

Outer Solar System: Many Worlds to Explore

OPAG R&A Update

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Alfred McEwen
University of Arizona



R&A is important to surviving the Decade of Darkness.

What effect has R&A restructuring had on OPAG research?

1. OPAG-relevant programs that didn't change much:

- Cassini DAP
 - 18 grants/yr average before & after restructuring
- Origins of Solar Systems → Emerging Worlds
- Technology programs—renamed but comparable
 - New opportunities relevant to ocean worlds in future years

2. OPAG-relevant programs that changed more:

- Several fundamental research programs important to OPAG have been merged into SSW
 - Outer Planets Research (OPR)
 - Planetary Geology and Geophysics (PGG)
 - Planetary Atmospheres (PATM)
- New R&A Programs: Habitable Worlds, PDART

How has OPAG done overall, given these changes?

How Has Outer Planets Research Fared in New R&A Scheme?

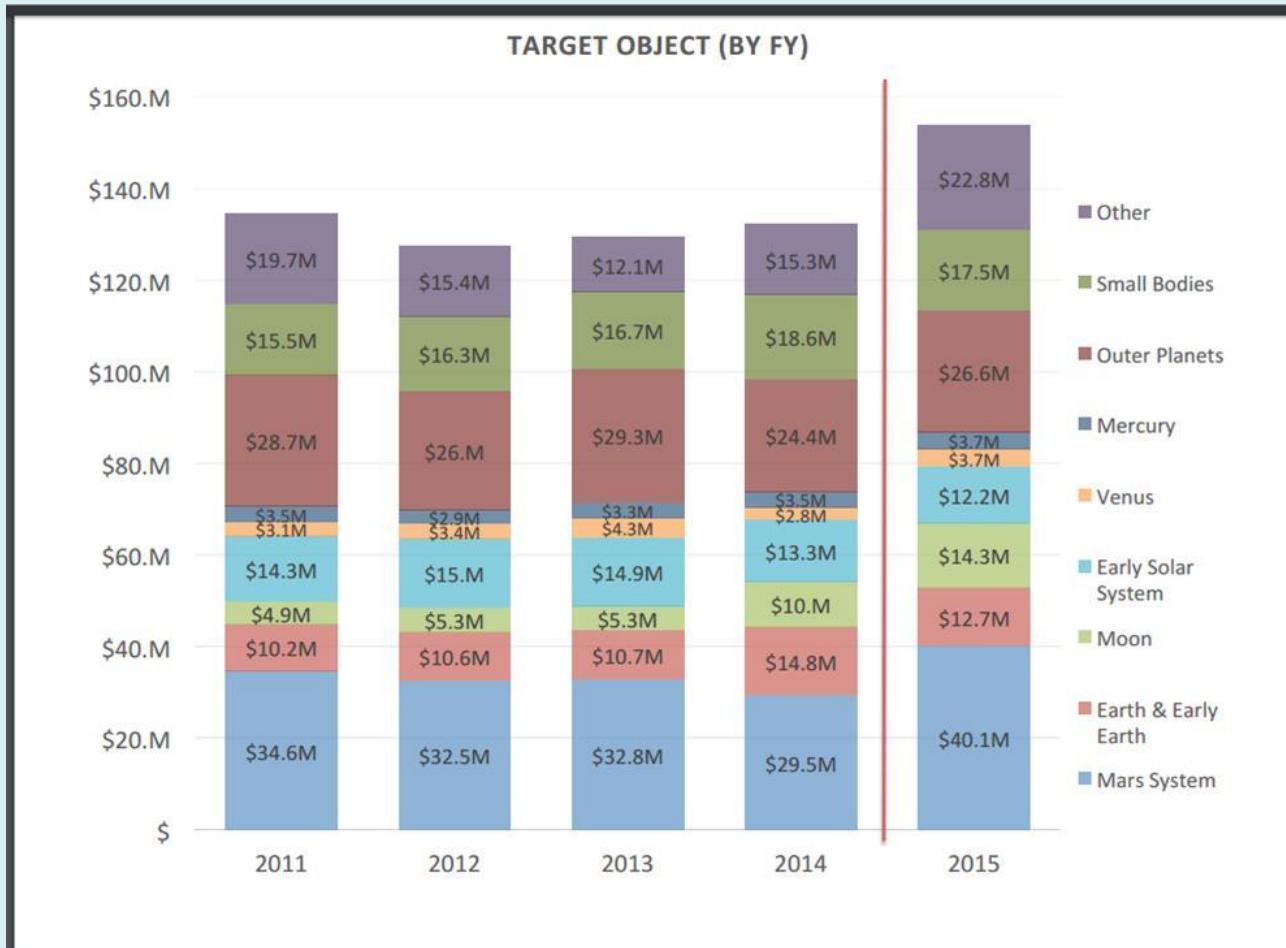
- I looked at number of funded grants posted in NSPIRES, and made a judgment call as whether or not each was primarily OPAG-centric
 - Some late selections not posted in NSPIRES
- OPAG-centric selections in 2010-2013
 - OPR (not counting Pluto or comets): $107/4 \text{ years} = 26.75/\text{yr}$
 - PGG: $13/4 \text{ years} = 3.25/\text{yr}$
 - PATM: $34/4 \text{ years} = 8.5/\text{yr}$
 - Total: $38.5/\text{yr}$
- OPAG-centric selections in 2014 (only year of new R&A grants available to me):
 - Habitable Worlds: 4
 - Solar Systems Workings: 22
 - PDART: 7 (**but not fundamental research**)
 - Total: $33/\text{yr}$ total; $26/\text{yr}$ (**fundamental research**)
- This considers number of grants only, not \$\$, as funding information is not publically available

