



Report from APL

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55th CGSIC Meeting – Timing Subcommittee

September 14, 2015

The Johns Hopkins University Applied Physics Laboratory



The largest University Affiliated Research Center in the United States

Located between Baltimore, MD and Washington, DC in Laurel MD on 400 acres with 20 major buildings + satellite campuses

Staff of about 5000 employees (68% are engineers & scientists)

Major sponsors are the DoD, NASA, DHS, IC

Time & Frequency Laboratory



Clock Vault



Time and Frequency Lab Hardware

- ◆ 3 High Performance Cesiums & 1 Standard Performance Cesium
- ◆ 3 Hydrogen Masers
- ◆ 2 5MHz measurement system
- ◆ 1 1pps clock monitor system
- ◆ 2 High Resolution Offset Generators
- ◆ 3 GPS Time Transfer Receivers

T & F Lab Mission

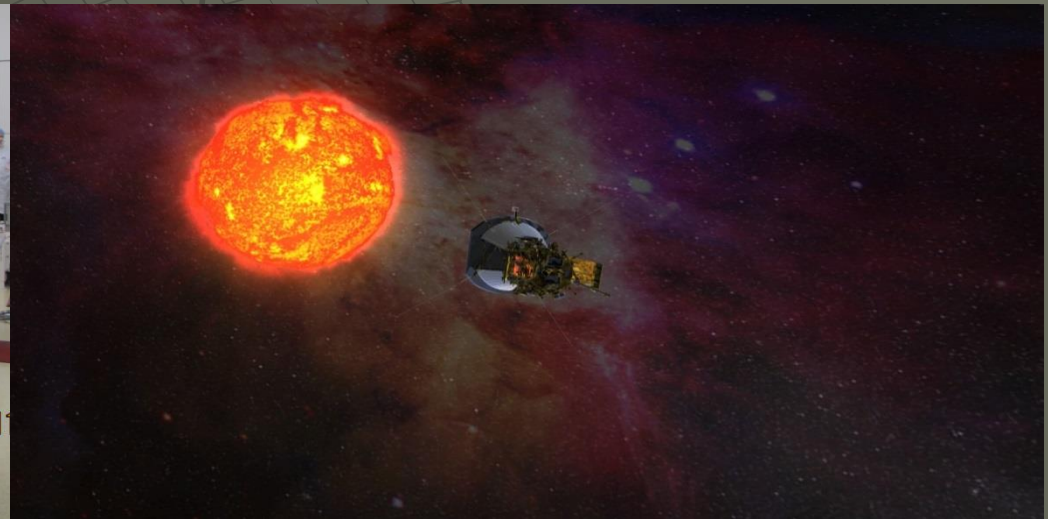
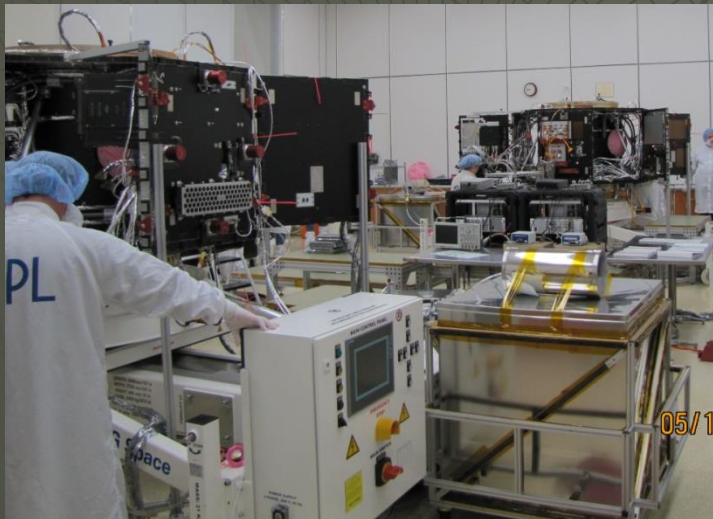
Provide precise time and frequency in support of critical APL projects and maintain traceability to U.S. and international timing laboratories.

