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Committee on Planetary Protection
November 30, 2021

Planetary Protection Independent Review Board Recommendation

Recommendation: *In cases of missions to Solar System destinations where there is a large population of similar Category I and II objects (e.g., comets, asteroids, Kuiper Belt Objects), NASA should allow classification of individual objects as Category I to simplify missions to them.*

Just as the lunar and Martian surfaces in their entirety do not need to bear the same planetary protection classification, in the case of small bodies where there are numerous potential targets, the contamination of any individual does not cause significant contamination to the class as a whole. If chemical evolution or origin of life experiments are planned for such objects, there are myriad to choose from that will not have been previously visited by robotic probes.

Response:

- Planetary protection policies need to be updated regularly and expeditiously to be effective
- Implementation of planetary protection for missions must take into account scientific advances and the growing number of space exploration entities

Planetary Protection and Small Bodies

Can missions to individual Solar System small bodies be assigned a lower planetary protection categorization?

- Do characteristics of small body populations allow for missions to individual bodies within these populations to be assigned as Planetary Protection Category I?
- What fraction of an individual population of small bodies needs to be preserved as a scientific sample? How many can be visited with Category I missions?
  - *How many bodies need to be preserved in any given population to preserve the ability to conduct compelling scientific exploration?*
  - *What are the kinds of scientific goals for small bodies missions?*

A dynamic problem: categorizations of small bodies and scientific questions will evolve as exploration and research continue

NASA's Key Science Themes

PROTECT & IMPROVE LIFE ON EARTH & IN SPACE

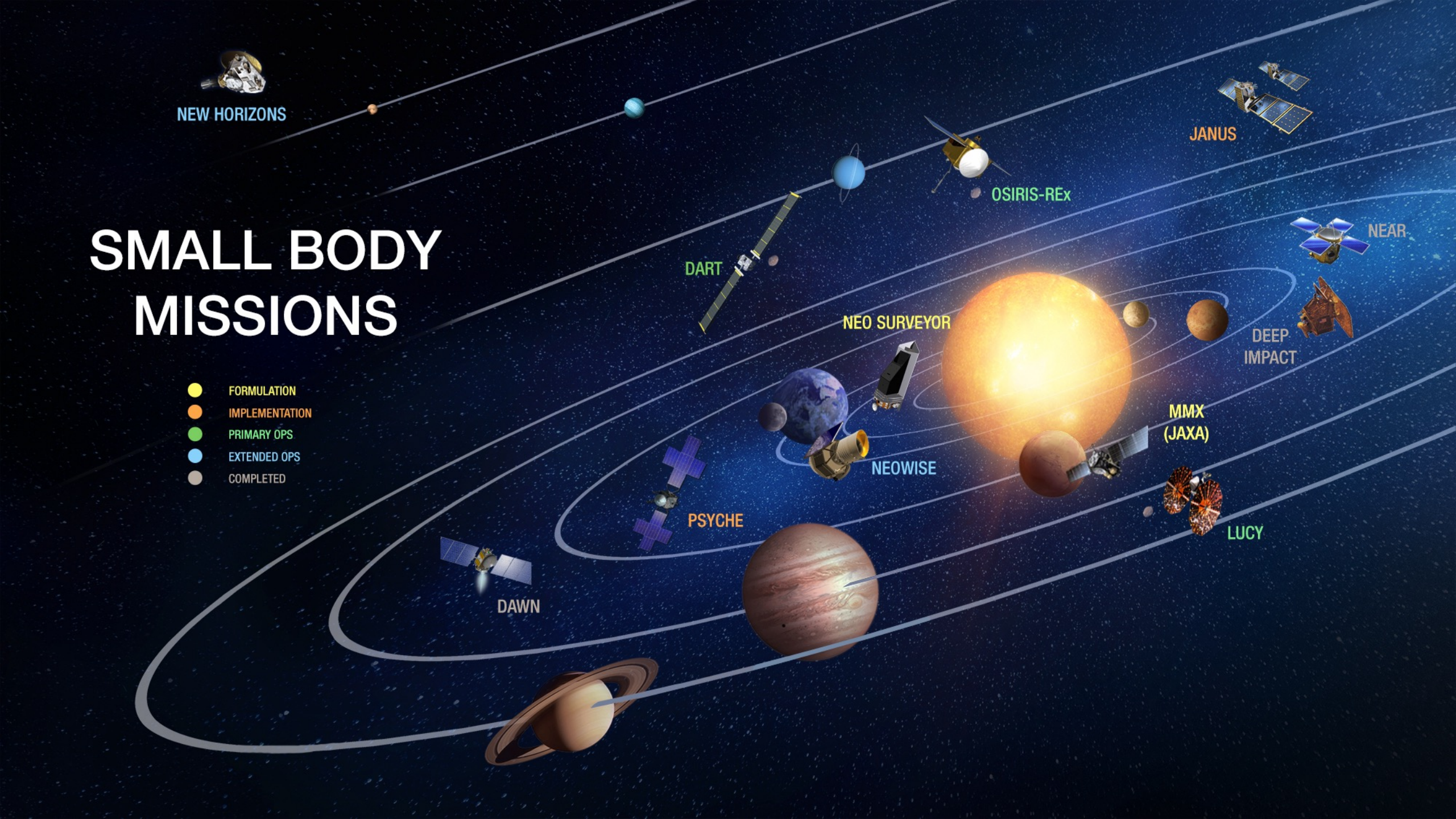
SEARCH FOR LIFE ELSEWHERE

DISCOVER SECRETS OF THE UNIVERSE

Scientific Importance of Small Bodies

- Formation of the Solar System
- Evolution of the Solar System
- Delivery of elements to initiate and sustain life
- Processes in an active Solar System
- Hazards to life and human populations
- Resources for exploration and habitation into the future

Small Body Exploration



SMALL BODY MISSIONS

- FORMULATION
- IMPLEMENTATION
- PRIMARY OPS
- EXTENDED OPS
- COMPLETED

	Formation	Evolution	Delivery	Processes	Hazards	Resources
NEAR		X	+	+	+	+
Deep Impact	+	+	X	+		+
Dawn	X	X	+	X		+
Rosetta (ESA)	X	X	+	X		+
New Horizons	X	X	+	X		
Hayabusa 1 & 2 (JAXA)	X		X	+	+	X
NEOWISE		X	+		X	+
OSIRIS-REx	X		X	+	+	X
Lucy	X	X	+	X		
DART				+	X	+
Psyche	X	X		X		+
MMX (JAXA)	X	X	X	X		+
NEO Surveyor					X	

X Major objective **+** Other contribution

Completed Ongoing In development

Planetary Science and Astrobiology Decadal Survey 2023–2032

- Will provide strategic input for Solar System exploration over the next 10 years
- Expected Spring 2022
  - Timeline for a response to the Decadal will be set by SMD and PSD
  - Initial PSD public response to the Decadal within 90 days
  - Full written response provided later (timing to be shared publicly in advance of Decadal release)
- Will retain target list for New Frontiers #5
  - Includes Comet In Situ Sample Return
- Two small bodies Planetary Mission Concept Studies were conducted:
  - *Assessing the Dwarf Planet Ceres' Past and Present Habitability Potential*
  - *Pluto Orbiter and Kuiper Belt Exploration Mission*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