

# Planetary Science Division Update

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NASA Headquarters  
May 10, 2011

Presentation to the Planetary Protection  
Subcommittee



# Outline

- PSD Plan to Respond to the Decadal Survey
- Recent Discovery Selections

# Planetary Program Architecture

## Recommended by the Planetary Decadal Survey



### Large Missions (“Flagship”-scale)

*“Recommended Program”*  
(budget increase for JEO new start)

- 1) Mars Astrobiology Explorer-Cacher – descoped
- 2) Jupiter Europa Orbiter (JEO) – descoped
- 3) Uranus Orbiter & Probe (UOP)
- 4/5) Enceladus Orbiter & Venus Climate Mission

*“Cost Constrained Program”*  
(based on FY11 Request)

- 1) Mars Astrobiology Explorer-Cacher – descoped
- 2) Uranus Orbiter & Probe (UOP)

*“Less favorable” budget picture than assumed*  
(e.g., outyears in FY12 request)

**Descope or delay  
Flagship mission**

### Discovery

\$500M (FY15) cap per mission (exclusive of launch vehicle) and 24 month cadence for selection

### New Frontiers

\$1B (FY15) cap per mission (exclusive of launch vehicle) with two selections during 2013-22

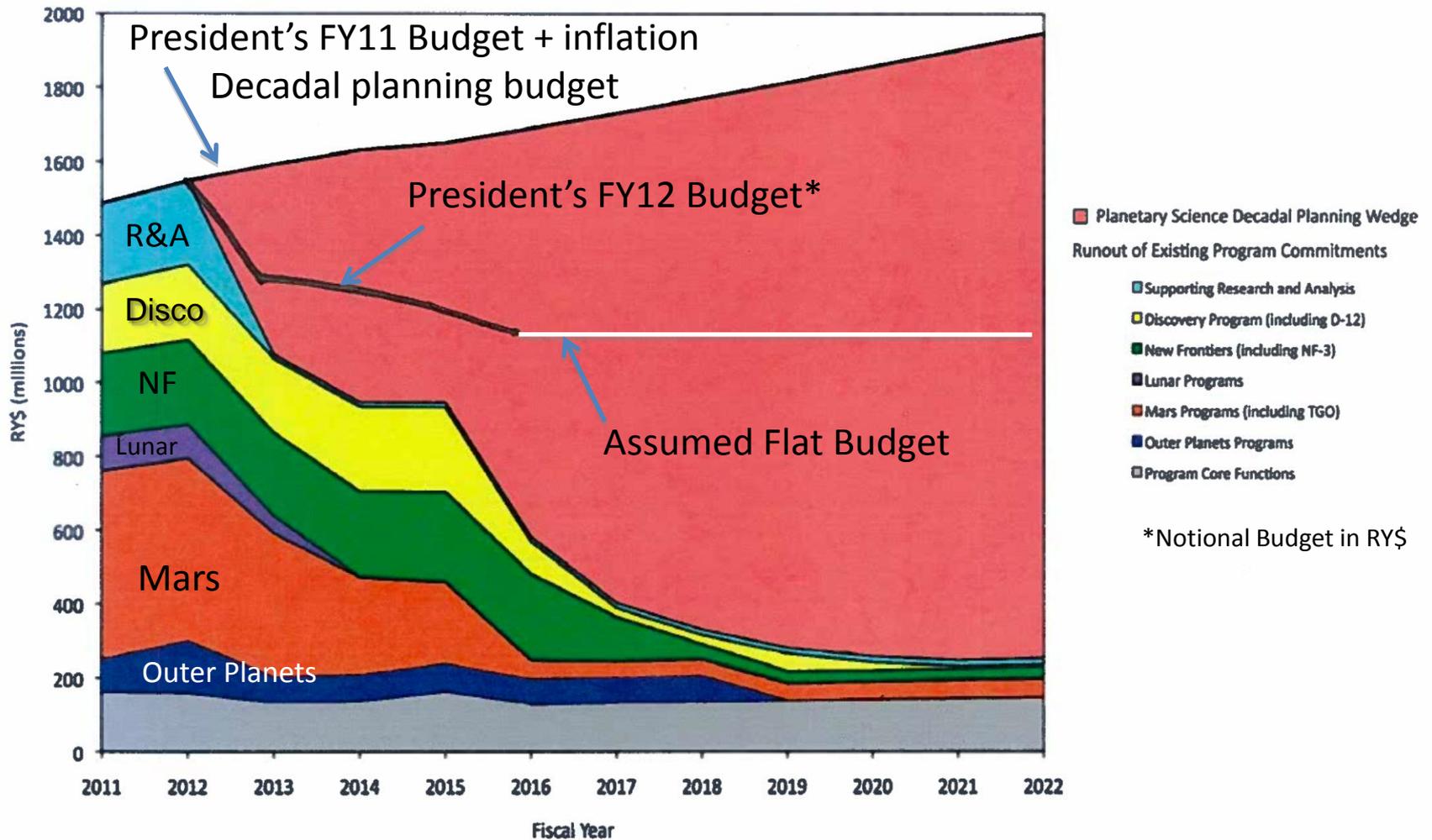
**Research & Analysis (5% above final FY11 amount then ~1.5%/yr)**