Mission Support

- ◆ Integration and testing of flight hardware
- ◆ Frequency reference for spacecraft ranging and communications
- ◆ Time-stamping of ground receipt telemetry packets
- ◆ R & D of time and frequency devices and distribution systems

Support of APL Space Science Missions

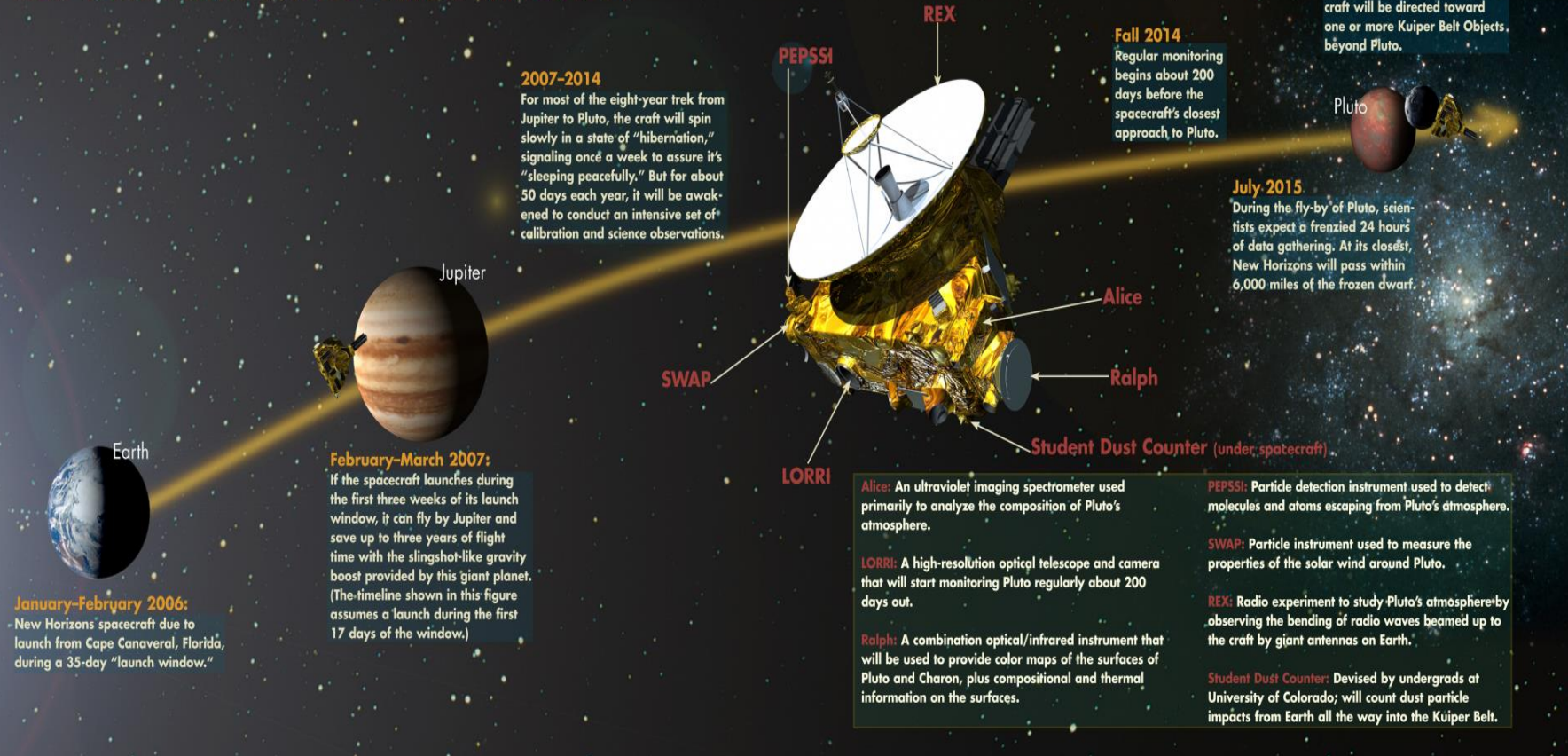
- ◆ Continued mission operations support for:
 - TIMED – **T**hermosphere **I**onosphere **M**esosphere **E**nergetics and **D**ynamics
 - STEREO – **S**olar **T**errestrial **R**elations **O**bservatory
 - New Horizons - mission to Pluto and Kuiper Belt Objects
 - MESSENGER – **M**ercury **S**urface, **S**pace **E**nvironment, **G**eochemistry, and **R**anging
 - Van Allen Probes - (formally Radiation Belt Storm Probes), launched Aug 2012
- ◆ Integration support for Solar Probe Plus starts in late 2015



