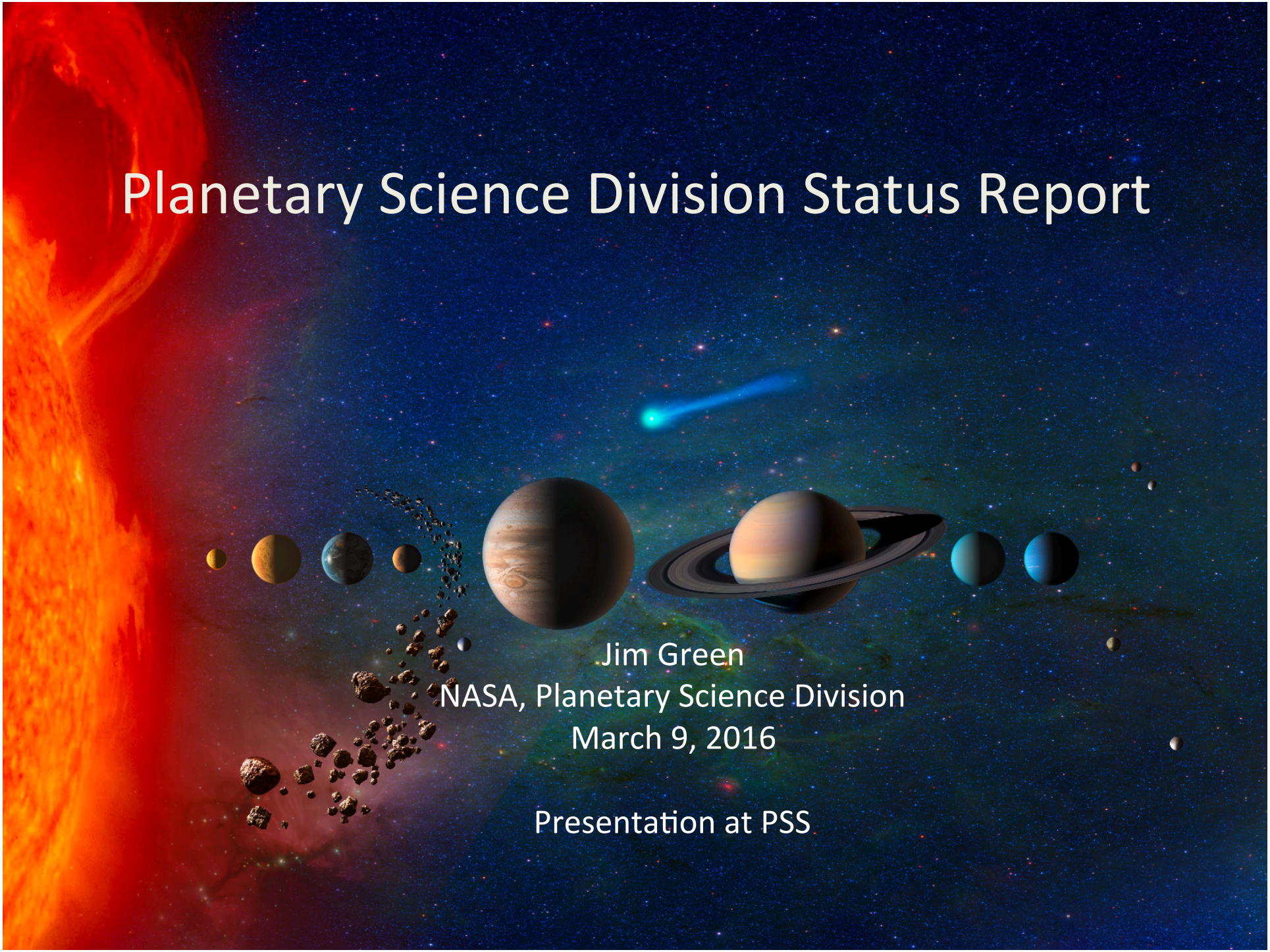
Planetary Science Division Status Report

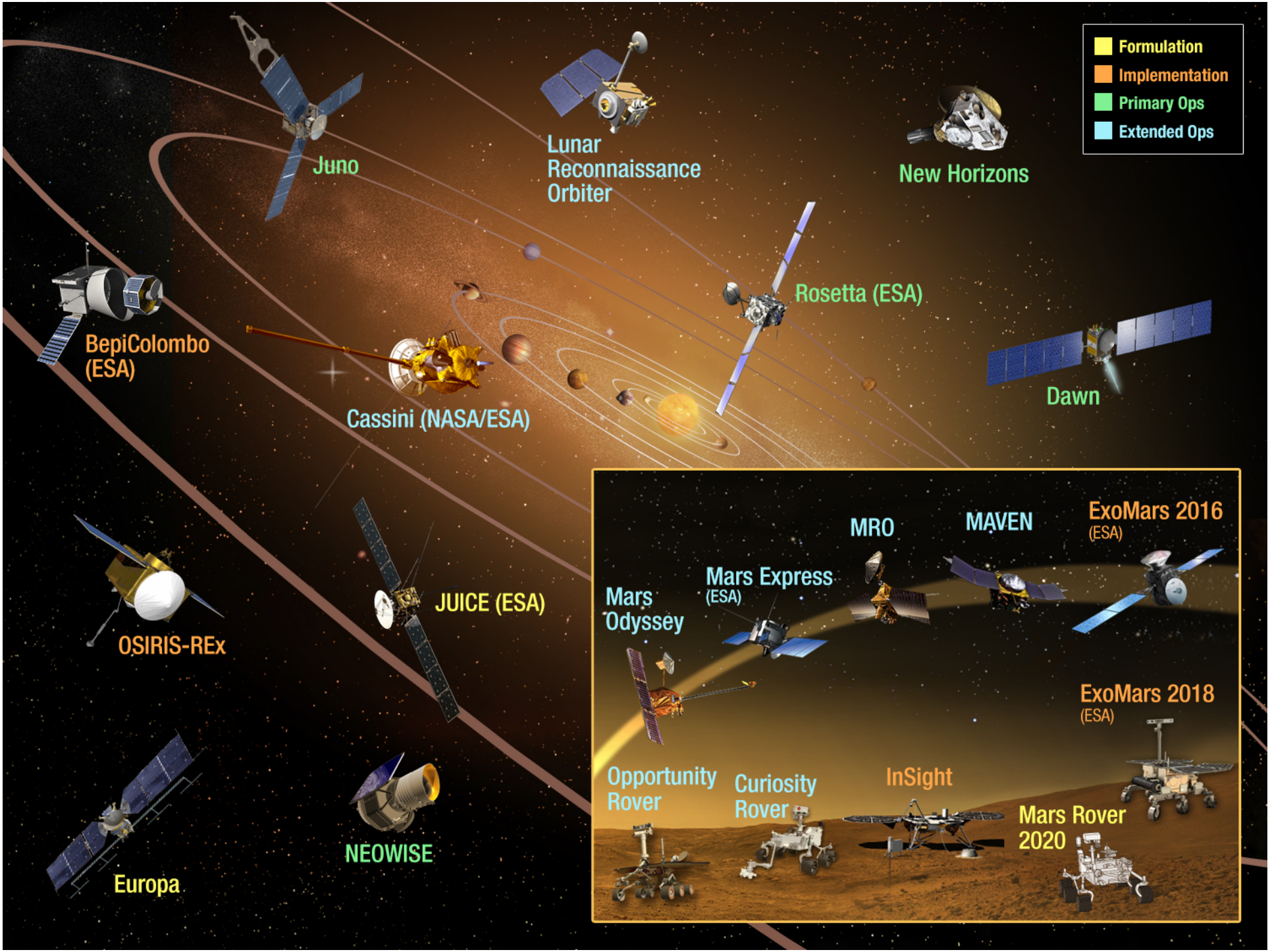


Jim Green
NASA, Planetary Science Division
March 9, 2016

Presentation at PSS

Outline

- Mission Overview
- FY 2016 Appropriation
- FY 2017 President's Budget
- Discovery & New Frontiers Programs
- Mars Exploration Program – *Jim Watzin*
- Europa mission
- Planetary Defense Coordination Office
- NRC studies and schedule for the mid-term
- PSS October Findings & PSD Response


