



Metropolitan Water Reclamation District of Greater Chicago

**WELCOME
TO THE OCTOBER EDITION
OF THE 2018
M&R SEMINAR SERIES**

BEFORE WE BEGIN

- **SAFETY PRECAUTIONS**
 - PLEASE FOLLOW EXIT SIGNS IN CASE OF EMERGENCY
 - AUTOMATED EXTERNAL DEFIBRILLATOR (AED) LOCATED OUTSIDE
- **PLEASE SILENCE CELL PHONES OR SMART PHONES**
- **A QUESTION AND ANSWER SESSION WILL FOLLOW PRESENTATION**
- **PLEASE FILL OUT THE EVALUATION FORM**
- **SEMINAR SLIDES WILL BE POSTED ON THE MWRD WEBSITE**
(www.MWRD.org: Home Page ⇒ Reports ⇒ M&R Data and Reports ⇒ M&R Seminar Series ⇒ 2018 Seminar Series)
- **VIDEO STREAM OF THE PRESENTATION WILL BE AVAILABLE ON MWRD WEBSITE** (www.MWRD.org: Home Page ⇒ MWRDGC RSS Feeds)

Bobak Ferdowsi

- You may remember Bobak Ferdowsi from such things as Battlebots, Cupcake Wars, and Sharknado 3, but by day he is the Fault Protection lead for the joint NASA-ISRO mission, an Earth-observing satellite evaluating global environmental change and hazards. His prior positions have included Europa Clipper flight system engineer, Integrated Launch and Cruise Engineer on Mars Science Laboratory Curiosity, and Science Planner on the Cassini mission. In addition he served as a Flight Director during Curiosity operations. Bobak earned his Bachelor of Science degree in Aeronautics and Astronautics in 2001 from the University of Washington and subsequently his Master of Science in the same area from Massachusetts Institute of Technology. He's always wanted to explore the universe, plays shortstop in the Jet Propulsion Laboratory softball league, batted 0.817 this year, and usually rides his bike to work.

**Searching for
Life and Habitability
in the Solar System**

An Unfinished Story

HELLO

I'm Bobak

clears throat



This is a planet



This is a planet



This is a planet

A large, glowing blue sphere, resembling a planet, is centered against a solid black background. The sphere has a slightly grainy texture and some faint, wispy white and light blue patterns on its surface, suggesting atmospheric features or clouds. Overlaid in the center of the sphere is the text "This is a planet" in a clean, white, sans-serif font.

