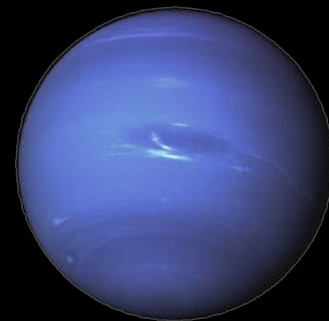
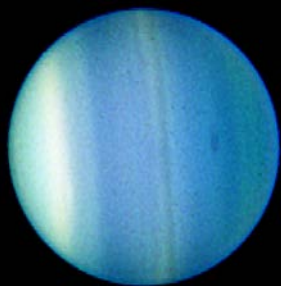


Giant Planets

Goals and Objectives

Kevin Baines, Heidi Hammel,
Mark Hofstadter



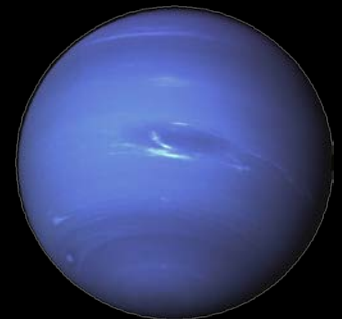
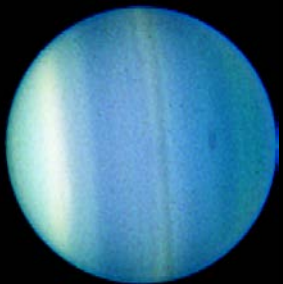


Over-Arching Themes of
Vision and Voyages, Table 3.1

A. Building New Worlds



- Q1. What were the initial stages, conditions and processes of solar system formation and the nature of the interstellar matter that was incorporated?*
- Q2. How did the giant planets and their satellite systems accrete, and is there evidence that they migrated to new orbital positions?*
- Q3. What governed the accretion, supply of water, chemistry, and internal differentiation of the inner planets and the evolution of their atmospheres, and what roles did bombardment by large projectiles play?*



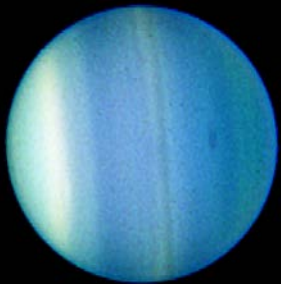


Over-Arching Themes of
Vision and Voyages, Table 3.1



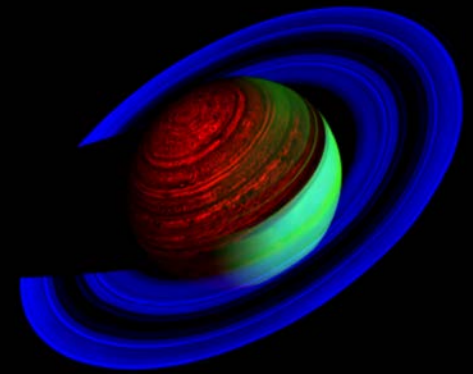
B. Planetary Habitats

- Q4. What were the primordial sources of organic matter, and where does organic synthesis continue today?*
- Q5. Did Mars or Venus host ancient aqueous environments conducive to early life, and is there evidence that life emerged?*
- Q6. 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?*



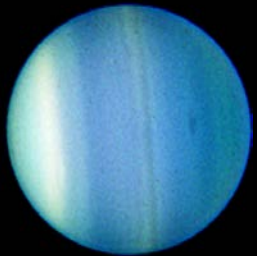


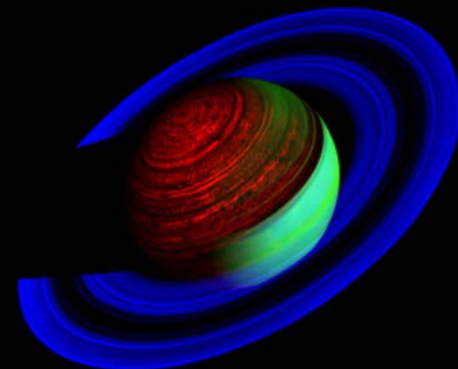
Over-Arching Themes of
Vision and Voyages, Table 3.1



