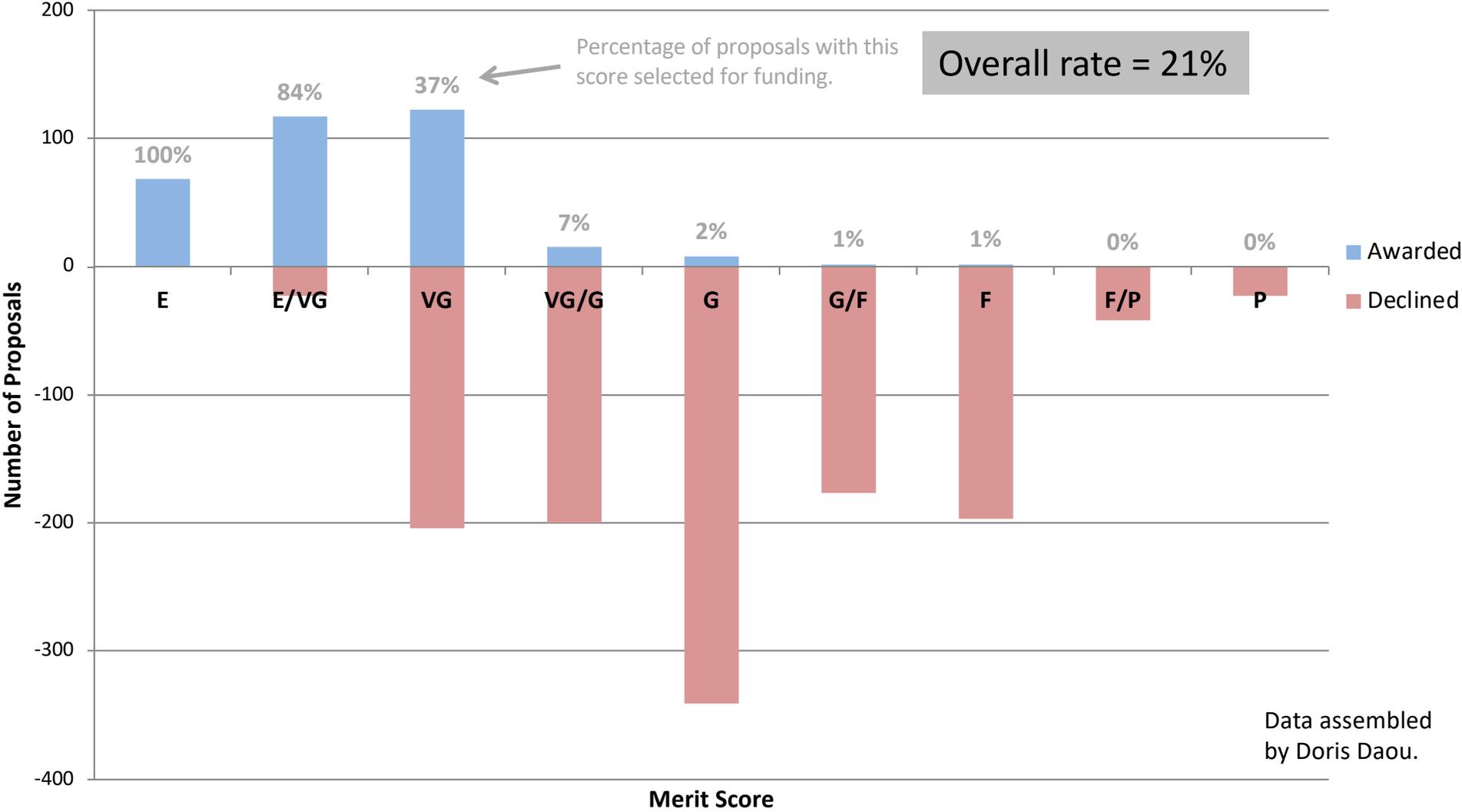
1. **What laboratory analytical capabilities are required** to support PSD (and partner) analysis and curation of existing and future extraterrestrial samples?
 - a. **Which of these capabilities currently exist, and where are they located** (including international partner facilities)?
 - b. **What existing capabilities are not currently accessible** that are/will be needed?
2. Whether the **current sample laboratory support infrastructure and NASA’s investment strategy meets the analytical requirements** in support of current and future decadal planetary missions.
3. How can NASA ensure that the **science community can stay abreast of evolving techniques and be at the forefront of sample analysis?**

Questions?