This is a planet

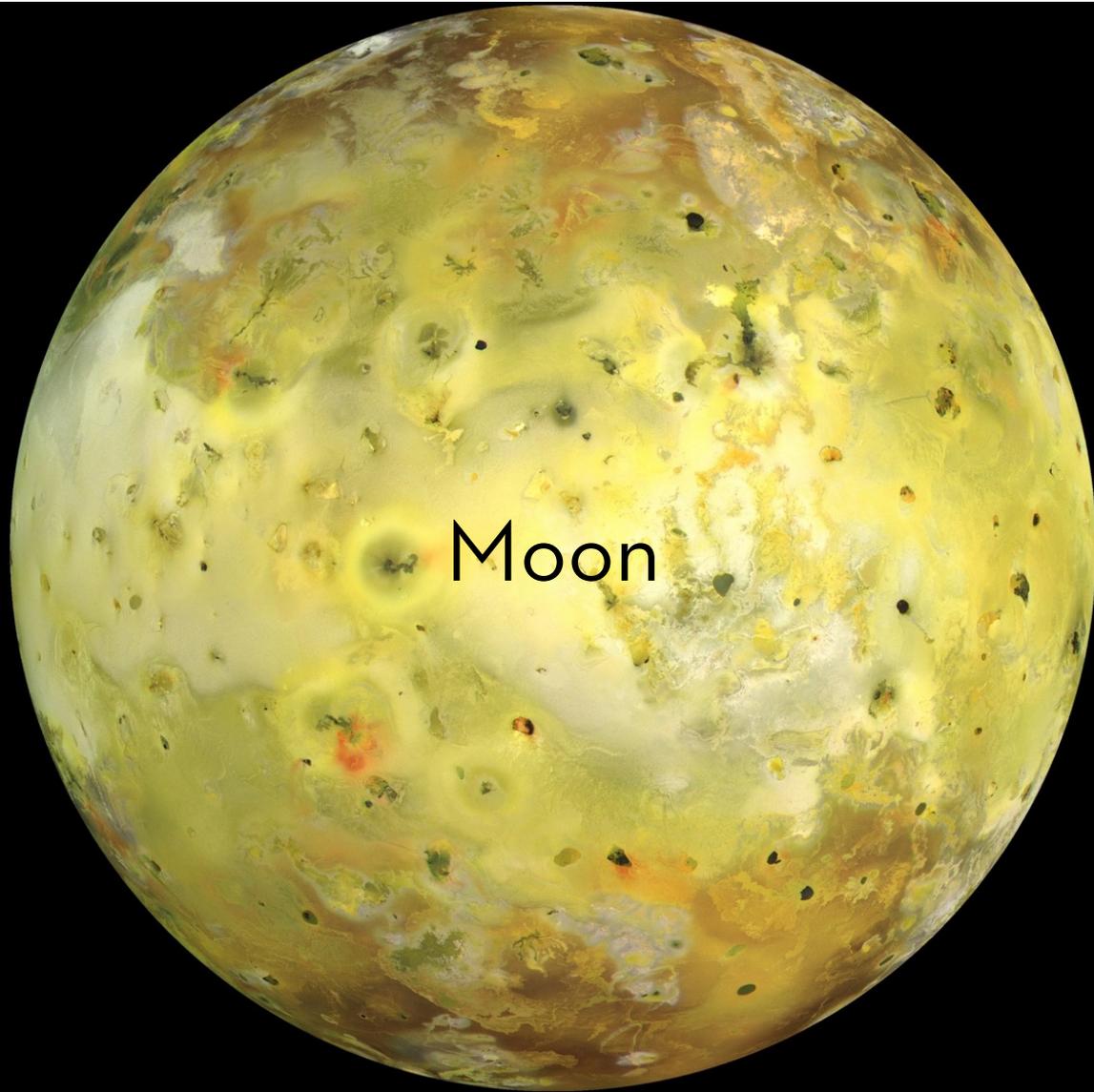