Formulation
Implementation
Primary Ops
Extended Ops
Juno
Lunar Reconnaissance Orbiter
New Horizons
BepiColombo (ESA)
Rosetta (ESA)
Cassini (NASA/ESA)
Dawn
OSIRIS-REx
JUICE (ESA)
Europa
NEOWISE
MRO
MAVEN
ExoMars 2016 (ESA)
Mars Express (ESA)
Mars Odyssey
ExoMars 2018 (ESA)
Opportunity Rover
Curiosity Rover
InSight
Mars Rover 2020

FY16 Appropriation supports a robust Planetary Science program

Planetary Science $270M above the request, at $1.63B

- $277M for Planetary Science Research
- $189M for Discovery (+$33M), including full funding for LRO
- $259M for New Frontiers
- $448M for Mars (+$36M), including full funding for Opportunity
- $197M for Technology (+$55M)
  - Includes $25M for icy satellites surface technology
- $261M for Outer Planets (+$145M) with direction
  - Directs that the Europa mission be launched on an SLS in 2022 and that a lander be included ($175M)
- Direction to fund AIDA/DART joint study with ESA
- Direction to establish a new Ocean Worlds program *with a primary goal to discover extant life on another world* using a mix of Discovery, New Frontiers, and flagship class missions

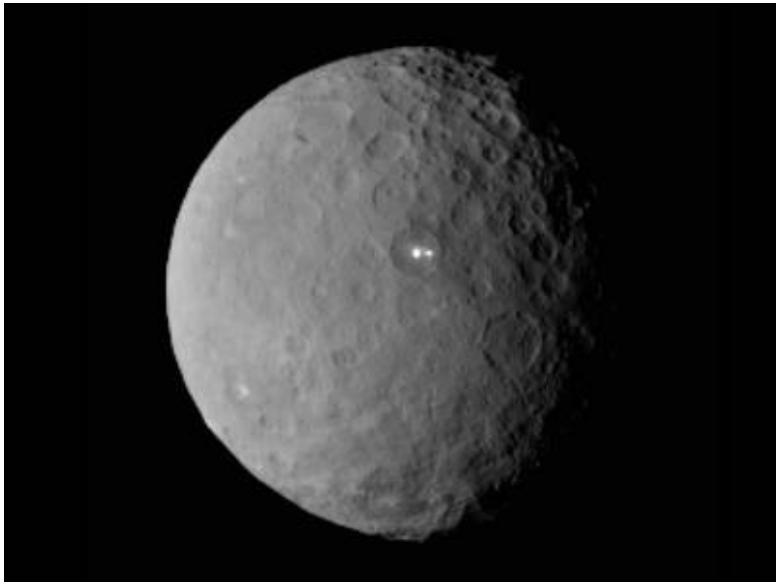
President’s FY17 Budget

Planetary Science

Outyears are notional

($M)	2016	2017	2018	2019	2020	2021
Planetary Science	$1,631	$1,519	$1,440	$1,520	$1,576	$1,626

- Continues development of the Mars 2020 mission.
- Funds continued formulation of a mission to Jupiter's moon, Europa.
- Continues work on the JUICE instrument in collaboration with the European Space Agency mission to Jupiter.



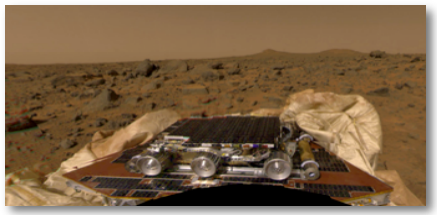
- Initiates studies for the next New Frontier Mission and continues operations of Juno and New Horizons.
- Operates 13 Planetary missions including MAVEN, Mars Curiosity, Opportunity, Odyssey, Mars Express, and Cassini (Saturn).
- Increases support for technology development to accelerate future power systems.
- Increases support for Research and Analysis.

Discovery Program

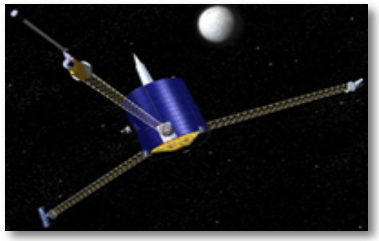
Discovery Program

Completed

Mars evolution:
Mars Pathfinder (1996-1997)

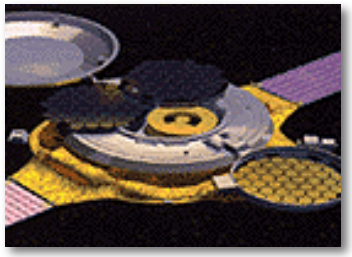


Lunar Formation:
Lunar Prospector (1998-1999)



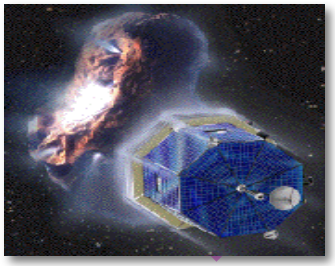
NEO characteristics:
NEAR (1996-1999)

Solar wind sampling:
Genesis (2001-2004)



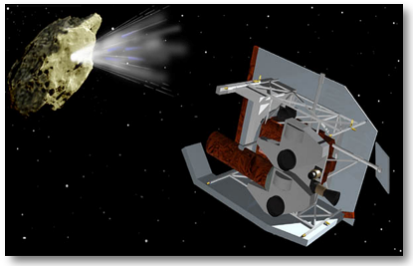
Completed

Comet diversity:
CONTOUR (2002)

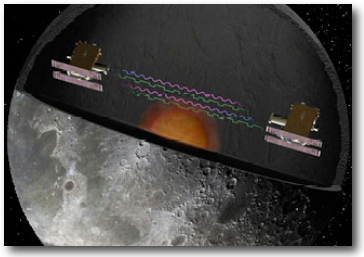


Nature of dust/coma:
Stardust (1999-2011)

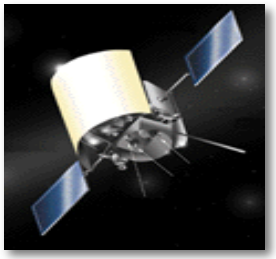
Comet internal structure:
Deep Impact (2005-2012)



Lunar Internal Structure
GRAIL (2011-2012)

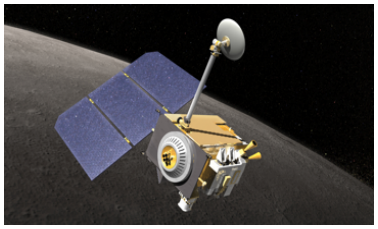


Mercury environment:
MESSENGER (2004-*2015*)