Summary:

1. There has been a 14% reduction in number of new OPAG-centric R&A grants (but statistics are poor with just 2014 selections available). **See next slides for better analyses.**
2. There appears to be a 32.5% reduction in the number of fundamental research grants for Outer Planets and satellites, but there was some PDART-like work funded in prior fundamental research programs.

Overall, there seems to have been a shift of emphasis, away from basic research and towards more directed R&A.

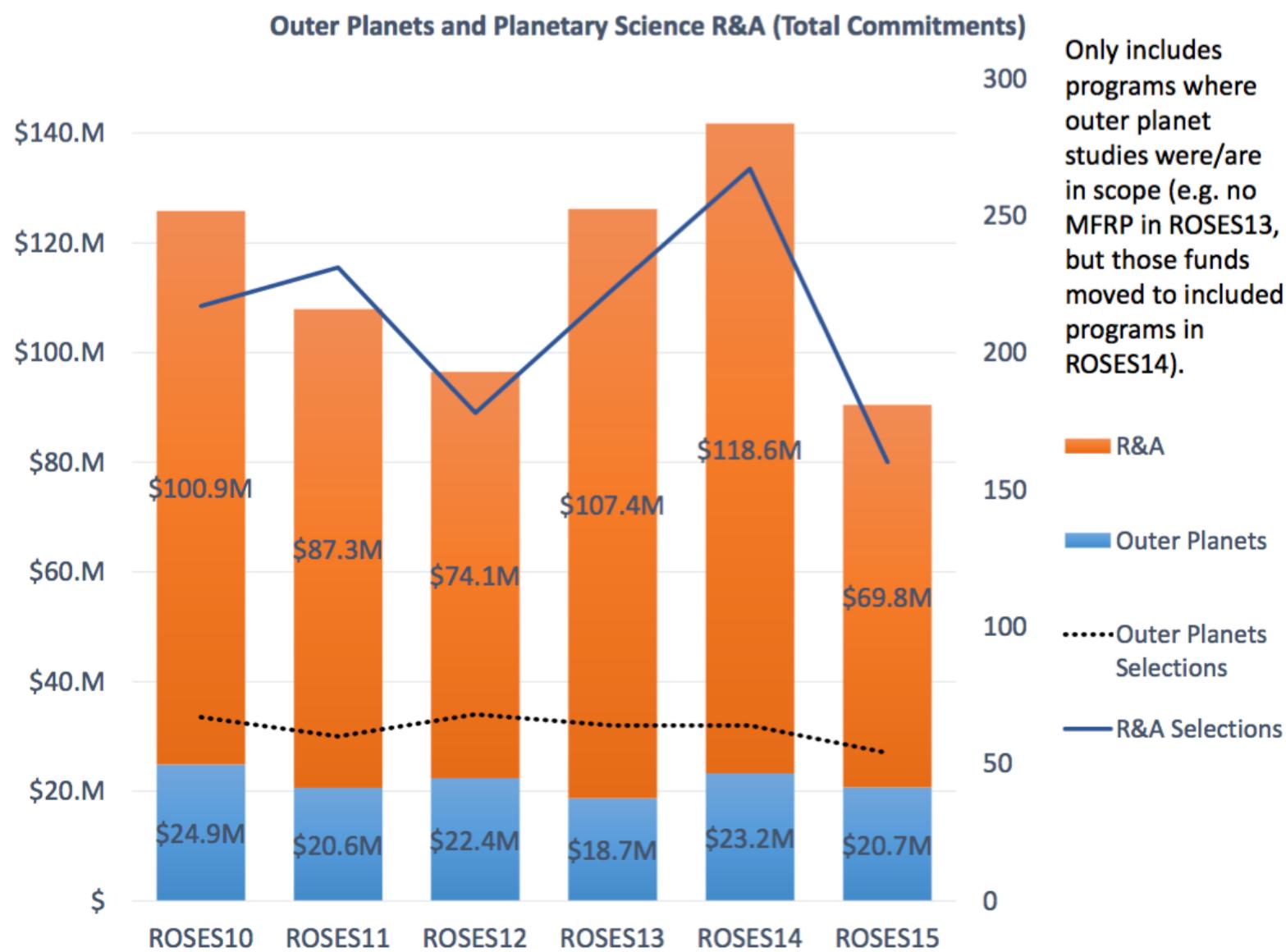
NASA Keywords analysis



Outer Planets 2011-13 average: \$28.0M/yr

Outer Planets 2014-2015: \$25.5M/yr, 9% decline

Presentation to OPAG 8/13/16 by Jared Leisner



- Expressed in total funding commitment for all task years (a 3-yr \$100k/yr and a 2-yr \$150k/yr award will both add \$300k to the ROSES year they were selected in)

Draft OPAG Findings on R&A

- Outer Planets R&A funding has been roughly constant (in RY \$) through R&A reorganization
- Relations between science community and NASA R&A managers needs improvement
 - Much distrust created by R&A reorganization, which is not productive
 - Regular updates based on keywords should help
 - Improvement over lack of information since reorganization
 - Insist on respectful discourse at OPAG meetings
- We need to continually make the case for fundamental research
 - Always difficult to justify basic research, because the benefits are long-term and can't usually be predicted
