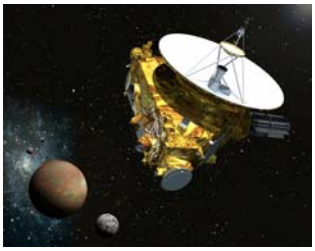
The 2007 Exploring Space Lectures

New Horizons:
Exploring the Solar System's Frontier

S. Alan Stern

June 14, 2007

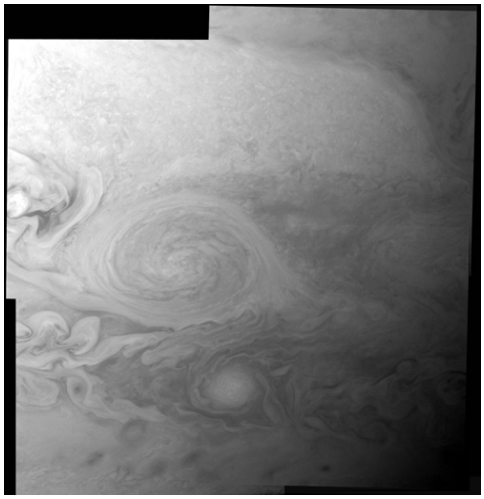


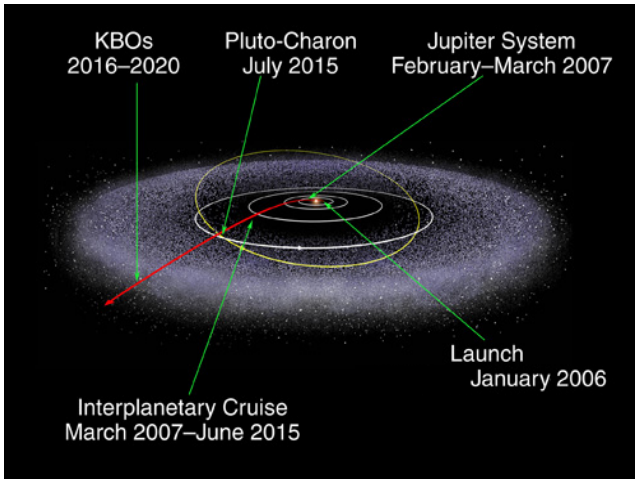
New Horizons at Pluto
(artist's conception)

Humans have explored much of the Solar System, either in person or with the aid or robotic surrogates. Mercury has been visited, and the MESSENGER spacecraft is presently en route there. We have mapped the surface of Venus with orbiting radar and have landed at a number of locations. Twelve people have walked on the Moon. Five spacecraft orbit or rove the martian surface. Jupiter has been visited by five spacecraft, Cassini is in Saturn orbit returning data, and Voyager 2 flew by Uranus and Neptune.

Only Pluto, whatever its exact status as a "planet," and the other denizens of the outermost parts of the Solar System have not been examined from close range.

Understanding the nature of the materials in the outer Solar System is important scientifically, for at least three reasons. First, the chemical composition of that material in that part of the Solar System is important in understanding Solar System formation and evolution. Any theoretical models of Solar System evolution must take that composition into account as an important set of initial conditions in the analysis. Second, the Kuiper Belt is a source region for many of the comets that upon occasion enter the inner Solar System, posing a hazard to Earth. Understanding the quantity and location of Kuiper Belt Objects (KBO's) will help us assess those risks. Third, the number of impact craters on a planetary surface provides important clues as to the age and evolution of that planet/moon. The better our knowledge of the population of objects in the outer Solar System and how those objects interact to cause comets to approach planets is, the better we will be able to use craters as a tool for determining the history of planetary surfaces throughout the Solar System.





Getting to Pluto

New Horizons was launched over a year ago, and it will not get to Pluto until mid-2015. Nine years may sound like a long time, and it is, but not for a multi-billion mile trip! The spacecraft recently flew closely by Jupiter and its moons, using the gravity of Jupiter to accelerate it towards Pluto; otherwise, the journey would take twelve years or more. The image on the left was acquired by *New Horizons* as it flew by Jupiter, showing the "Little Red Spot" storm just left of center. "Little" is a relative term; the LRS is about the size of the entire Earth!