C. Workings of Solar Systems

- Q7. How do the giant planets serve as laboratories to understand Earth, the solar system, and extrasolar planetary systems?*
- Q8. What solar system bodies endanger Earth's biosphere, and what mechanisms shield it?*
- Q9. Can understanding the roles of physics, chemistry, geology and dynamics in driving planetary atmospheres and climates lead to a better understanding of climate change on Earth?*
- Q10. How have the myriad chemical and physical processes that shaped the solar system operated, interacted, and evolved over time?*

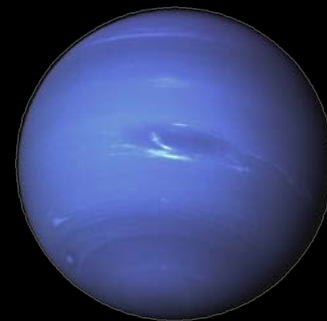
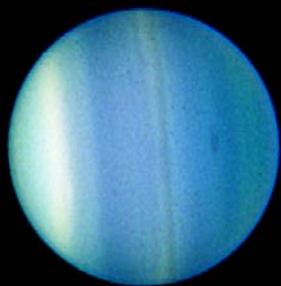


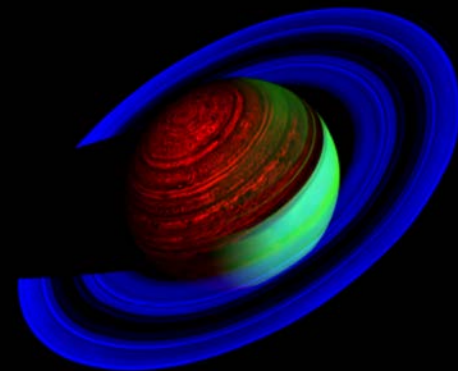


Goal I

Explore Processes and Properties

Explore the processes and properties that influence giant planets in our solar system (including origin/formation, orbital evolution, composition, atmospheric structure, and chemical, dynamical and other environmental processes).

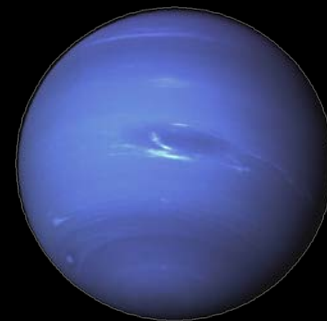
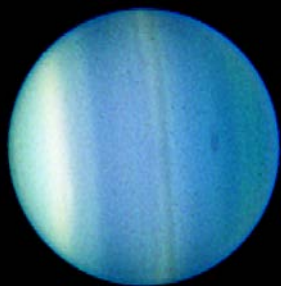


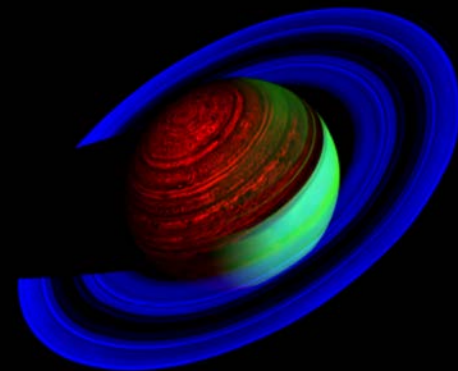


Goal 2

Connections of Giant Planets to Extrasolar Planetary Systems

Investigate observable processes and activities ongoing in our giant planet systems as an aid to understanding similar processes and activities on other planets and other planetary systems.

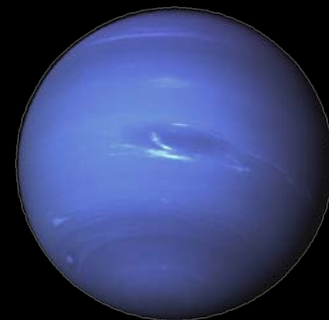
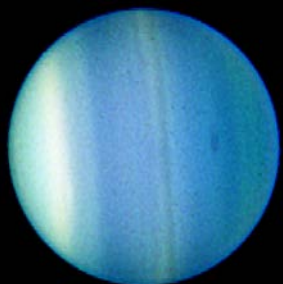