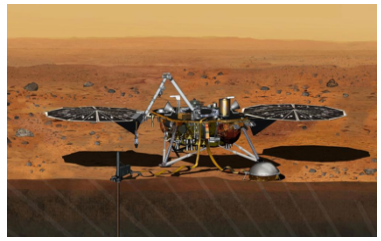
Main-belt asteroids:
Dawn (2007-*2016*)

Lunar surface:
LRO (2009-*TBD*)

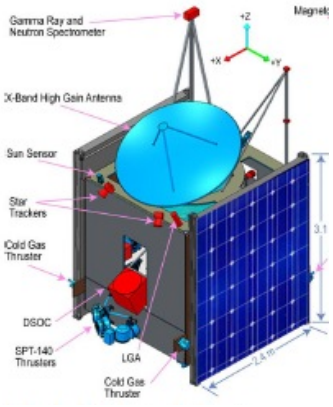


ESA/Mercury Surface:
Strofio (*2017-TBD*)

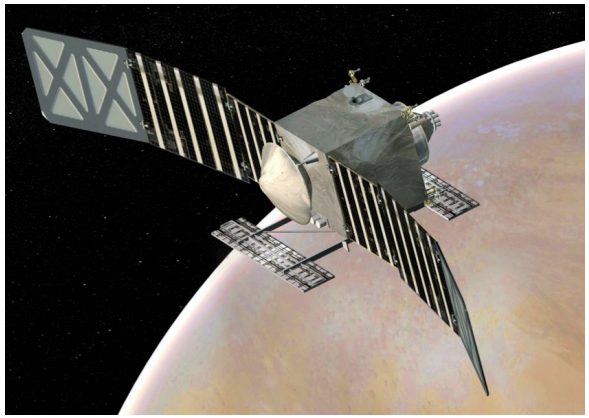
Mars Interior:
InSight (*TBD*)



Discovery Selections 2014

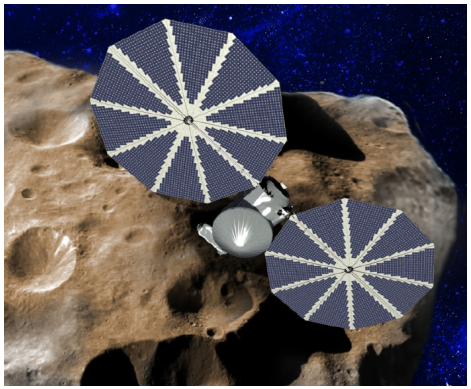


Psyche: Journey to a Metal World
PI: Linda Elkins-Tanton, ASU
Deep-Space Optical Comm (DSOC)

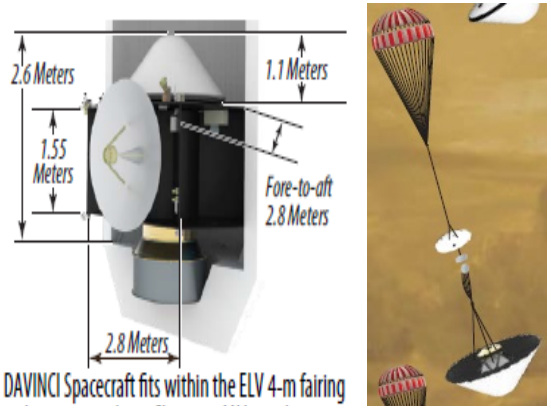


VERITAS: Venus Emissivity, Radio Science, InSAR, Topography, And Spectroscopy
PI: Suzanne Smrekar, JPL
Deep-Space Optical Comm (DSOC)

NEOCam:
Near-Earth Object Camera
PI: Amy Mainzer, JPL
Deep-Space Optical Comm (DSOC)



Lucy: Surveying the Diversity of Trojan Asteroids
PI: Harold Levison, Southwest Research Institute (SwRI)
Advanced Solar Arrays



DAVINCI: Deep Atmosphere Venus Investigations of Noble gases, Chemistry, and Imaging
PI: Lori Glaze, GSFC

New Frontiers Program

- New Frontiers Missions for flight
- National Academy Reports
- Science Case for Ocean Worlds: Enceladus & Titan
- Congressional Interest
- NF-4 Announcement
- Summary

New Frontiers Program

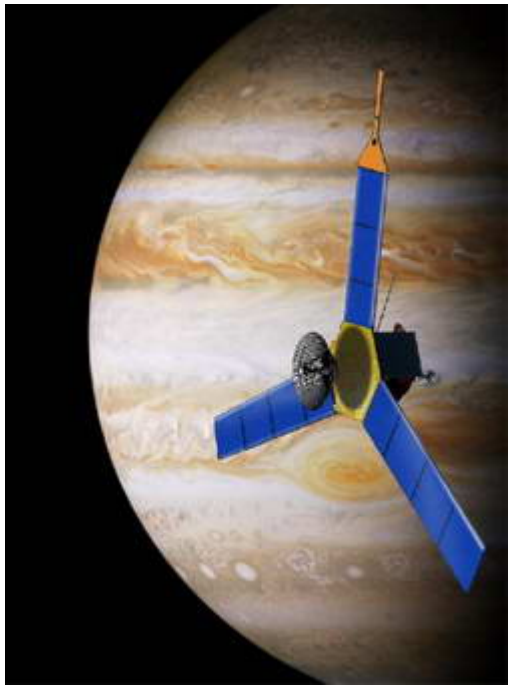
1st NF mission
New Horizons:

Pluto-Kuiper Belt

Launched January 2006
Flyby July 14, 2015
PI: Alan Stern (SwRI-CO)

2nd NF mission
Juno:

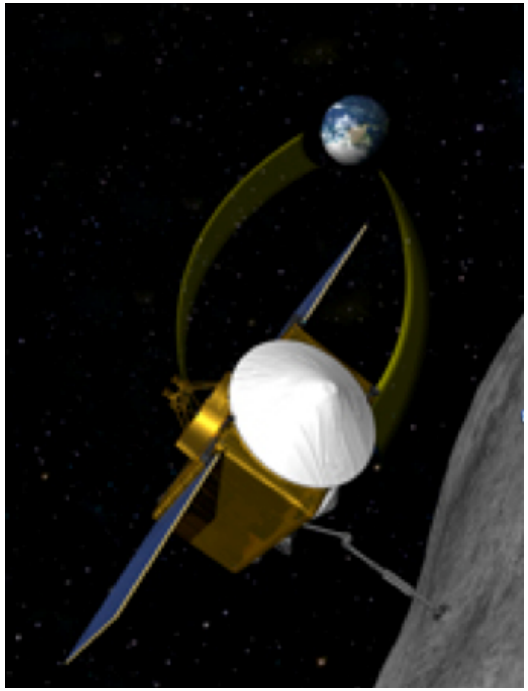
Jupiter Polar Orbiter



Launched August 2011
Arrives July 4, 2016
PI: Scott Bolton (SwRI-TX)

3rd NF mission
OSIRIS-REx:

Asteroid Sample Return

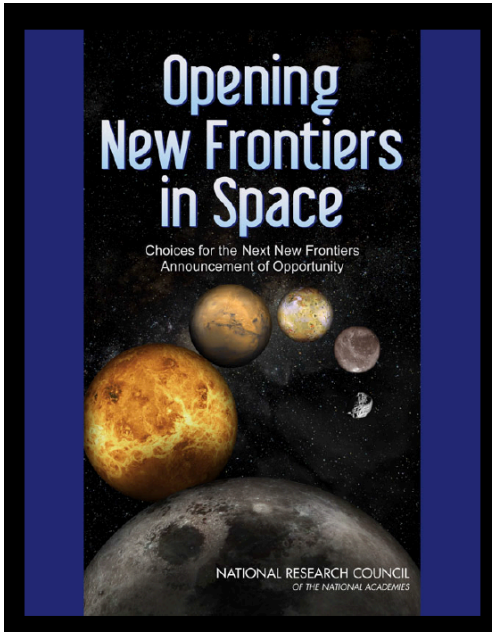


Launch window: Sept. 8, 2016
PI: Dante Lauretta (UA)