**Technology Development (6-8%)**

**Current Commitments (ie: Operating Missions)**

# Planetary Funding Profiles

## FY11 and FY12 Requests





# Decadal Decision Rules

- Page 9-6: NASA's suite of planetary missions ... should consist of a *balanced mix of Discovery, New Frontiers, and Flagship* missions, enabling both a steady stream of new discoveries and challenges ...
- Page 9-21: It is also possible that the budget picture could turn out to be less favorable ... If cuts to the program are necessary, the committee recommends that the first approach should be *descope or delaying Flagship missions. Changes to the New Frontiers or Discovery programs should be considered only if adjustments to Flagship missions cannot solve the problem.*
- Actions based on Decadal Guidance:
  - Maintain a balanced program – small, medium, large missions
  - Maintain a partnership with ESA
  - Descope flagship missions as a first resort due to tight budgets
  - If flagship descopes are *not sufficient* then stretch out New Frontiers and Discovery A/Os

# PSD Decadal Budget Planning



- Lay In Current Commitments
  - All Operating Missions Through Expected End of Life
  - Current R&A Awards
  - All missions in development or competition
    - Juno, GRAIL, MSL, LADEE, MAVEN, EMTGO
    - New Frontiers-3, and Discovery 12
  - In-Space Propulsion Technology
  - Radioisotope Power System Program
  - Pu-238 Production
- Accommodate Decadal Recommendations
  - Maintain a healthy R&A program
  - Discovery AO's on 2 year Cadence
  - New Frontiers AO's on 5 year Cadence
  - Mars 2018 Cache Rover Directly Tied to MSR
    - Includes initiation of MSR high-priority technologies wedge
- Per OMB \$10M/year set aside for cooperative activities with Human Exploration
- Full decadal recommendations greatly exceed President's FY12 Budget
  - Must use decision rules from decadal to develop a balanced budget



# Approach to Develop new “Notional” Budget

- Capped R&A at \$200M/year
- Next Discovery AO on current <36 month cadence
  - All subsequent AO’s accelerated to 24 Month Cycle
- Select NF-3 planned for NF-4 and NF-5 within decade
  - Will maintain New Frontiers schedule
- Extended Mission budget for ALL operating missions
  - Senior Review used for determining which missions to be extended
- Dedicated Lunar R&A wedge transferred to PSD R&A
- Residual Lunar Quest Program moved to Discovery
- JEO Descoped to Studies Funded FY11/12
  - No JEO Instrument AO
  - Budget for some radiation technology efforts