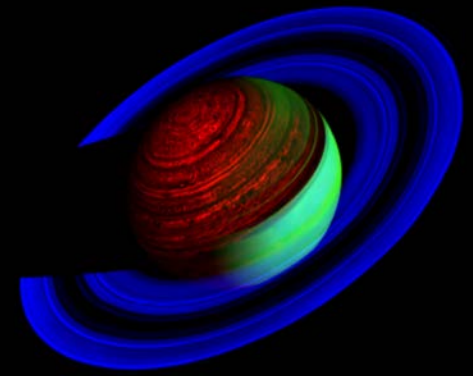
Goal 3

Determine Influences on Habitability

Test the hypothesis that the existence and location of the giant planets in our solar system has contributed directly to the evolution of terrestrial planets in the habitable zone.



SCIENCE OBJECTIVES FOR THE GIANT PLANETS

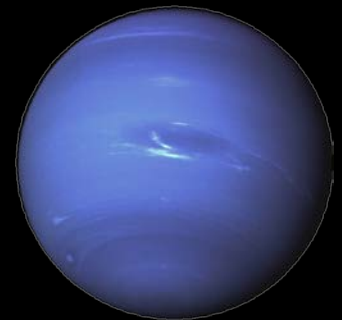
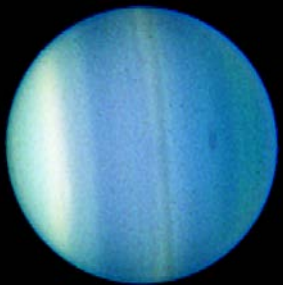


Objective 1

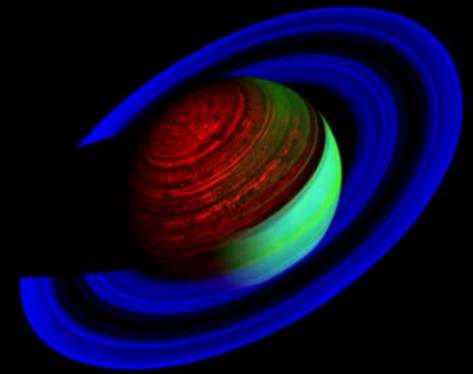
Addresses Goals 1, 2, and 3

What is the interior structure and bulk composition of giant planets (including noble gas abundances and the isotopic ratios of H, C, N, and O)?

[Addresses questions from Visions and Voyages Table 3.1 Q1, Q2, Q3).]



SCIENCE OBJECTIVES FOR THE GIANT PLANETS

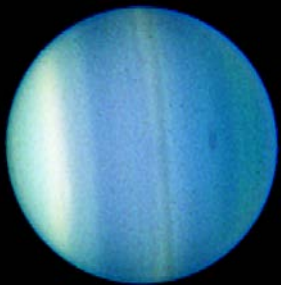


Objective 2

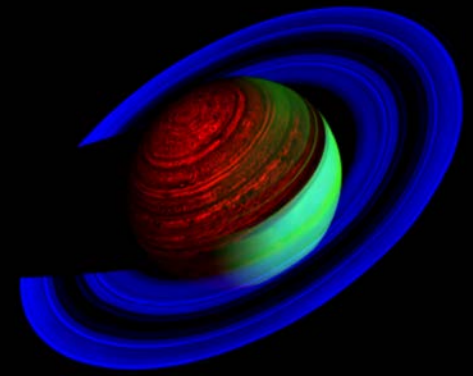
Addresses Goals 1 and 2

What are the sources of internal heat, the nature of heat flow, and the radiation balance in giant planets?

[Addresses questions from Visions and Voyages Table 3.1
Q7, Q9, Q10.]