National Academy Reports
1. NOSSE Report
2. Vision & Voyages

Opening New Frontiers in Space

- NASA recognized that the New Frontiers program is both a Principal Investigator and a Stategic program
  - A study was requested in March 2007
- For this report, the NRC was asked to "provide criteria and guiding principles to NASA for determining the list of candidate missions."
- Results were issued in March 2008 commonly called the NOSSE report



Extracts from the NOSSE Report (1 of 4)

- Page 2: "The decadal survey stated that although this list was ranked by scientific priority, NASA should not automatically select on the basis of that priority and should first consider the overall viability of the proposed mission."
- Page 3: "However, the committee noted that scientific discoveries have been made since the decadal survey was presented to NASA in summer 2002, and new technologies and technological approaches may be available today."
- Recommendation 2 expanded the NF list from three to eight
- Page 4: "Thus, in addition to the eight identified missions, the committee believes that NASA should offer an additional option for other missions in the same class that can acquire compelling information answering high-priority science questions from the decadal survey. The committee believes that this approach not only will provide an opening for innovation but also might enable the applicant pool for future missions to grow. The committee believes that any such mission will have to meet a very high standard of scientific proof. Possible examples of such missions could include–but are not limited to– shallow atmoshere probes for the outer planets."

Extracts from the NOSSE Report (2 of 4)

- Page 4: "As such, the committee concluded that the mission options for the next announcement of opportunity cannot be drawn strictly from the decadal survey but rather should be interpreted in light of scientific discoveries made since the decadal survey was conducted in 2002. New discoveries made about several of the targets evaluated in this mission class in some cases enhance the importance of these scientific questions, and in other cases may undercut the original rationale for investigating a target. Planetary exploration is an ongoing endeavor advanced by paradigm-shifting scientific discoveries and mission-enabling technological developments. NASA's New Frontiers Program will have to adapt to include them.
- Pages 4-5: "The committee concluded that it is important to the health of the program that a method exist for including such innovations, while acknowledging that those proposing missions will have a high standard to meet."

Extracts from the NOSSE Report (3 of 4)

- Recommendation 3: "NASA should consider mission options outside the three remaining and five additional medium-size missions described in the decadal survey that are spurred by major scientific and technological developments made since the decadal survey. As with any New Frontiers mission, these proposals must offer the potential to dramatically advance fundamental scientific goals of the decadal survey and should accomplish scientific investigations well beyond the scope of the smaller Discovery Program. Both mission enabling technological advances and novel applications of current technology could be considered. However, NASA should limit its choices to the eight specific candidate missions unless a highly compelling argument can be made for an outside proposal."
- Page 5: "Finally, the committee notes that the New Frontiers Program is intended to be both strategic—based on the science goals established in the decadal survey—and adaptable to new discoveries. The committee believes that it is important for NASA to find a method for incorporating new discoveries into the goals of the program for announcements of opportunity made several years after a decadal survey has been produced. Seeking input from the scientific community via the NRC (in the form of reports such as this one) is one method to achieve this, but not necessarily the only method.

Extracts from the NOSSE Report (4 of 4)

- Page 13: “The committee acknowledges that scientific developments since 2002 require some reinterpretation of the New Frontiers Program’s goals.”
- Page 13: “However, the committee believes that any mission proposed under this more open option should meet a very high standard of scientific content: it cannot simply be a Discovery-class mission that scores high for its limited costs but relatively low scientifically—it must answer fundamental questions established in the decadal survey. The New Frontiers Program is a strategic program and its missions must be strategic in conception.”
- Page 56: “Thus, the committee concluded that NASA’s next New Frontiers announcement of opportunity should not be strictly limited to the eight mission options discussed in detail above, but should also be open to proposals with extraordinary justification and inventiveness. This was the foundation for the committee’s third top-level recommendation.”

V&V Decadal Survey: Satellites (1/2)

- Structure: Goals (3) → Objectives for each goal (12) → Important Questions for each Objective (75), Future directions for each Objective
- Two of three Goals are related to OW (form and evolve, processes controlling current behavior, habitable environments)
  - Goal 1: 4 objs; 6 questions for O1, 6 questions for O2 (one is about Enceladus plumes), 15 questions for O3 (6 about oceans, etc.), 12 questions for O4 (1 is ocean)
  - Goal 2: 4 objs (1 ocean, 1 lakes); 4 questions for O1 (2 are plumes/oceans), 9 for O2 (1 plume, 4 lakes), 5 questions for O3 (1 is ocean), 6 questions for O4 (1 is plumes)
  - Goal 3: 4 objs (all oceans); 3 questions for O1 (all oceans), 4 questions for O2 (2 are ocean/plume, 1 lake), 3 questions for O3 (2 are oceans), 2 questions about O4 (1 is ocean, 1 is Titan)
- Explicitly, 2 of 3 goals are OW, 6 of 12 objs are OW, 27 of 75 important questions are OW.
  - OW accounts for two thirds of goals, half of objectives, and one third of important questions.
  - OW is relevant to all goals, all objectives, and 66 out of 75 important questions

V&V Decadal Survey: Satellites (2/2)

- "In the coming decade, two key objectives will be to further characterize the known subsurface oceans, and to determine whether other bodies also possess such oceans." p. 8-21
- "Discovery of liquid water in the subsurfaces of the icy Galilean satellites and probably Enceladus has markedly advanced their priority for further exploration in the context of this question. (Beyond Earth, Are There Modern Habitats Elsewhere in the Solar System with Necessary Conditions, Organic Matter, Water, Energy, and Nutrients to Sustain Life, and Do Organisms Live there Now?)" p. 3-10
- Deferred 6 high priority large missions, 3 are relevant to OW (Titan, Ganymede Observer, Neptune)
- Five candidate flagships, 3 are OW