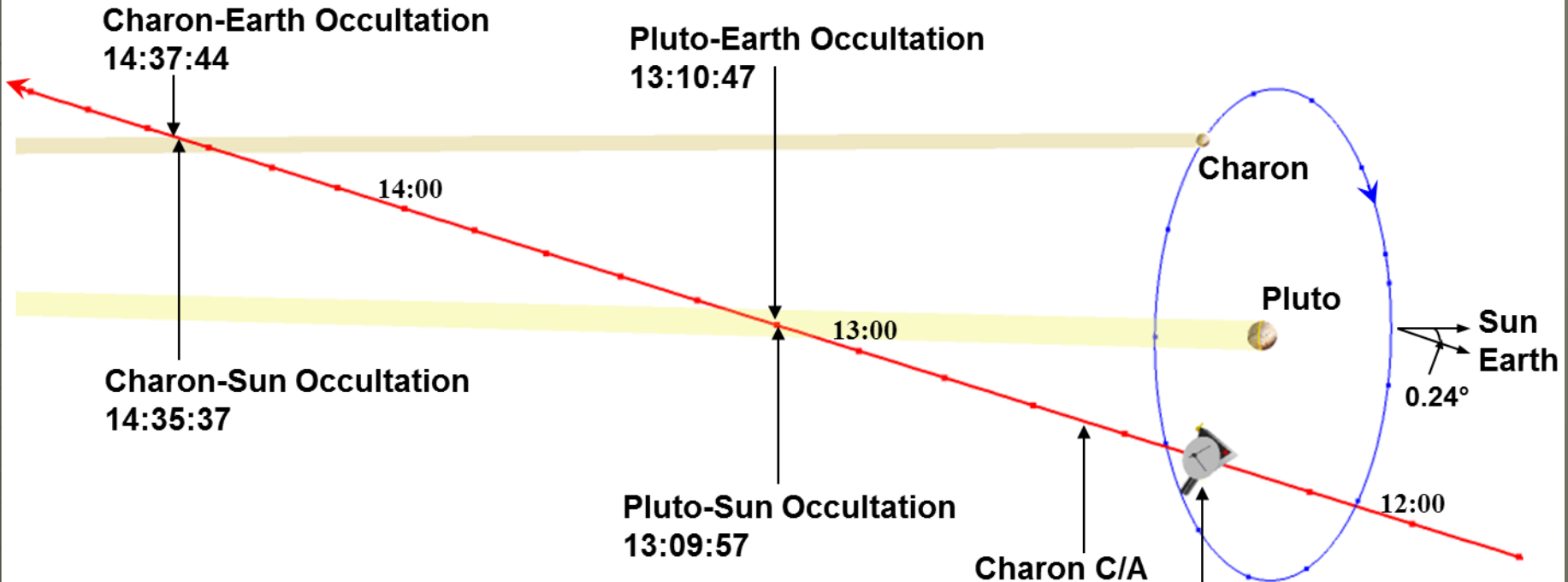
New Horizons

Launched: January 19, 2006
Pluto Closest Approach: July 14, 2015

Ten Years and Three Billion Miles . . .



Pluto-Charon Encounter – 14 July 2015



- 3-axis Encounter period starts January 2, 2015
- Better than best HST images: 50 days from closest approach
- Closest approach: July 14, 2015 @ 7:49 a.m.(EDT)
- 3-axis Encounter period ends July 30, 2015
- 16 months to play back data