 - Roadmap to Ocean Worlds (ROW) study has identified R&A needs
 - Appropriate to this long-term vision
- Minor issue: Difficult to fund comparative planet data analysis studies
 - Saturn (CDAP) vs Jupiter (via Juno, eventual NFDAP)
 - Pluto (NFDAP) vs. Triton (SSW)
 - Enceladus (CDAP) vs. Europa (SSW)

Value of Basic Research

- <http://www.icsu.org/publications/icsu-position-statements/value-scientific-research/the-value-of-basic-scientific-research-dec-2004>
- Basic scientific research is defined as fundamental theoretical or experimental investigative research to advance knowledge without a specifically envisaged or immediately practical application.
- It is the quest for new knowledge and the exploration of the unknown. As such, basic science is sometimes naively perceived as an unnecessary luxury that can simply be replaced by applied research to more directly address immediate needs.
- However the demarcation between basic research and applied research is not at all clear cut. In reality they are inextricably inter-twined.
- Most scientific research, whether in the academic world or in industry, is a hybrid of new knowledge generation and subsequent exploitation. Major innovation is rarely possible without prior generation of new knowledge founded on basic research.
- Strong scientific disciplines and strong collaboration between them are necessary both for the generation of new knowledge and its application.
- Retard basic research and inevitably innovation and application will be stifled.