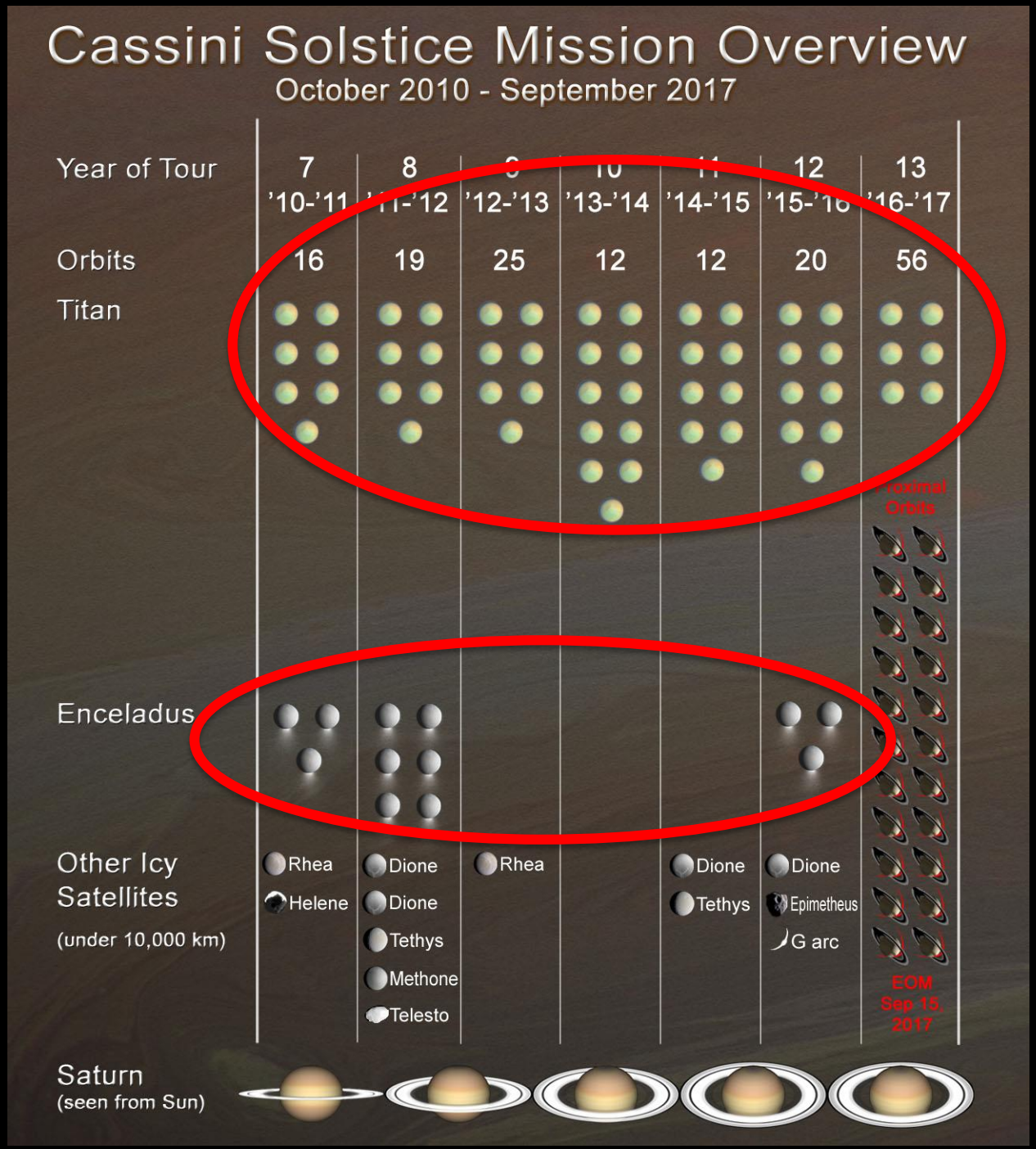
V&V Decadal Survey: Survey Implementation

- If a midterm assessment is carried out, it must be carefully constructed to reinforce the decadal survey process, while still taking into account any new discoveries or other changes that have taken place.

To prepare for the next decadal survey:

- Monitoring the implementation of the survey
  - Agency budgets wax and wane, new scientific discoveries are made, and new technologies come to the fore. Change, both good and bad, has an influence on the planetary science agenda and will affect the implementation of the recommendations in this report. A decadal survey should not be blindly followed if external circumstances dictate that a change in strategy is needed.
- Mission Studies
  - The committee therefore recommends that NASA sponsor community-driven, peer-reviewed mission studies in the years leading up to the next decadal survey, using a common template for the study reports.

Science Case for Ocean Worlds: Enceladus and Titian



56 Flybys

12 Flybys

Enceladus Discoveries (1/2)

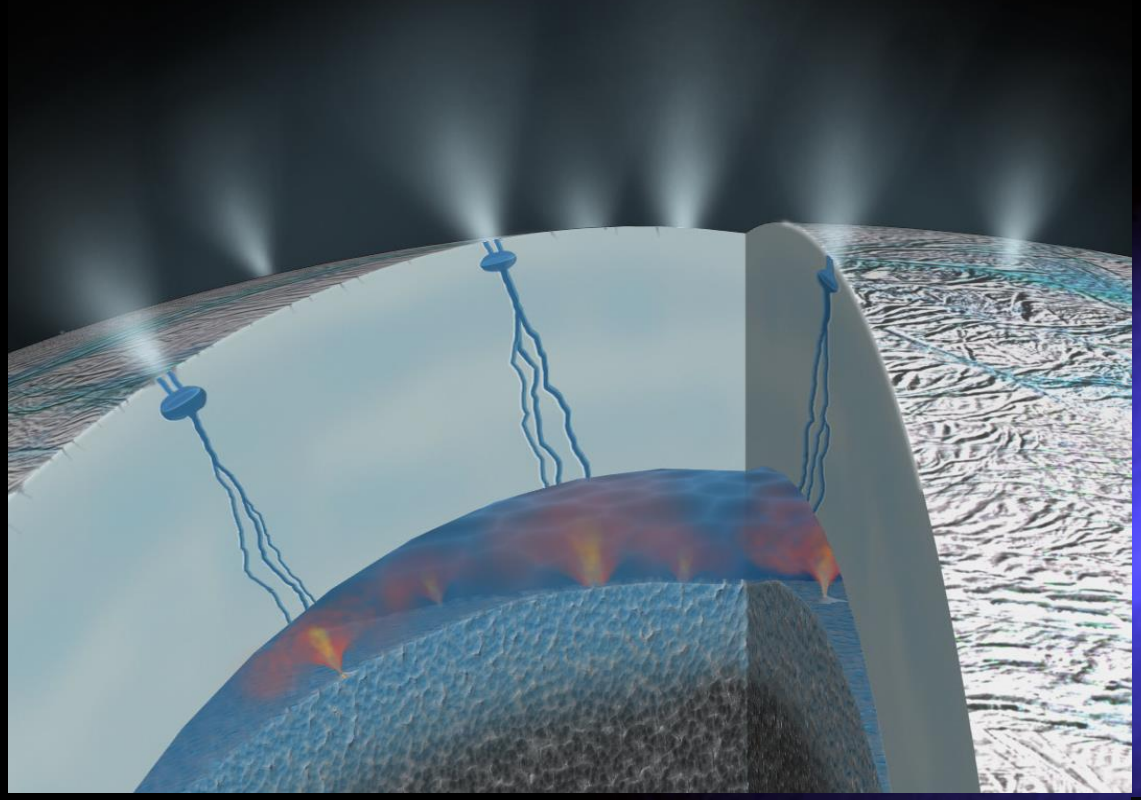
Year paper Accepted	**Summary of Discovery** (V&V priorities were finalized Sept 2010)
2009	The plume of Enceladus feeds the E ring of Saturn
2010	The plumes of Enceladus vary over time
2010	Enceladus maybe the ultimate source of oxygen for the upper atmospheres of Titan and Saturn
2010	Heat output of Enceladus is greater than thought possible
2011	Dusty plasma, previously theorized, discovered near Enceladus
2011	Grains from Enceladus plume are from a subsurface ocean or sea
2011	Saturn & Enceladus share electrical circuit: Auroral footprint of Enceladus on Saturn"
2011	Saturn and Enceladus share an electrical circuit: Observing auroral hiss, electron beams and standing Alfvén wave currents near Enceladus
2012	Enceladus Plume is a new Kind of Plasma Laboratory
2012	Enceladus is theorized to have hydrothermal activity
2012	Many craters on Enceladus are unusually shallow, suggesting high heat fluxes
2013	Enceladus' subsurface ocean may be long-lived; Ice rheology and tidal heating
2013	Enceladus' subsurface ocean may be long-lived: Shape of Enceladus due to an irregular core: Implications for gravity, libration, and survival of its subsurface ocean"
2013	Intensity of Enceladus jets depends on proximity to Saturn
2013	Plume activity and tidal stresses on Enceladus are correlated
2013	Enceladus fissures are ~9 m wide