Pluto and Charon



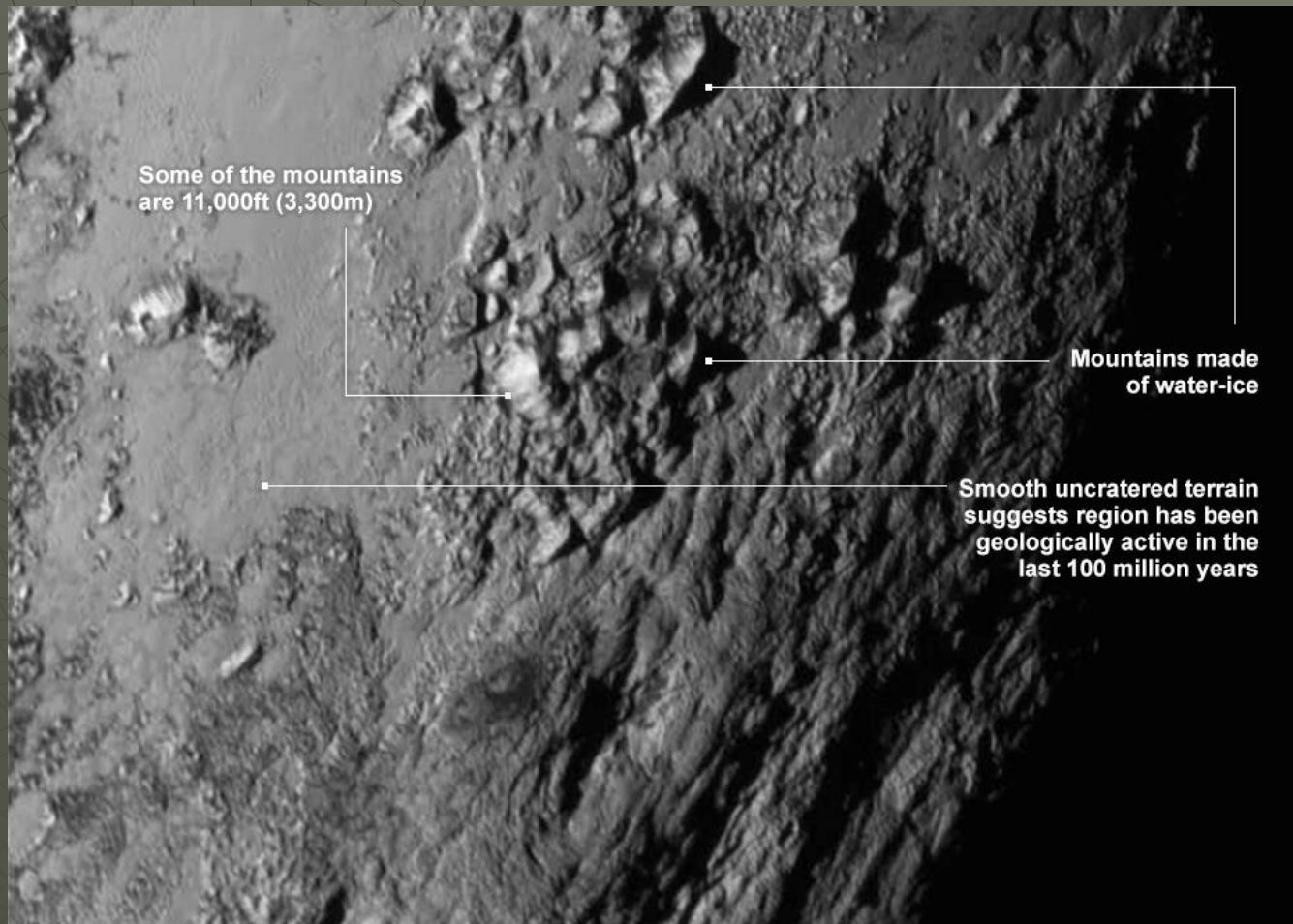
(NASA Photo)

