The Everest of Planetary Exploration:
New Horizons Explores The Pluto System 2015
The New View:

A Three-Zone Planetary System

A Third Class of Planet Found

Small Planets Dominate

Plot prepared by the Minor Planet Center
Highest Funding Priority Medium-Scale Mission
New Start of the 2003 Planetary Decadal Survey:

A *Reconnaissance Expedition*
to Pluto-Charon & the Kuiper Belt
July 2015

Be There!
New Horizons: Science At The Pluto System
Total System Characterization

- New satellites?
- Dust rings?
- Measure satellite masses, orbits, colors, compositions
Total System Characterization

• Goal: Understand formation of Pluto system and the Kuiper Belt – and transformation of early solar system
Global Geology

- High-Res mapping of Pluto and satellites Charon, Nix and Hydra
- Search for changes on approach to Pluto, surface-atmosphere interactions, mobile frosts, clouds and hazes
- Goal: Understand how dwarf planets evolve; compare and contrast with icy satellites
Atmospheric Structure & Escape

- Goal: Understand dwarf-planet atmospheres and climates
Atmospheric Structure & Escape

- Goal: Understand how planets lose their atmospheres

Model: D McComas (SwRI)
Composition & Temperature Maps

- Surface-ice distribution; search for complex organic molecules
- Relation of ices to sunlight, topography, atmosphere; evidence for cryovolcanism or geysers
- Goal: understand Pluto and Charon as planet and major moon
Archetype Kuiper Belt Planet

• New Horizons will revolutionize our understanding of icy planets of the Kuiper belt and broader trans-Neptunian population
• Pluto “saw” early cataclysmic events, including wholesale reorganization of the solar system
• Pluto is an active world with (perhaps) a rock core and internal ocean
• *We will be surprised and thrilled!*
New Horizons
Mission Operations
and Navigation
Pluto Approach Operations 1

- Optical imaging to determine the projected path
- Trajectory adjustments
- Deep imaging of Pluto system to assess potential hazards and need to choose a ‘safer’ path
Pluto Approach Operations 2

- Approach and encounter science observations
- Final days: Late updates to flyby timing and navigation information to observatory systems
Timeline 2

Time frame

2015

P-194 Jan 1
P-135 Mar 1
P-74 May 1
P-13 Jul 1
P+48 Sep 1
P+109 Nov 1
P+170 Jan 1
P+230 Mar 1

Science phases

AP1  AP2  AP3  DP1  DP2  DP3

Pluto Closest Approach
July 14 ~11:50:00 UTC
Closest Approach

- Charon-Sun Occultation: 14:17:50
- Charon-Earth Occultation: 14:20:09
- Pluto-Sun Occultation: 12:51:28
- Pluto-Earth Occultation: 12:52:30
- Charon C/A: 12:04:00, 29,432 km, 13.87 km/s
- Pluto C/A: 11:50:00, 13,695 km, 13.78 km/s

- S/C trajectory time ticks: 10 min
- Occultation: center time
- Position and lighting at Pluto C/A
- Distance relative to body center

Sun - Earth: 0.24°
Pluto Departure Operations

- Spacecraft health and trajectory assessments
- Departure science
- Playback and evaluation of initial science results
- KBO trajectory change maneuvers
- Complete science data playback = 16 months!
New Horizons
Science and Outreach
Get Involved

- ‘Plutopalooza’ parties will be held across the U.S. and abroad
- Join the Pluto Corps of Discovery
- Register, track and find New Horizons events on the Web
Have a 3-D printer? Make your own New Horizons!

My other vehicle is on its way to Pluto

http://nasa3d.arc.nasa.gov/detail/new-horizons
What’s Ahead

- Long-distance views
- ~ 15 weeks of ‘Better than Hubble’
- 1,000+ approach images!
- Best look: hours after flyby
- Surprises!
After Nine Years and Three Billion Miles

Pluto Awaits 2015

- First planetary student instrument
- Pluto Pals
- ‘The Real Plutophiles’
- The ‘Year of Pluto’