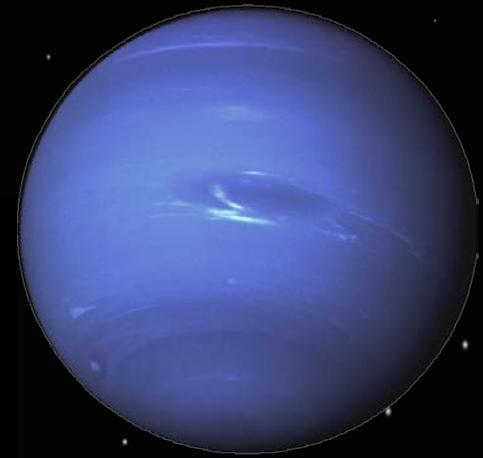
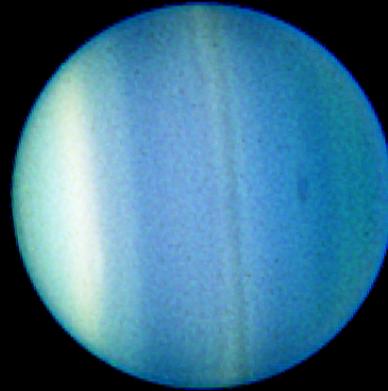
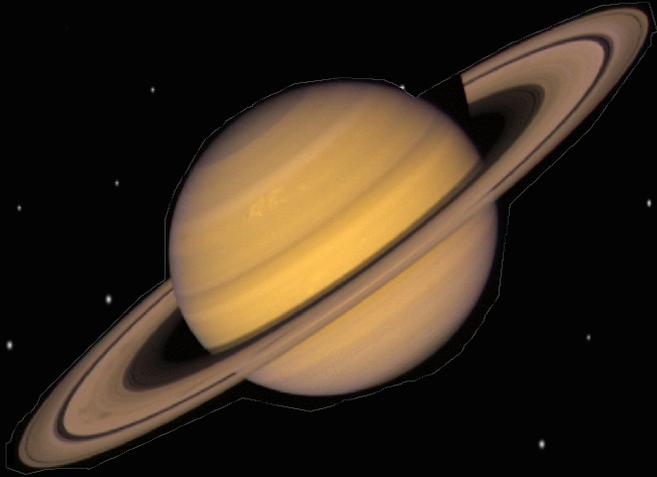


# OPAG



Future Science and  
Exploration



# Looking to the Future

- The next decadal survey (2023 – 2032) is looming – take the last decadal survey, simply add 10 years to each step
  - 2017 to 2019: Mission concepts formulated and vetted; Technologies > TRL 4
  - 2018 Dec: NASA charters NRC to conduct Decadal Survey
    - Panels formed and staffed
  - 2019 Sept: White papers due to NRC
    - Decadal panel deliberations, writing
  - 2010 March: Results released
- An Ocean Worlds Program?

# COMMERCE, JUSTICE, SCIENCE, AND RELATED AGENCIES APPROPRIATIONS BILL, 2016

*Ocean Worlds Exploration Program.*—The recommendation provides \$226,000,000 for Outer Planets, of which not less than \$140,000,000 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.**

- This is a huge opportunity – we need to jump on it!

# OPAG Science Goals Document

- The body is in good shape, but we've been struggling to gain traction with the two current themes (origins and habitability)
- Maybe now is a good time to re-formulate the over-arching statement as

*“Explore Ice Giants and Ocean Worlds”*

- If yes, we need to re-write the intro to the document

# Over-arching Themes

- Ice Giants
  - Origin of the solar system; migration of planets; gas giant composition
  - Comparison to exoplanets
- Ocean Worlds
  - Interior structure and evolution; heat sources; nature and composition of crust
  - Ocean composition, physical properties
  - Habitability (fits nicely within ocean world context)

# Our Abundance of Riches

Insert solar system diagram

# What might a program look like?

- Infrastructure oversight: power sources, DSN capabilities, other special technology dev't
- Mission studies
- Long-term strategic plan (crossing multiple decades)

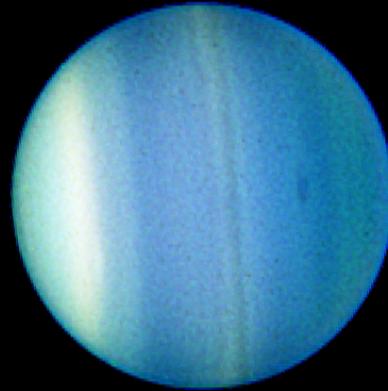
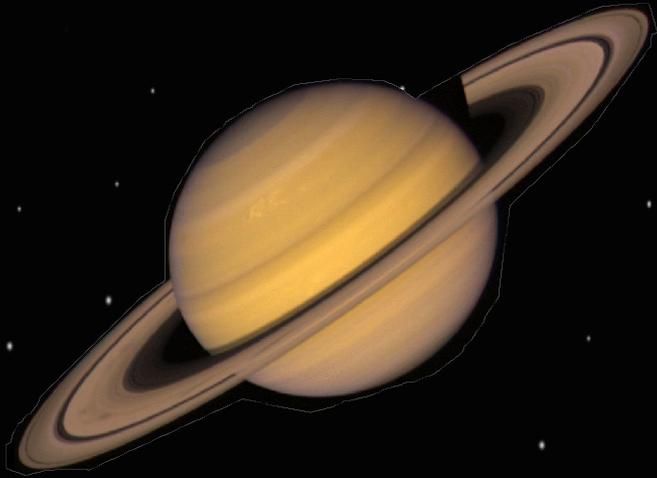


# Outer Planets Assessment Group

## Charter

- OPAG is NASA's *community-based forum* designed to provide science input for planning and prioritizing outer planet exploration activities for the next several decades.
  - Long-term strategy
- Open to all interested scientists, OPAG regularly evaluates outer solar system exploration goals, objectives, investigations and required measurements on the basis of the widest possible community outreach.
  - Near-term strategy

# Outer Solar System Exploration



*Worth the journey*