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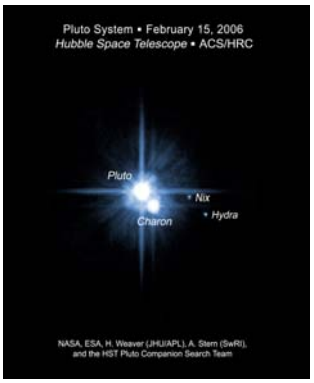
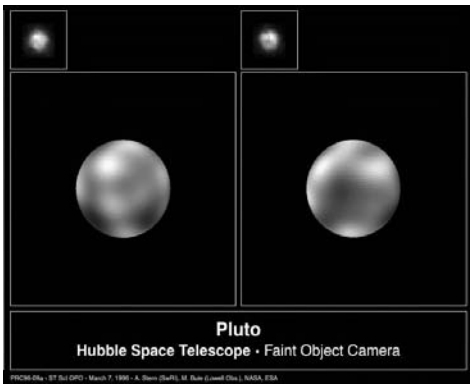
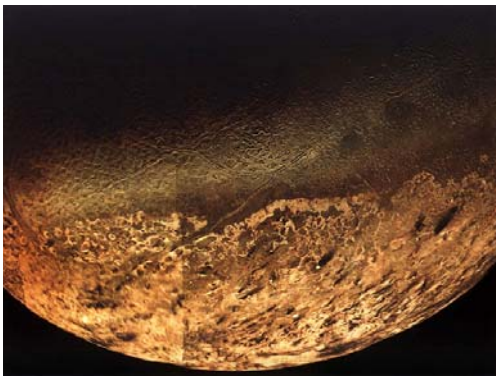


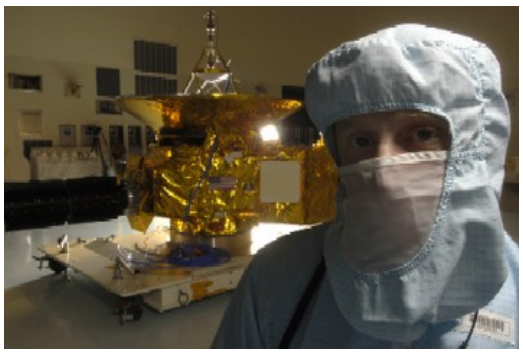




Our best views of Pluto to date have been (near) Earth-based, from the Hubble Space Telescope. Pluto's moon, Charon, was discovered in 1978; its other moons, Nix and Hydra, were discovered in 2006. Even with the HST, the best images of Pluto's surface reveal few details. Could Pluto be like Neptune's moon, Triton (right, as seen during the flyby of the Voyager 2 spacecraft in 1989), or are Pluto and its moons going to be full of surprises?

Mythological Connections: Pluto was the Roman God of the Underworld, and the use of that name was consistent with previous planet naming (Pluto was the son of Saturn and Rhea, brother to Jupiter and Neptune). In mythology, Charon is the boatman taking souls across the River Acheron (not Styx!) past the three-headed guard dog, Cerberus. Charon was the son of Erebus, the embodiment of darkness and son of Chaos, and Nyx, the embodiment of the night. "Nyx" has already been used as a name for an asteroid (#3908), so the New Horizons team proposed "Nix," the Egyptian equivalent goddess. "Hydra" is named for the famous nine-headed serpent ultimately slain by Hercules (and is also a large constellation in the sky). Nine heads, nine "planets;" get it? The initials of the new moons are also the same as the two devices giving us most of what we know of Pluto: ***N****ew Horizons* and the ***H****ubble Space Telescope (*or just ***N****ew* ***H****orizons*!), reflecting the story that "Pluto" was considered a particularly-apt name because the "P" and the "L" could also represent Percival Lowell, whose calculations, and funding, allowed Clyde Tombaugh to discover Pluto in 1930. We know now that Tombaugh's diligence was the reason for his success; Lowell's calculations contained an error, so Tombaugh was searching at random, even if he did not know it at the time!

Our Speaker
S. Alan Stern is the Principal Investigator for the New Horizons mission, and the Associate Administrator of the NASA Space Mission Directorate. Dr. Stern's interests include hiking, camping, gardening, and writing. He is an instrument-rated commercial pilot and flight instructor, with both powered and sailplane ratings.



References

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NASA Pluto information: http://solarsystem.nasa.gov/planets/profile.cfm?Object=Pluto
New Horizons website: http://pluto.jhuapl.edu (source of images used in this handout)
Dr. Stern's Astronomy.com blog: http://www.astronomy.com/asy/default.aspx?c=a&id=5108
Dr. Stern's Southwest Research Institute webpage: http://www.boulder.swri.edu/~alan
Bill Arnett's "Nine Planets" website's Pluto page: http://www.nineplanets.org/pluto.html