Our moon

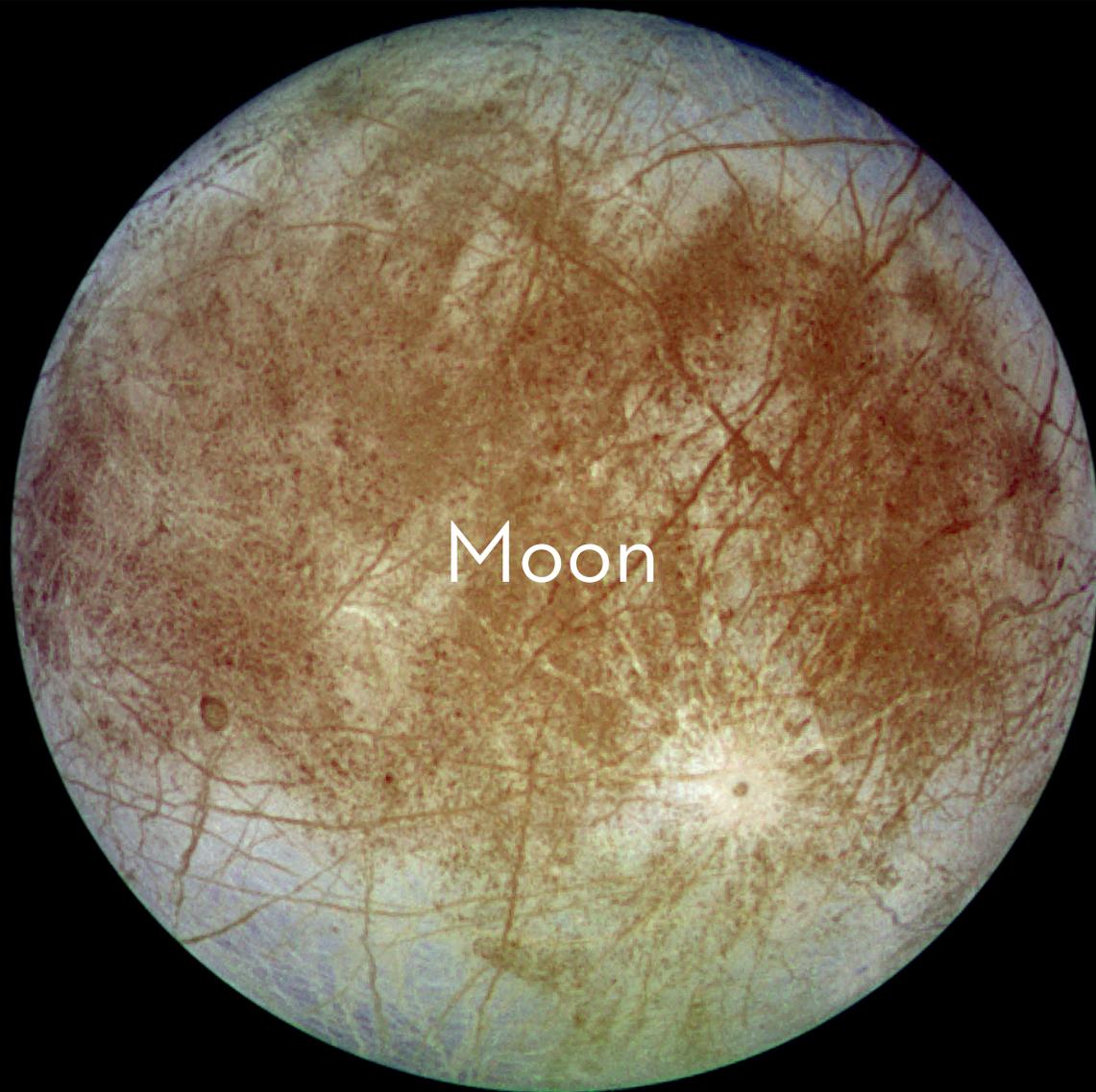
(obviously)