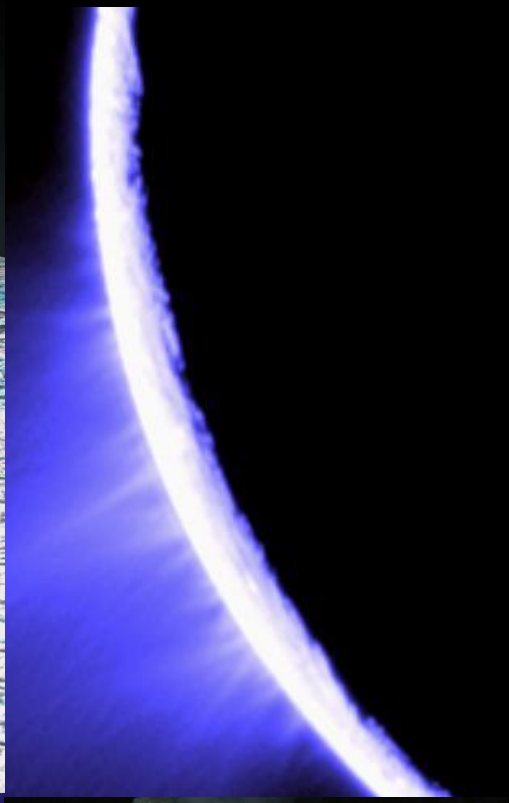
Enceladus Discoveries (2/2)

Year paper Accepted	Summary of Discovery
2014	Enceladus is differentiated and has a regional subsurface ocean (global ocean not ruled out)
2014	Jet activity & tidal stresses correlate spatially along the active tiger stripe fractures in the South Polar Terrain
2015	Enceladus has a fragmented, unconsolidated core that may produce sufficient heat to keep the global subsurface ocean from freezing over long timescales
2015	The pH of the ocean is basic (11-12)
2015	Plume structure may be curtain-like
2015	Detection of a global ocean
2015	Ongoing hydrothermal activity
2015	Hydrothermal vents: Evidence for a methane source in Enceladus' ocean
2015	Heating on Enceladus is not caused by obliquity tides, but probably eccentricity tides
2015	Enceladus' core is irregularly shaped, possibly due to low-velocity impacts by impactors in the 10 km size range (supports hydrothermal activity)
2015	Confirmation of a global ocean
2015	Liquid water on Enceladus could be only 2 km below the surface

19 NASA Press Releases

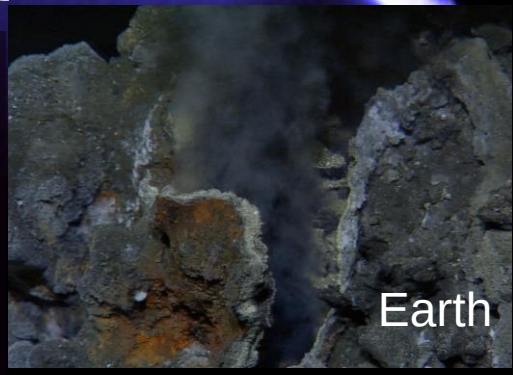
Seafloor Dust Captured by Cassini





Silica nanoparticles captured by Cassini provides first evidence for ongoing seafloor hydrothermal activity.

Hydrothermal activity occurs when seawater infiltrates and reacts with a rocky core, emerging as a heated, mineral-laden liquid.

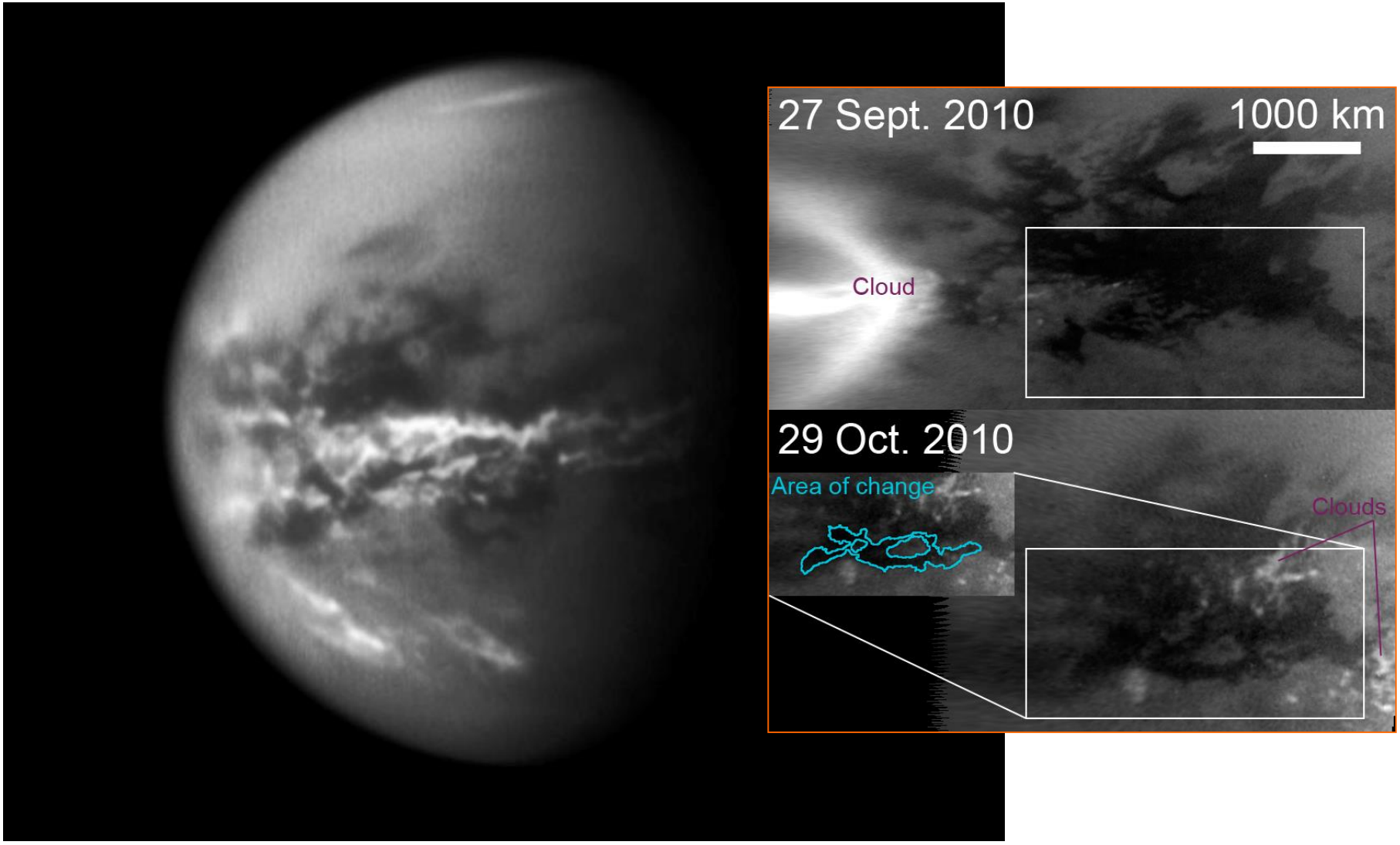


Titan Discoveries

Year paper Accepted	**Summary of Discovery** (V&V priorities were finalized Sept 2010)
2010	Changing shoreline of northern seas
2011	Titan south polar vortex
2011	Methane rain storm
2012	Global subsurface ocean
2012	Seasonal change in atmosphere circulation
2012	Tropical lakes
2013	Definitive detection of a plastic ingredient
2013	Confirmation of complex hydrocarbons in Titan's upper atmosphere
2013	Large Abundances of Polycyclic Aromatic Hydrocarbons in Titan's Upper Atmosphere
2013	Titan’s ionospheric density linked to solar activity
2014	First determination of depth of a Titanian sea
2014	Titan's "Magic Islands": initial discovery
2014	Titan's ocean as salty as Dead Sea
2014	Methane Ice Cloud in Titan’s Stratosphere
2014	Titan Observed Outside of Saturnian Magnetosphere
2015	Titan dissolves to form small lake basins
2016	"Magic Islands" ongoing observations