Pluto



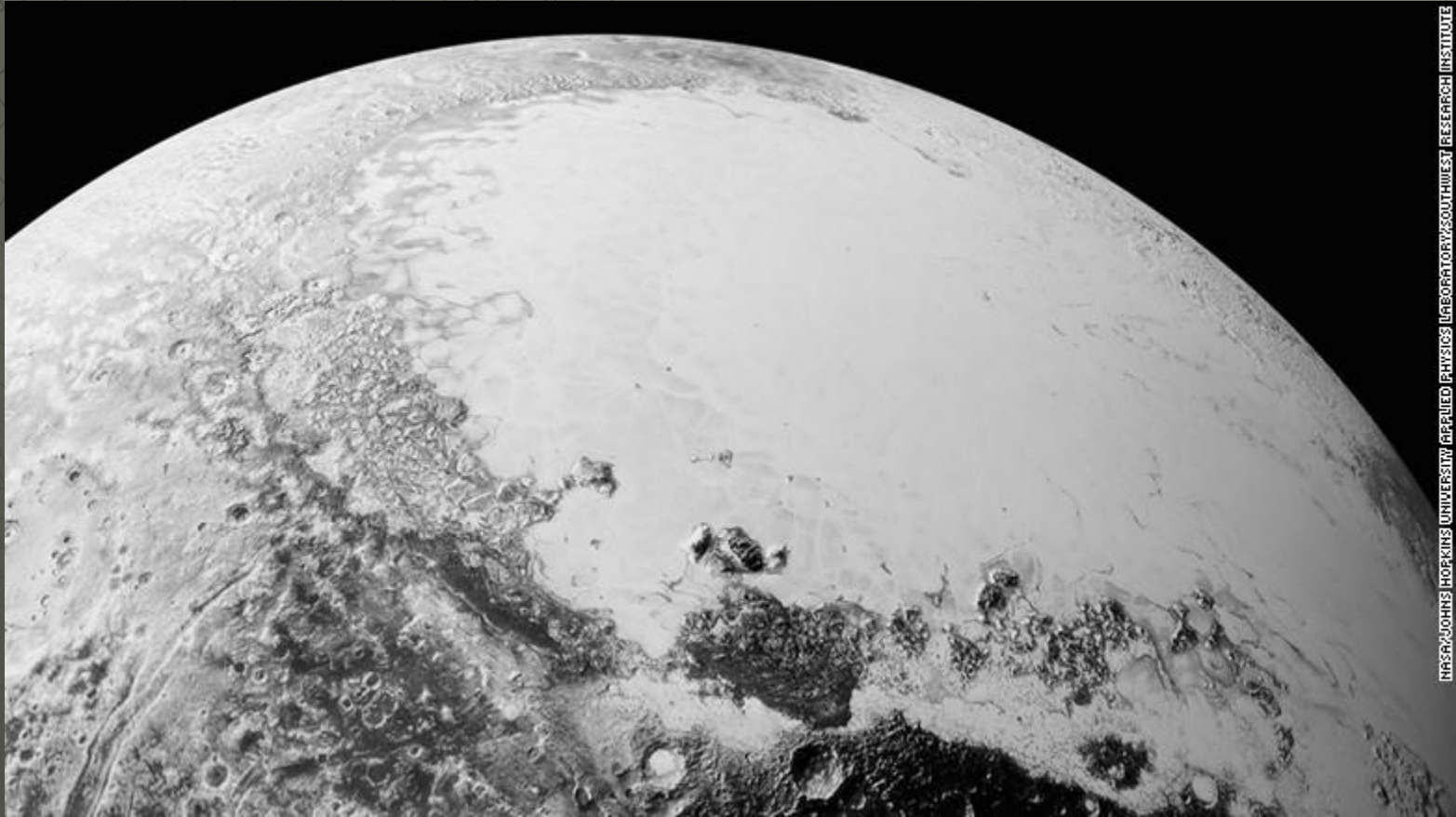
(NASA Photo)