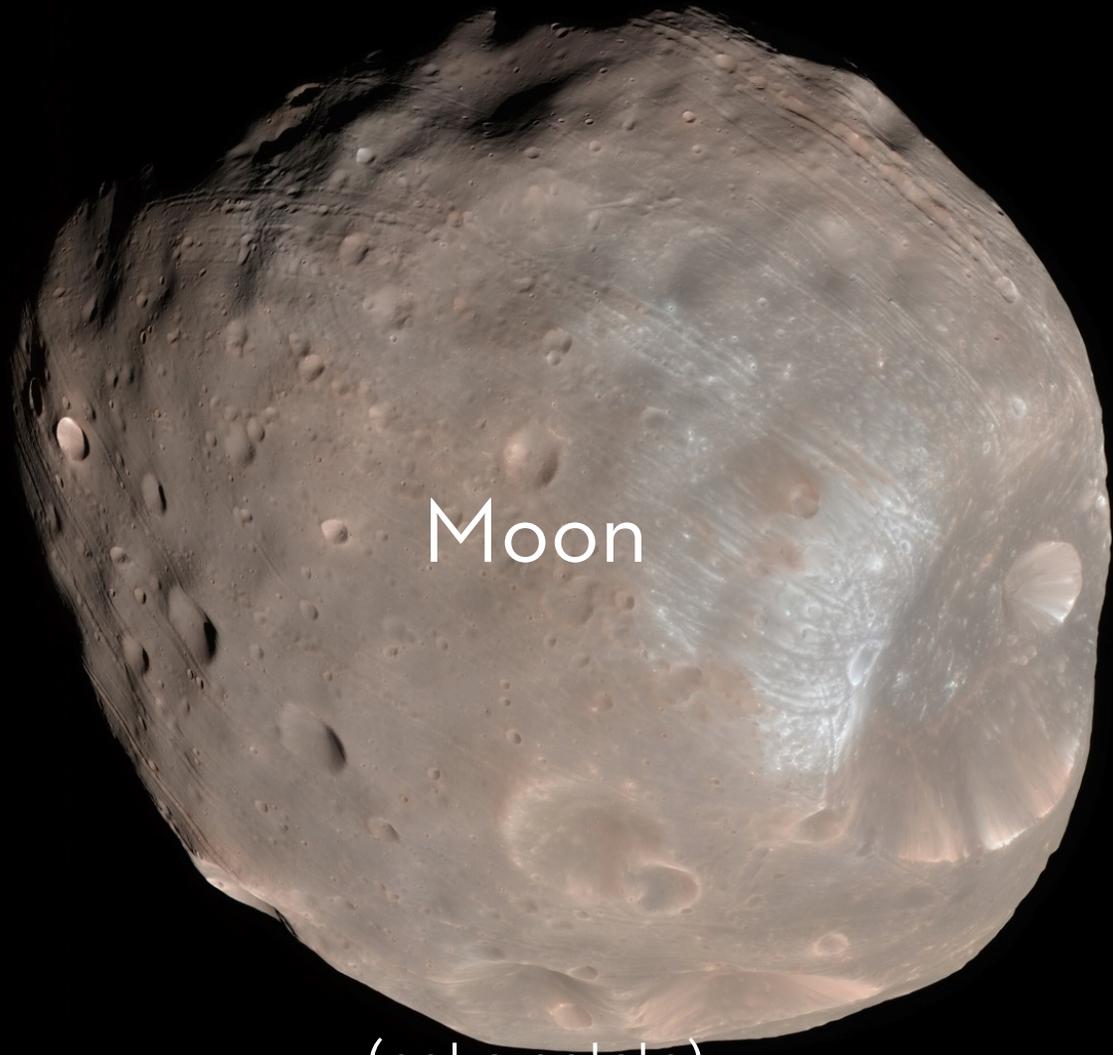


Also our moon



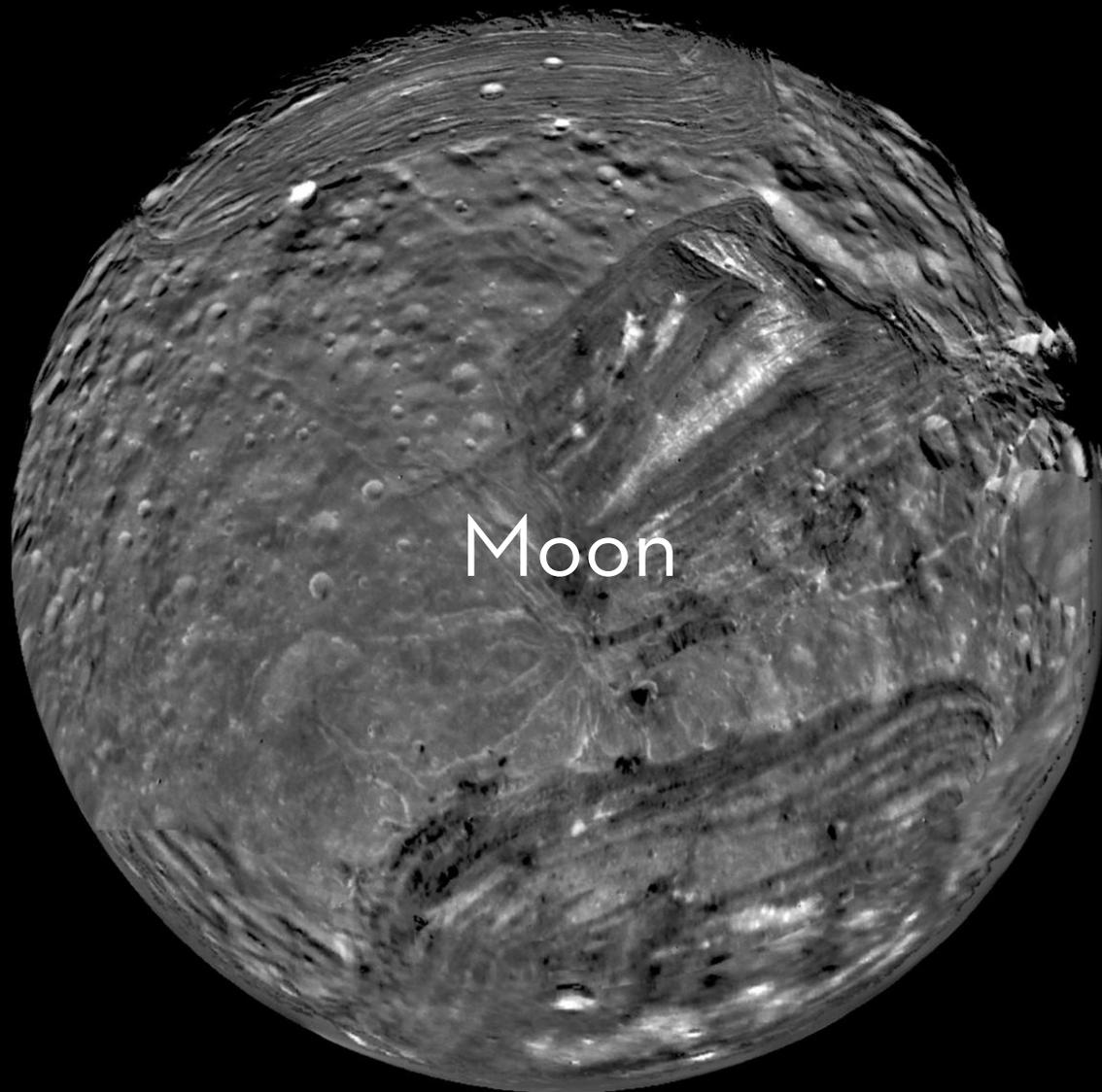
Moon

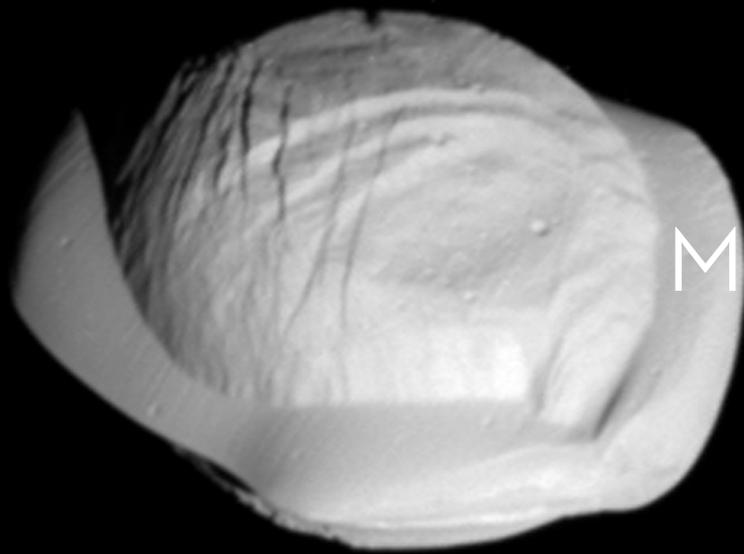




Moon

(not a potato)





Moon



The image shows the Death Star, a large spherical space station, in a dark space filled with stars. The Death Star is illuminated from the right, showing its metallic surface and a prominent circular opening. The text "That's no moon" is overlaid in white, sans-serif font across the center of the sphere.