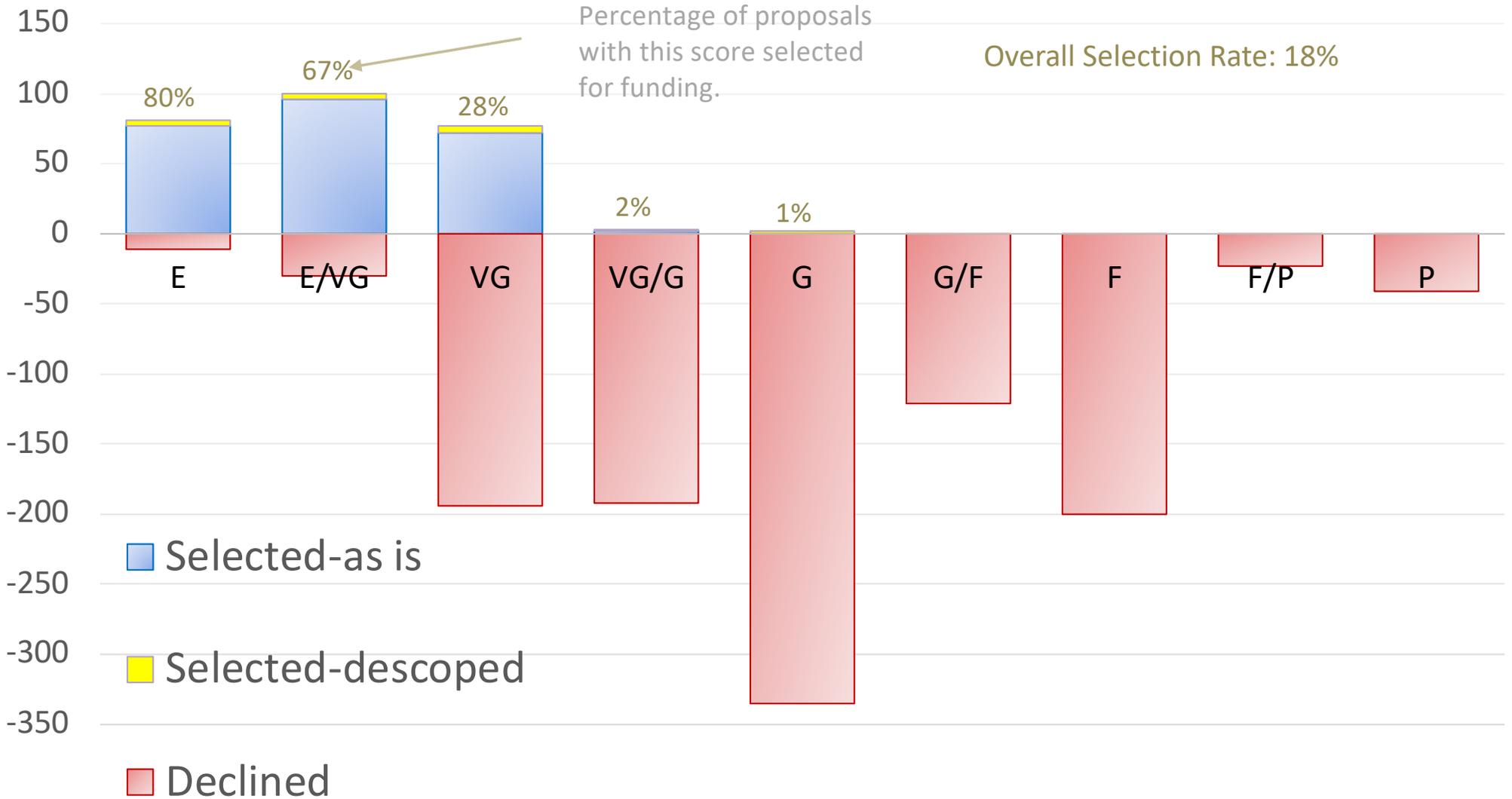
Back Up

PSD R&A Selections – ROSES 2014



Shown are proposals submitted to ROSES-2014, including all core programs (EW, SSW, HW, SSO, EXO) and all DAPs (MDAP, DDAP, LDAP, CDAPS).

PSD R&A SELECTIONS – ROSES 2015



Metrics for proposals submitted to ROSES 2015, including all core programs (EW, SSW, HW, SSO, EXO) and all DAPs (MDAP, DDAP, LDAP, CDAPS).

Working Definitions

High-Impact: Research whose outcome, if confirmed, would have a substantial and measureable effect on current thinking, methods or practice.

High-Risk: Research that tests novel and significant hypotheses for which there is scant precedent or preliminary data or that are counter to the existing scientific consensus.

Are these definitions good enough to start with?

How can they be improved?

- **Multidisciplinary:** Research in which contributions from two or more different disciplines *are independently or sequentially applied, providing additive contributions* to the solution of a common problem.
- **Interdisciplinary:** Research in which contributions from two or more different disciplines *are jointly applied, providing interactive contributions* to the solution of a common problem.

Interdivisional: Research that simultaneously advances the strategic objectives of more than one SMD Division. Such research may be multi- or inter-disciplinary but need not be.

The ACs will be asked to improve these definitions, if they see fit to do so.