The Surface of Pluto



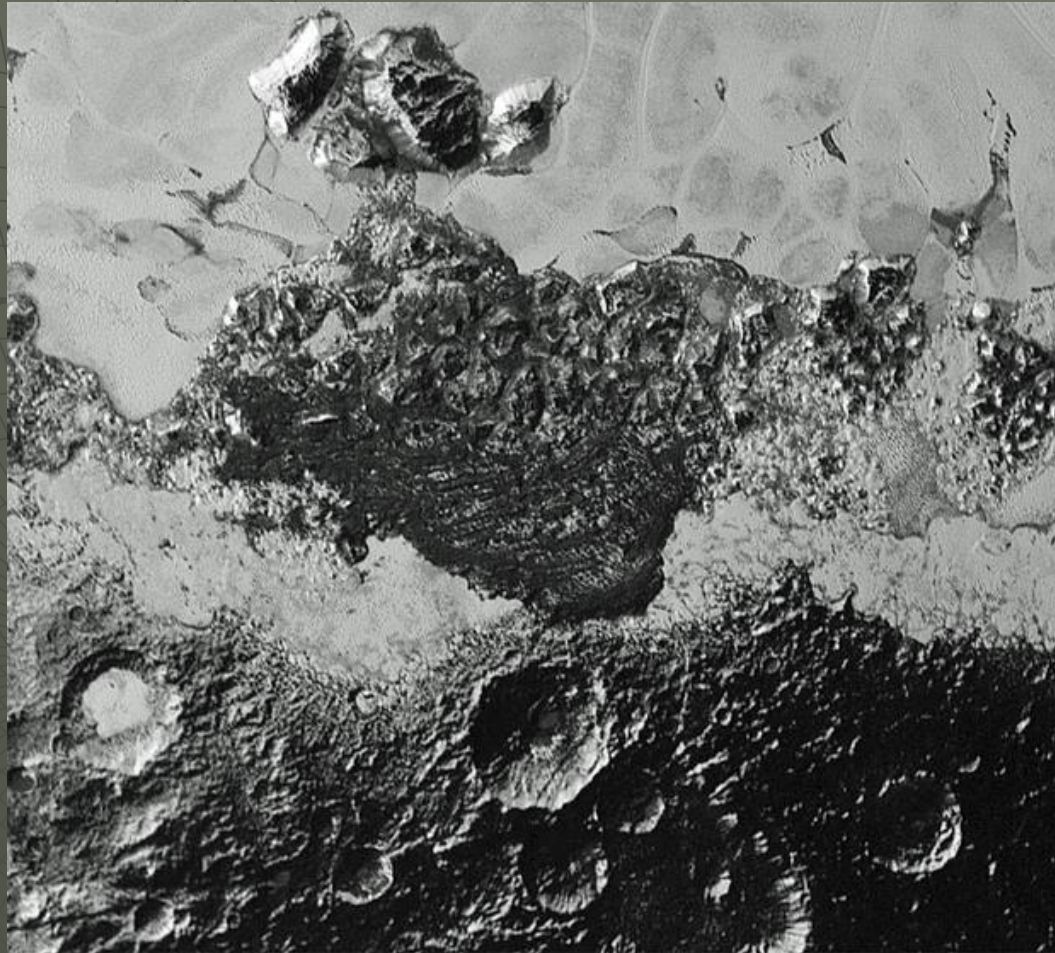
(NASA Photo)