That's no moon



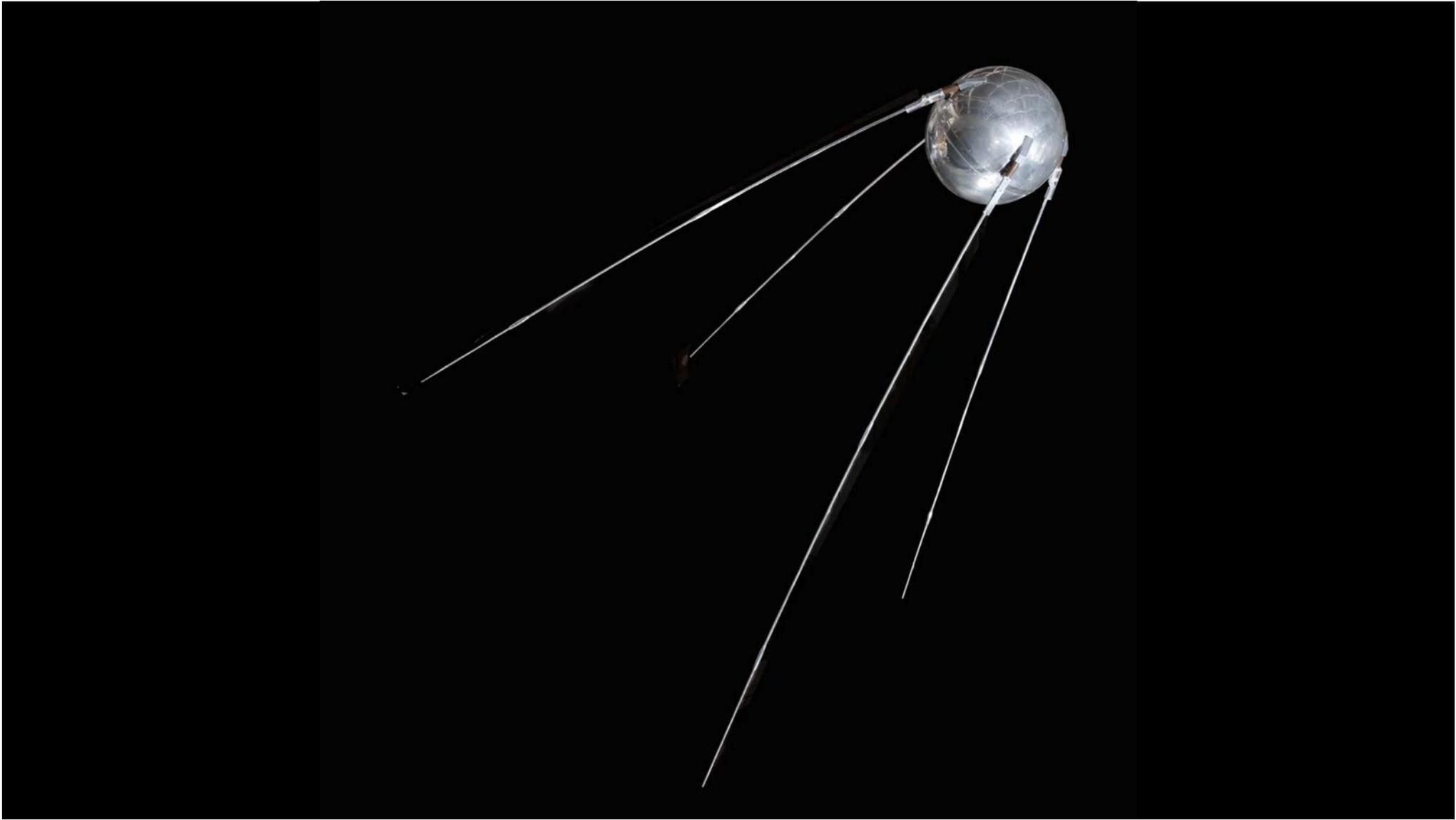
That is though

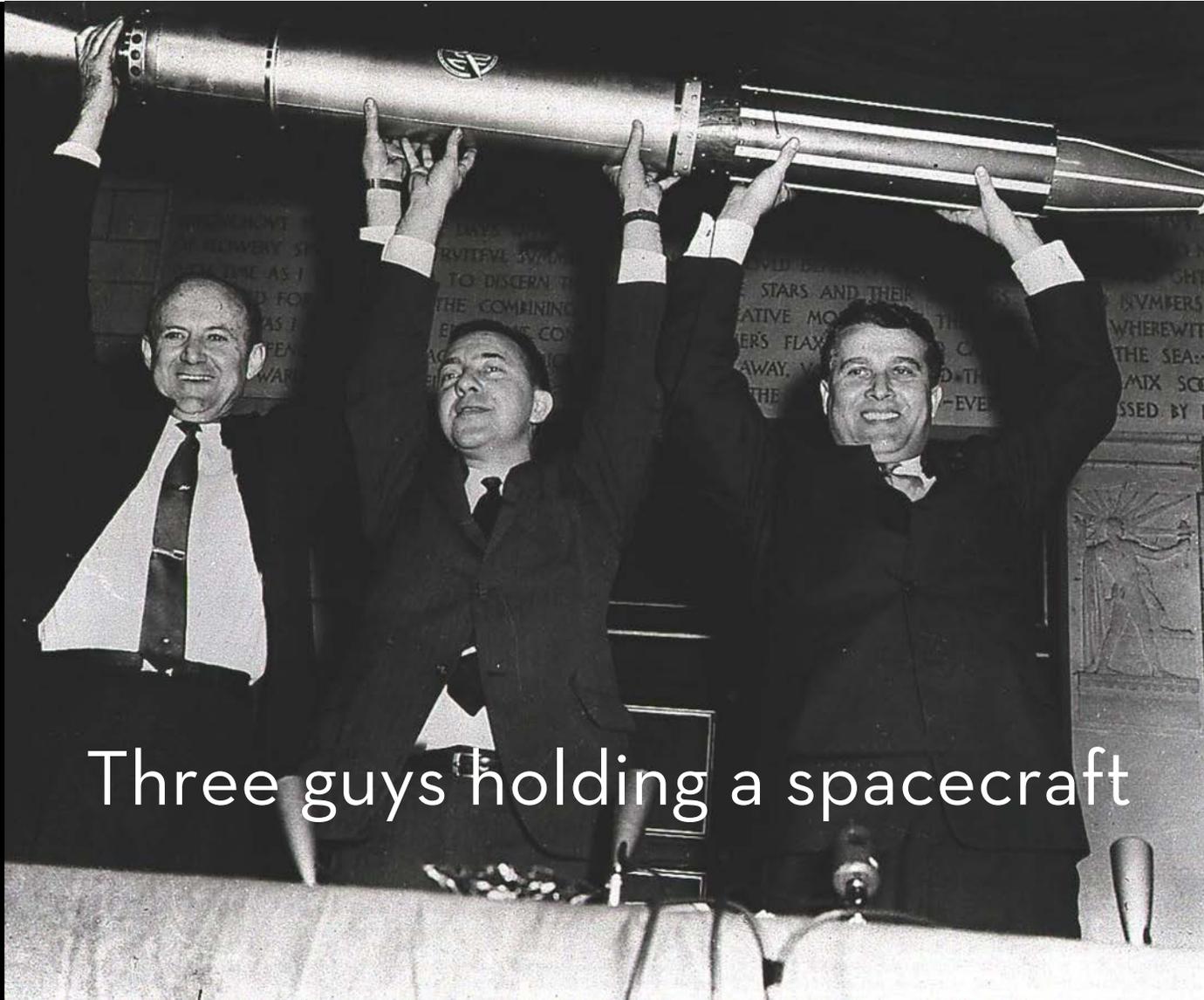


(Looks fake)

the only known example of life in
the universe

Are we alone?