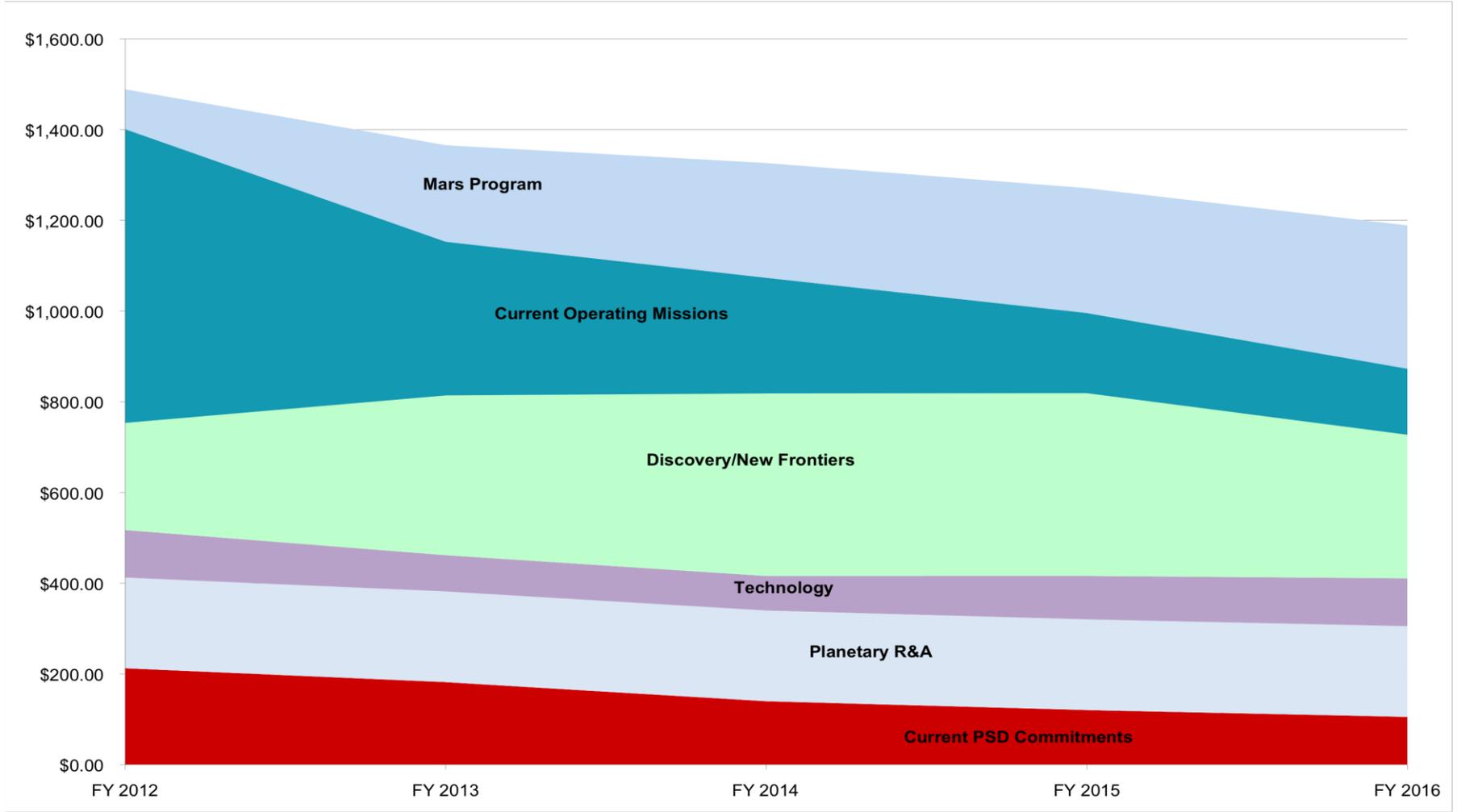
# Overall Program Content

- Mars Exploration Program (Negotiated with ESA)
  - EMTGO, MOMA, Mars 2018 (JR-1), Management, Future missions
- Discovery Program
  - Strofio, LaRa, Disc-12, Management, Future missions
- New Frontiers Program
  - NF-3, Management, Future missions
- Technology Program
  - PIDDP, ASTID, ISP, RPS, MSR Tech, OP Tech
- Planetary R&A
  - Move PIDDP and ASTID to Technology Program
- Mission Commitments (operating etc.)
  - GRAIL, Juno, MSL, MAVEN, LADEE, MER, MRO, Odyssey, Mars Express, Dawn, New Horizons, LRO, MESSENGER, Deep Impact, Stardust, ASPERA-3, Rosetta, Cassini
- Other Commitments
  - Pu-238, AMMOS, OPF studies, JGO/ESA MOO, Joint coordination w/HSF