22 NASA Press Releases

Seasonal Rains Transform Titan's Surface



Congressional Interest

House Report Language (Hrpt 114-130, p. 59):

Ocean Worlds Exploration Program.—The recommendation provides $226M for Outer Planets, of which not less than $140M is for the Jupiter Europa Clipper, or comparable mission, to support the process of finalizing the mission design concept that meets the scientific objectives described in the most recent Planetary Science decadal survey. To support sustained momentum in this program, NASA shall ensure that future funding requests are consistent with achieving a launch no later than 2022, with the goal of launching on a Space Launch System platform as discussed elsewhere in this report.

Many of NASA's most exciting discoveries in recent years have been made during the robotic exploration of the outer planets. The Cassini mission has discovered vast oceans of liquid hydrocarbons on Saturn's moon Titan and a submerged salt water sea on Saturn's moon Enceladus.

The Committee directs NASA to create an Ocean World Exploration Program whose primary goal is to discover extant life on another world using a mix of Discovery, New Frontiers and flagship class missions consistent with the recommendations of current and future Planetary Decadal surveys.

OW Hearing 3/3/2016

"Cassini and its antecedent at Jupiter, the Galileo orbiter, have provided nearly incontrovertible evidence for salt water oceans underneath the icy surfaces of three moons of the outer solar system—Europa at Jupiter, Enceladus and Titan at Saturn. And, on Titan, Cassini has discovered vast hydrocarbons seas."

Jonathan Lunine

The U.S. House of Representatives
COMMITTEE ON APPROPRIATIONS
Chairman Hal Rogers

HOME | ABOUT | NEWSROOM | SUBCOMMITTEES | COMMITTEE ACTION | LINKS | MINO

Hearings

Oversight Hearing - National Aeronautics and Space Administration, Ocean Worlds
Thursday, March 3, 2016 10:30 AM in H-309 The Capitol
Commerce, Justice, Science, and Related Agencies

Witnesses
Dr. Charles Elachi
Director
Jet Propulsion Lab
Biography
Truth-in-Testimony

Dr. Jonathan Lunine
Director
Cornell Center for Astrophysics and Planetary Science
Biography
Truth-in-Testimony

Webcast

Washington, DC Office | H-305, The Capitol, Washington, DC 20515 | T (202) 225-2771

New Frontiers - 4 Announcement

Next New Frontiers Program AO

- Community Announcement Regarding New Frontiers Program issued in January 2016
- Draft to be released by end of Fiscal Year 2016 (September)
- Investigations are limited to the following mission themes (listed without priority):
  - Comet Surface Sample Return
  - Lunar South Pole-Aitken Basin Sample Return
  - Ocean Worlds (Titan, Enceladus)
  - Saturn Probe
  - Trojan Tour and Rendezvous
  - Venus In Situ Explorer

New Frontiers 4 AO - Parameters

- Some key elements from that announcement:
  - PI-Managed Mission Cost (PMMC) $850M (FY15$) cap for phases A-D,
  - Foreign contributions may not exceed one-third of the PMMC, and the value of foreign contributions to the science payload may not exceed one-third of the total payload cost,
  - MMRTGs and RHUs are available and paid for under the PMMC,
  - Some technologies will be incentivized, and
  - Launch readiness date of 2024 (2025 if nuclear).
- NASA has not approved the issuance of the New Frontiers AO and this notification does not obligate NASA to issue the AO and solicit proposals.
- The 4th New Frontiers AO is scheduled for release in Jan 2017

Next New Frontiers AO Time Frame

Notional Schedule:

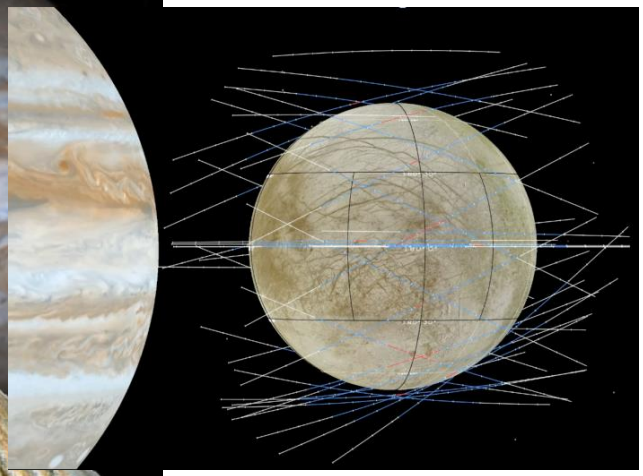
- Release of final AO…… January 2017 (target)
- Preproposal conference…… ~3 weeks after final AO release
- Proposals due …… ~90 days after AO release
- Selection for competitive Phase A …. November 2017 (target)
- Concept study reports due……. October 2018 (target)
- Down-selection …… May 2019 (target)
- KDP B …….. August 2019 (target)
- Launch readiness date …… 2024

Summary

- Why was the Ocean Worlds mission theme added to NF4?
  1. NOSSE Report: As a strategic program NF should be "adaptable to new discoveries"
  2. Consistent with V&V Planetary Decadal: "A decadal survey should not be blindly followed if external circumstances dictate that a change in strategy is needed."
  3. Compelling science case for Enceladus and Titan
  4. Congressional FY16 Approps: Response is required
- Next Steps:
  - Present that decision and rationale to PSS for feedback (considering AG input)
  - Present that decision and rationale to CAPS (3/29-31) for feedback – midterm charge will also address how to accommodate recent discoveries
  - Community can also comment via the draft AO process