Pluto Ice Cap



NSERC/JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LABORATORY/SOUTHWEST RESEARCH INSTITUTE

Craters and Ice



Pluto Atmosphere



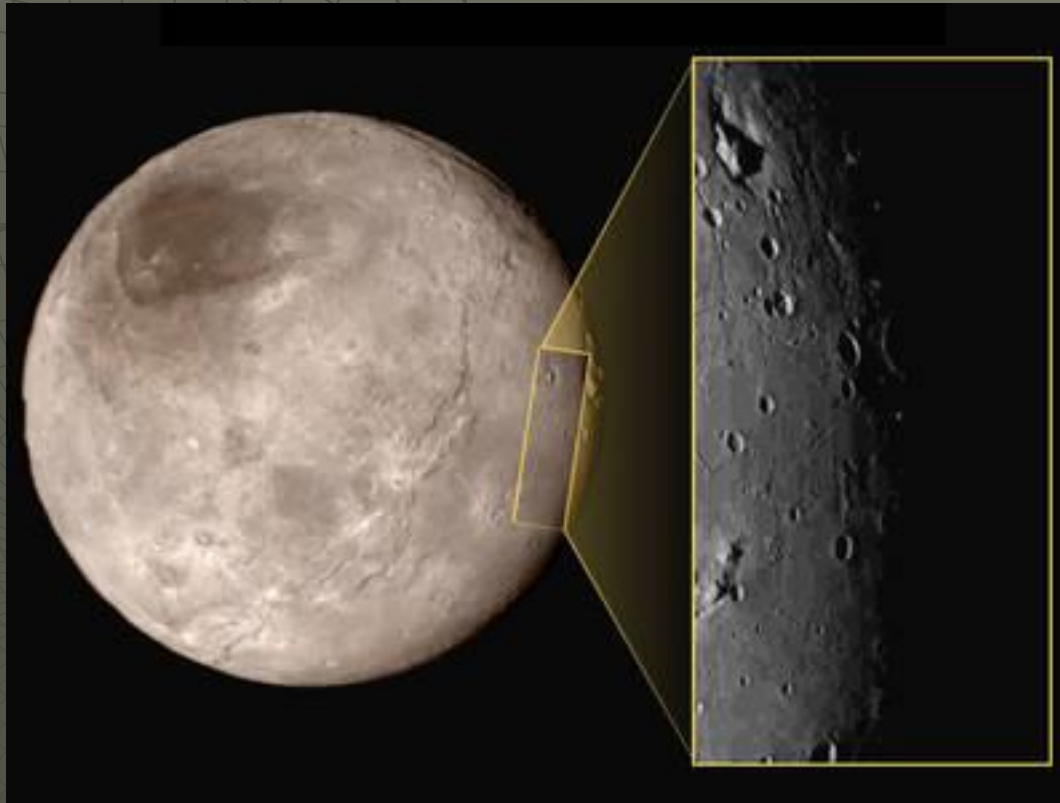
ESA/NASA/JPL/MSL/CI

Charon



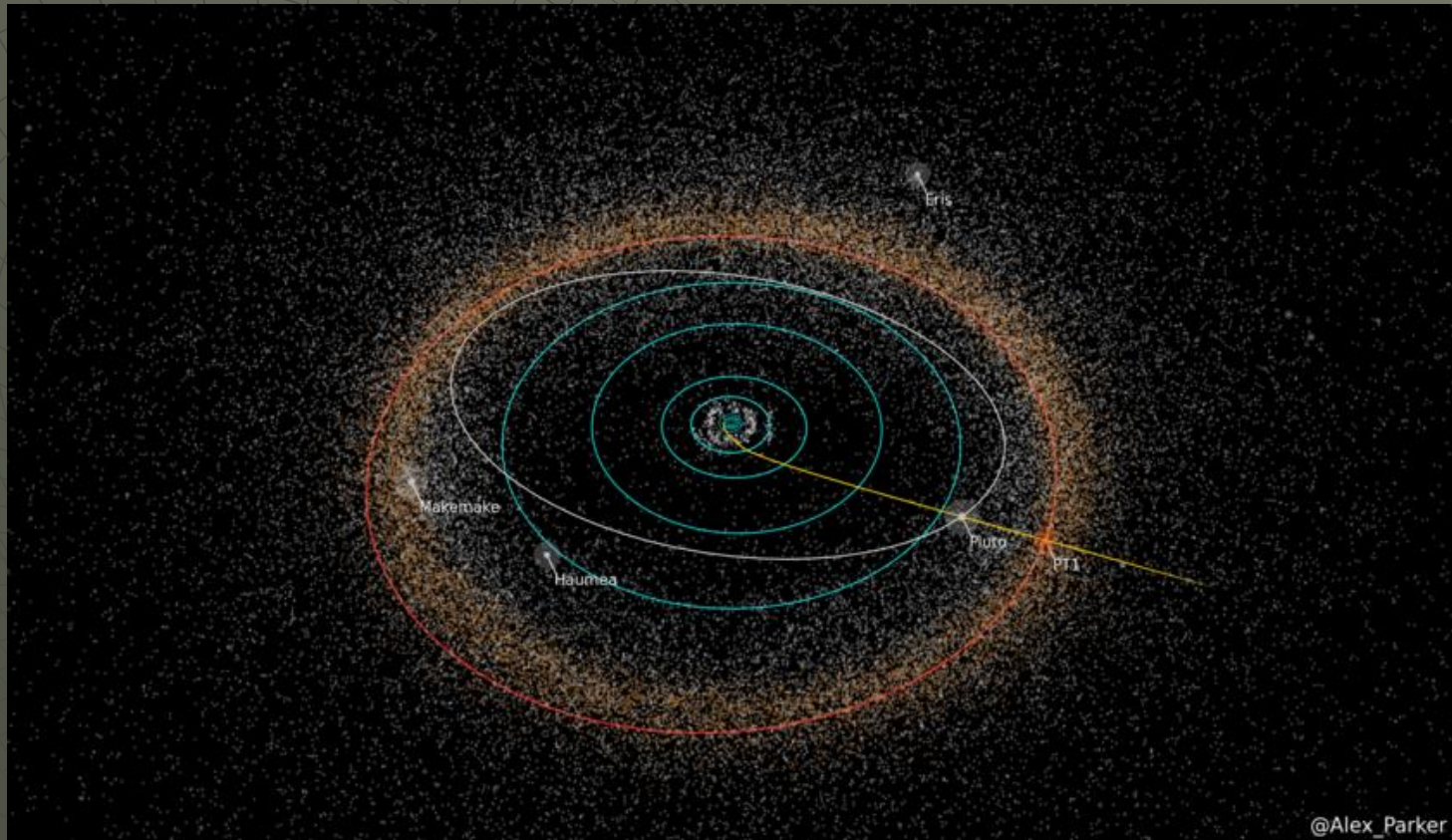
(NASA Photo)