Operating  
Development  
In Competition



# A PSD "Notional" Decadal Budget





# Road to Response

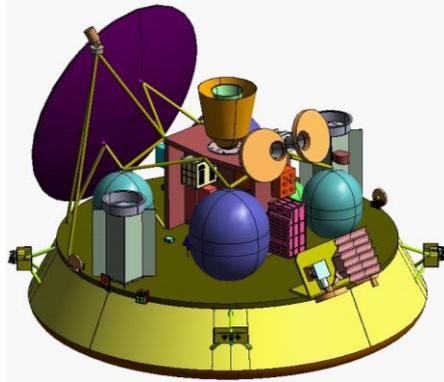
- March 7, 2011 Decadal Survey Released at LPSC
- April 5, 2011 Response Strategy Briefing to OMB
- Budget Guidelines and DS Objectives Reconciled
- Cataloging of Recommendations (200+) Completed
  - Consolidated into 37 Actionable Recommendations
  - Writing Assignments
- May 6, 2011 Rough Draft Assembled
- June 12, 2011 Draft Supplied to PSS
- June 26, 2011 PSS Comments on PSD Response
- July, 2011 Final Response Delivered to NRC



# Discovery 12 Selections

# 031- CHopper: Comet Hopper

## PI: Jessica M. Sunshine



### Mission & Science Team:

PI: Jessica Sunshine, UMD  
Deputy PI: M. A'Hearn, UMD  
Project Management: GSFC  
S/C: LM  
Mission Ops: LM  
Science Ops: UMD

### Mission:

Comet Wirtanen rendezvous and landing mission using LM S/C. 4 sorties between 4.5 and 1.5 AU from Sun.

### Goals:

- Map spatial heterogeneity of gas & dust emissions and surface solids
- Determine nucleus structure, geologic processes, coma mechanisms
- Document changes w/ increasing isolation

### Instruments:

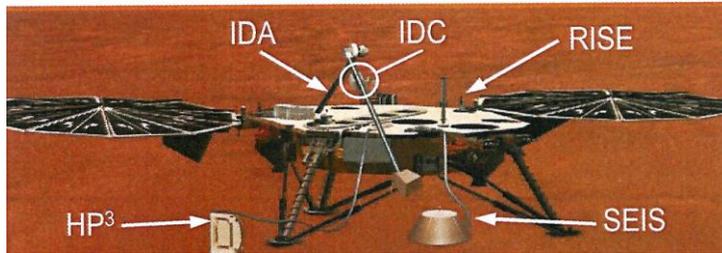
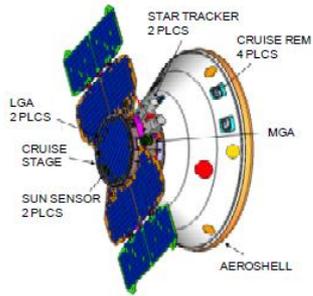
- CHIRS- CHopper Infrared Spectrometer
- CHIMS- CHopper Ion/Neutral Mass Spectrometer
- CHI- CHopper Imager
- CHEX- CHopper Heating Experiment
- PanCams- Panoramic Cameras

### Mission Details:

- Flight: 2016 launch with Standard 4m LV, 34-day launch period
- Mission: 7.3-yr mission, 2022 rendezvous / science ops
- Science Phase: Remote survey and multiple *in situ* surface measurements
- Cruise/Parked Ops: Quiescent ops during cruise and between sorties, science data downlink
- Spacecraft: high-heritage spacecraft design, flight-proven components for reliability and long life, large systems margins, dust covers for robustness in cometary environment, two ASRGs supply continuous power during all mission phases