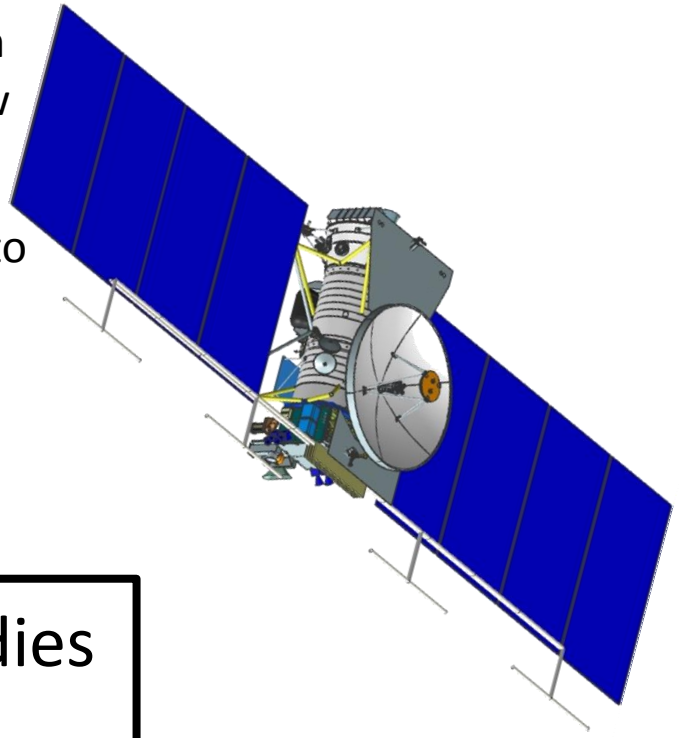
Europa Mission

Europa Multi-Flyby Mission Concept Overview



Science	
Objective	**Description**
Ice Shell & Ocean	Characterize the ice shell and any subsurface water, including their heterogeneity, and the nature of surface-ice-ocean exchange
Composition	Understand the habitability of Europa's ocean through composition and chemistry.
Geology	Understand the formation of surface features, including sites of recent or current activity, and characterize high science interest localities.
Recon	Characterize scientifically compelling sites, and hazards for a potential future landed mission to Europa

- Conduct 45 low altitude flybys with lowest 25 km (less than the ice crust) and a vast majority below 100 km to obtain global regional coverage
- Traded enormous amounts of fuel used to get into Europa orbit for shielding (lower total dose)
- Simpler operations strategy
- No need for real time down link



Lander Concept Studies Are Continuing

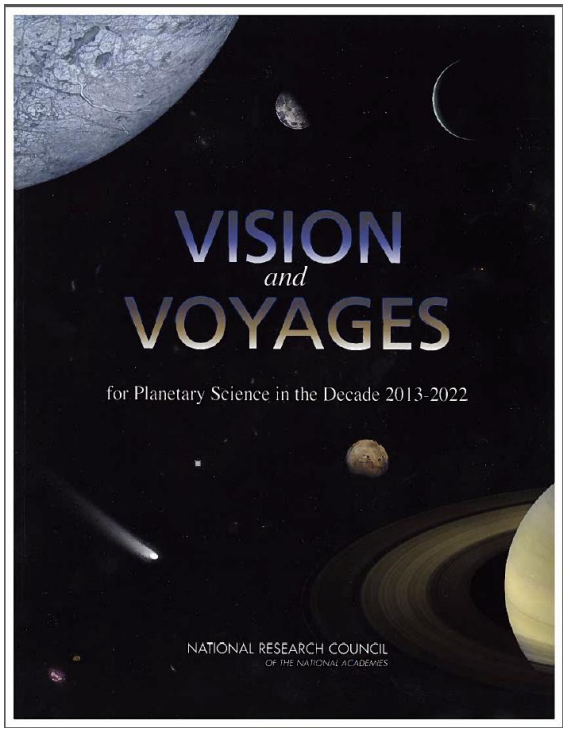
Planetary Defense Program

Planetary Defense Coordination Office (PDCO)

Hosted by the Planetary Science Division PDCO is responsible for:

- Oversight of potentially hazardous objects (PHOs):
  - Ensure early detection
  - Characterize PHOs of size large enough to affect Earth's surface
  - Provide warning of potential impact effects if not deflected or mitigated
  - Provide timely and accurate communications about PHOs and any potential impact
- Lead research into potential asteroid deflection and impact mitigation technologies and techniques
- Provide lead coordination role in U.S. Gov't planning for response to an actual impact threat (*e.g.,* planetary science and deep space mission expertise for Federal Emergency Response Team)

Timeline of NRC Studies



- 1st Planetary decadal: 2002-2012
- 2nd Planetary decadal: 2013-2022
- Extended Missions Review:
  - Tasked April 30, 2015
  - Report due to NASA September 2016
- R&A Restructuring Review:
  - Tasked August 13, 2015
  - Report due to NASA December 2016
- Large Strategic NASA Science Missions
  - Tasked March 2016
  - Report due to NASA August 2017
- Midterm evaluation:
  - To be tasked by September 2016
  - Extended Missions, R&A Restructuring & Large Strategic Missions will be input
  - Expect report due December 2017
- 3rd Planetary Decadal: 2023-2032
  - To be tasked *before* October 2019
  - Expect report to NASA due 1st quarter 2022

PSS Findings from the meeting on Oct 5-6, 2015

Mars 2022 Orbiter

- Preliminary information from a MEPAG science analysis group that studied functions for a Mars 2022 orbiter to be inserted into the overall plans for Mars exploration indicates a large and complex mission set merging goals of human exploration, technology demonstration, and planetary science. Coordination across multiple NASA Directorates will be necessary for funding the proposed mission architecture without placing an undue burden on other Planetary Science missions. At the next meeting of the PSS, we would like to hear details about the anticipated funding wedge and management plan for the currently envisioned set of highly collaborative missions on the path to humans at Mars.

- Response: see Jim Watzin's presentation

Discovery and New Frontiers

- We applaud PSD's issuance of a Discovery AO in 2014 and the timely completion of the Step 1 review process by the end of Fiscal Year 2015. The PSS is excited by the selection of five missions for Phase A study, leaving open the possibility that 2 missions may be selected for flight and making significant progress toward returning to the 24 month cadence for Discovery recommended by the Planetary Decadal Survey. We also applaud the commitment from the PSD to release New Frontiers Announcements of Opportunity #4 and #5 during this decadal cycle, as recommended by the Planetary Decadal Survey for medium missions. We encourage the continued support of the lines of PI-led cost-capped missions that deliver world-class science and encourage innovative approaches.
- Response: PSD concurs

Assessment of Reorganized R&A

- The PSS has requested, across the full range of R&A programs within PSD, selection statistics, open access to titles and abstracts of funded proposals, total funding levels by program, selection rates by panel score for new program elements, and statistics on time required for determining selectable and selected proposals following proposal submission or review. This information would allow us to compare these data for the year before the R&A program restructuring to subsequent years in order to address community concerns over the reorganization.

- Response: See Rall/New presentation - The reorganization of the R&A program was a National Academy recommendation that we implemented. Therefore, we have tasked the National Academy with the assessment of the reorganization. The National Academy will make its report public when the review is completed.

Assessment of Reorganized R&A

- We understand it is currently difficult to assemble this information due to the lack of tools. We therefore request that the resources be allocated to the program managers to set up a database with the relevant information from all PSD research programs and the necessary software for regularly mining information from this database. The goal of such an investment is to allow both improved PSD tracking of R&A activities and communication of information to the proposing community. Such communication is particularly necessary in this era of low selection rates and the associated stress.

- Response: See Rall/New presentation

- We encourage continuing a regular dialog with the planetary science community about the R&A program through venues such as townhalls at LPSC, DPS and AGU.

- Response: PSD concurs

AG Status

- The PSS recognizes the value of community dialog with PSD managers and greatly appreciates the sustained support by PSD for all of the Assessment/Analysis Groups (AGs). These groups provide an effective conduit for communication between PSD and the scientific communities represented by the individual AGs. In addition, their summaries provided to PSS allow further discussion of concerns and topics of broad interest, as well as overviews of progress in specific areas of planetary science endeavor. PSS encourages continued opportunities for the AGs to present reports to the Planetary Science Division leadership, and to participate in PSS meetings.

- Response: PSD concurs

Questions?