SCIENCE OBJECTIVES FOR THE GIANT PLANETS

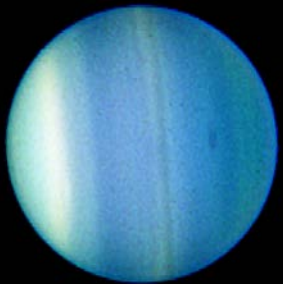


Objective 3

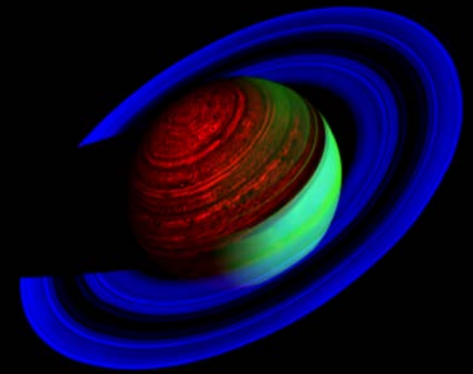
Addresses Goals 1 and 2

What is the global circulation and what are the dominant dynamical processes in giant planet atmospheres? What seasonal/temporal changes occur and why?

[Addresses questions from Visions and Voyages Table 3.1
Q7, Q9, Q10]



SCIENCE OBJECTIVES FOR THE GIANT PLANETS

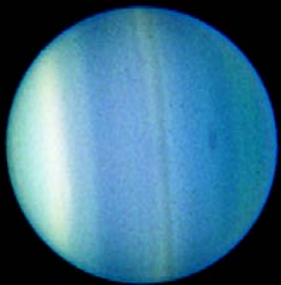


Objective 4

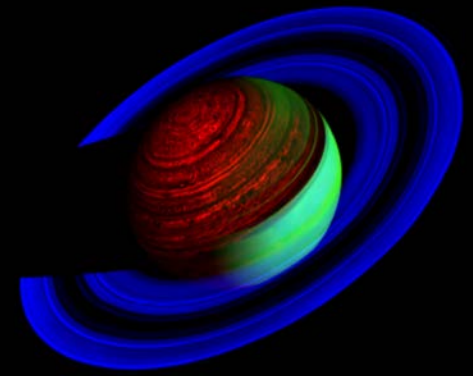
Addresses Goals 1 and 2

What is the composition of giant planet atmospheres, and what are the photo- and thermo-chemical processes acting within those atmospheres (including cloud processes)?

[Addresses questions from Visions and Voyages Table 3.1 Q7, Q9, Q10).]



SCIENCE OBJECTIVES FOR THE GIANT PLANETS

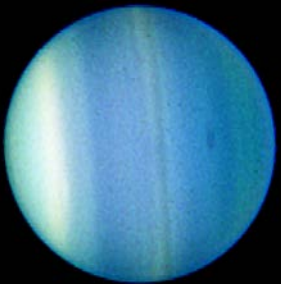


Objective 5

Addresses Goals 1 and 2

How do gravitational interactions drive the evolution of satellites and rings within giant planet systems?

See rings and satellites sections



SCIENCE OBJECTIVES FOR THE GIANT PLANETS

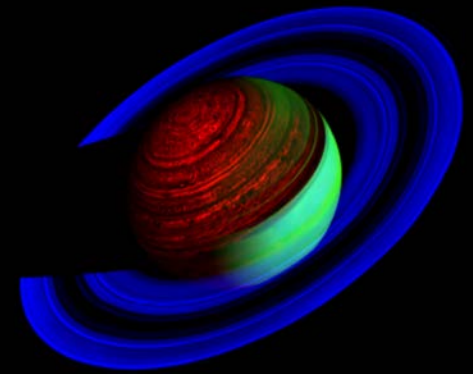
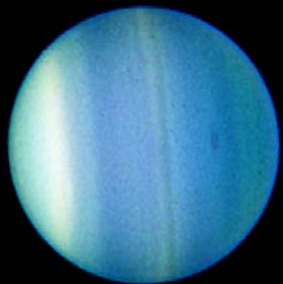
Objective 6

Addresses Goals 1 and 2

6.1 How are the internal magnetic fields of the giant planets generated? What can we learn about the interior composition and evolution of these bodies from the study of the planetary magnetic fields? 0)

6.2 What are the properties and processes in giant-planet magnetospheres?

[Addresses questions from Visions and Voyages Table 3.1
Q3, Q7, and Q10)



SCIENCE OBJECTIVES FOR THE GIANT PLANETS

Objective 7

Addresses Goal 3

What was and is the role of giant planets in creating/mitigating
impact events throughout the solar ?

[Addresses questions from Visions and Voyages Table 3.1
Q1, Q2, Q3, Q4, Q8, Q10]