# 008- GEMS: GEophysical Monitoring Station

## PI: Bruce Banerdt



### Mission & Science Team:

PI: Bruce Banerdt, JPL

PM: Tom Hoffman, JPL

Deputy PI: Sue Smrekar, JPL

Spacecraft: Lockheed-Martin (LM)

Operations: JPL/LM

Payload: JPL, IPGP (France), DLR (Germany)

### Mission:

- Geophysical (seismology, heat flow, planetary rotation) lander mission on Mars using Phoenix heritage spacecraft

### Goals:

- Understand formation/evolution of terrestrial planets via interior structure/processes of Mars
- Determine present tectonic activity and meteorite impact rate

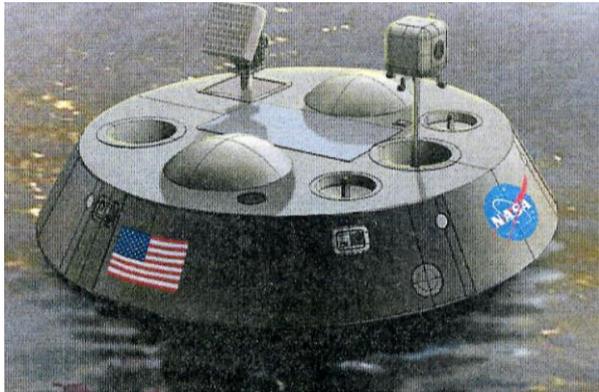
### Payload:

- Seismic Experiment for Interior Structure (SEIS)
- Rotation & Interior Structure Experiment (RISE)
- Heat Flow & Physical Properties Probe (HP<sup>3</sup>)
- Instrument Deployment Arm (IDA)
- Instrument Deployment Camera (IDC)

### Mission Details:

- Flight: 3/2016 launch w/ELV, 4m fairing; 9/2016 landing; ~6.5 mo cruise, 1 Mars yr surface ops
- Selected Systems Features (Phoenix-based design):  
Cruise: 3-axis stabilized, 3.2 m<sup>2</sup> UTJ solar array, X-band telecom; EDL: Landing radar, UHF telecom; Surface: 4.3 m<sup>2</sup> UTJ solar array, 2 Li-ion batteries, UHF telecom, Rad 750-based avionics
- Mass: 597.6kg dry launch, margin  $\geq 31\%$  (depending on ELV)
- Surface Ops Energy: 881Wh/sol, margin 180%
- Schedule: 39 mo B/C/D, 98 days sched reserve
- Threshold Mission: Descope: HP<sup>3</sup>, SEIS SP sensors

**TIME: Titan Mare Explorer**  
**PI: Ellen Stofan**



Mission & Science Team:

PI: Ellen Stofan, Proxemy

Project Mgmt: APL

S/C: LM

Ops: LM, JPL (nav)

Payload: APL, GSFC, MSSS

Deputy PI: J. Lunine, UA

Project Scientist: R. Lorenz, APL

Mission:

Lander msn to Titan's *Ligeia Mare* methane-ethane polar sea, 96 days on surface

Goals:

- Understand Titan's methane cycle through study of a Titan sea.
- Investigate Titan's history & explore the limits of life

Instruments:

- Meteorology & physical properties (MP3)
- Mass Spec for Lake Chemistry (NMS),
- Descent and Surface Imaging Cameras

Efficient Trajectory:

- Launch 2016
- Cruise 7.5 years (EGA, JGA)
- Entry 2023

Mission Features:

- Focused science objectives
- High-heritage instruments
- Simple cruise, no flyby science
- Simple surface operations
- ASRGs, launch vehicle are GFE

**“Flyby, Orbit, Land, Rove, and Return Samples”**

# **NASA's Planetary Science**

**Advance scientific knowledge of the origin and history of the solar system, the potential for life elsewhere, and the hazards and resources present as humans explore space**

