Triton
Moons of Neptune

14 and counting...

- 7 “regular” moon & 7 “irregular” moons
- Triton: 99.5% of the mass of all Neptune’s moons
Discovery

Quick discovery after a predicted planet

- Neptune mathematically predicted by Le Verrier on August 31 1846
- Neptune observed by Johann Galle on September 23 1846
- Triton discovered on Oct 10 1846 by William Lassell
Exploration

Voyager II fly-by

- Voyager II launched in August 1977 and reached Neptune in August 1989
- Performed close fly-by of Triton
- Passed within 40,000 km of surface
Exploration
Exploration
Characteristics

- **Radius**: 1353 km
- **Mass**: 0.4% Earth
- **Albedo**: 76%
- **Temperature**: 38 K
- **Density**: 2 g/cm^3
  - ~2/3 rock, ~1/3 ice
- **Inclination**: 157 deg
- **Period**: 5.9 days
- **Synchronous Rotation**
- **Geologically Active**
Characteristics

*Retrograde Orbit*
Atmosphere

- Tenuous atmosphere of Nitrogen, with trace amounts of CO and methane
- Pressure: \(~1.5\) Pa (0.015 millibar)
- Seasonal winds capable of moving particles
- Heating up?
Surface

Composition

- ~55% N, 30% H₂O, 15% CO₂
- Surface features indicate differentiation
- Enough rock for radioactive decay to power convention
- Subsurface ocean?
Surface

Cryovolcanism

- Dust streaks: deposits left by nitrogen geysers
- Observed geysers at subsolar point (solar heating plays crucial role)
Surface

Cryovolcanism
Surface

Cratering

- Very few impact craters
- Surface between 50 million and 6 millions years old
Surface

*Polar Cap*

- Highly reflective icy polar cap
- Some ridges and valleys, possibly from freeze-thaw cycles
- Some evidence of tectonic activity with *strike-slip* faulting
Surface

“Cantaloupe” terrain

- Believed to be oldest terrain on Triton
- Depressions 30-40 km in diameter
- Possible explanations:
  - Diapirism
  - Cryovolcanos
Origin

*Binary gravitational encounter*
Origin

Orbit of Nereid
Origin

Simulations

Agnor & Hamilton 2006
Origin

Simulations

Agnor & Hamilton 2006
Fate of Triton

\[ L_R = 2.44 \left( \frac{\rho_P}{\rho_S} \right)^{\frac{1}{3}} R_p \]
Future Missions

• Neptune Orbiter - 2016 (deceased)
• New Frontiers Program: Argo (deceased)
• ODINUS by the ESA - 2034 (still breathing)
• OSS by ESA & NASA - ???
References