The Surface of Charon

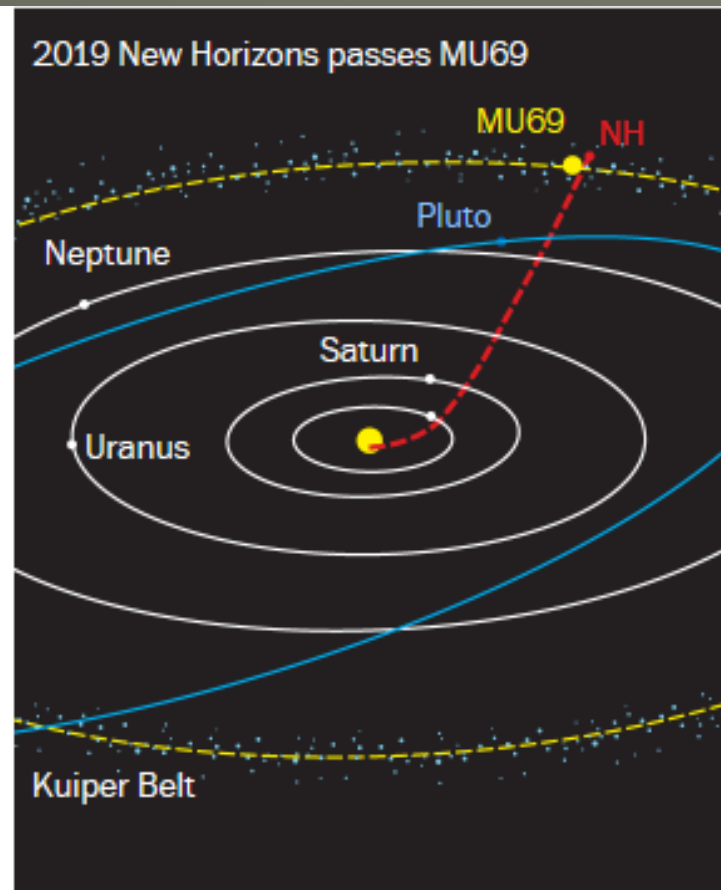
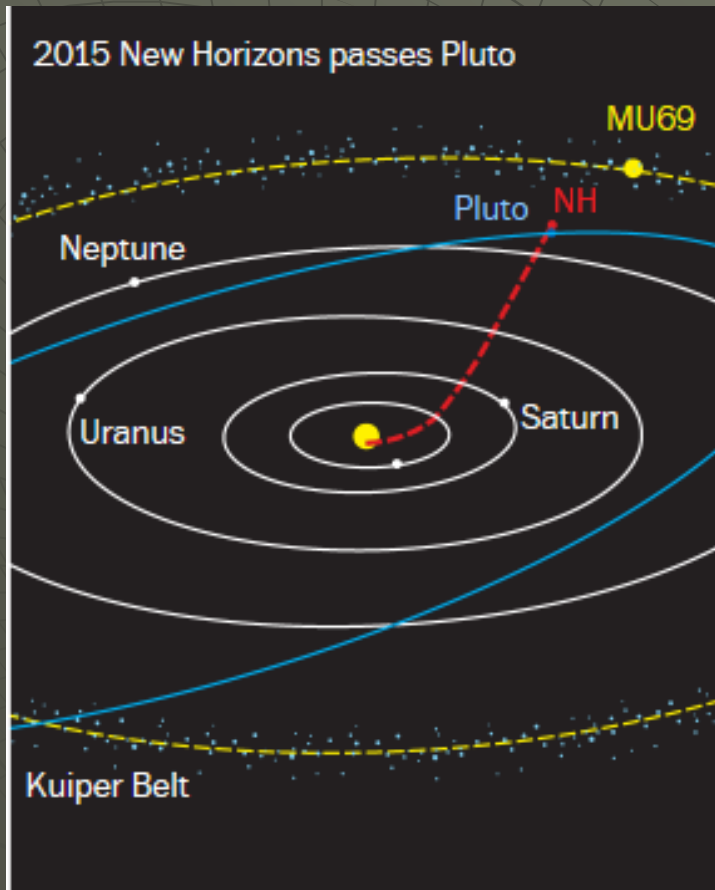


(NASA Photo)

The Exploration Continues



MU69 Flyby



(NASA Photo)

Kuiper Belt Object MU69

- ◆ Estimated diameter 28 miles
- ◆ Course corrections begin October, 2015
- ◆ New Horizons currently 3 billion miles from Earth
- ◆ Another billion miles to go
- ◆ MU69 flyby in January 2019
- ◆ Estimated flyby distance 12,000 miles

Thank You

BREWSTER ROCKIT: SPACE GUY!

TIM RICKARD

I'M COMING UP ON THE DWARF
PLANET PLUTO.



Rickard

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CONGRATULATIONS, NEW
HORIZONS! WE KNEW YOU
COULD DO IT!



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WAIT ... DID NO ONE TELL PLUTO
THAT IT WAS DEMOTED?



WELCOME TO
PLANET PLUTO!



"WE WERE
HOPING
YOU COULD
DO THAT!"