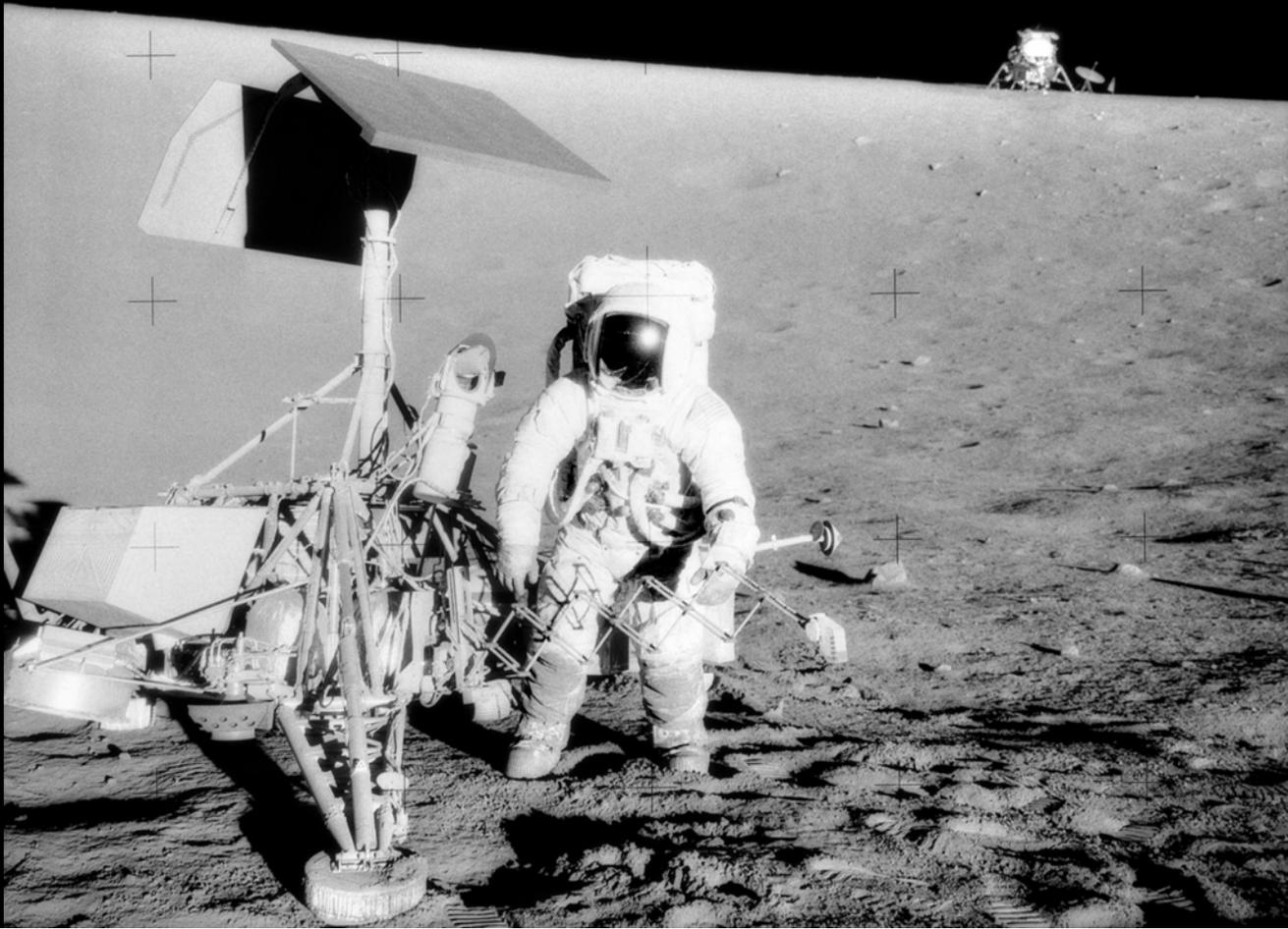


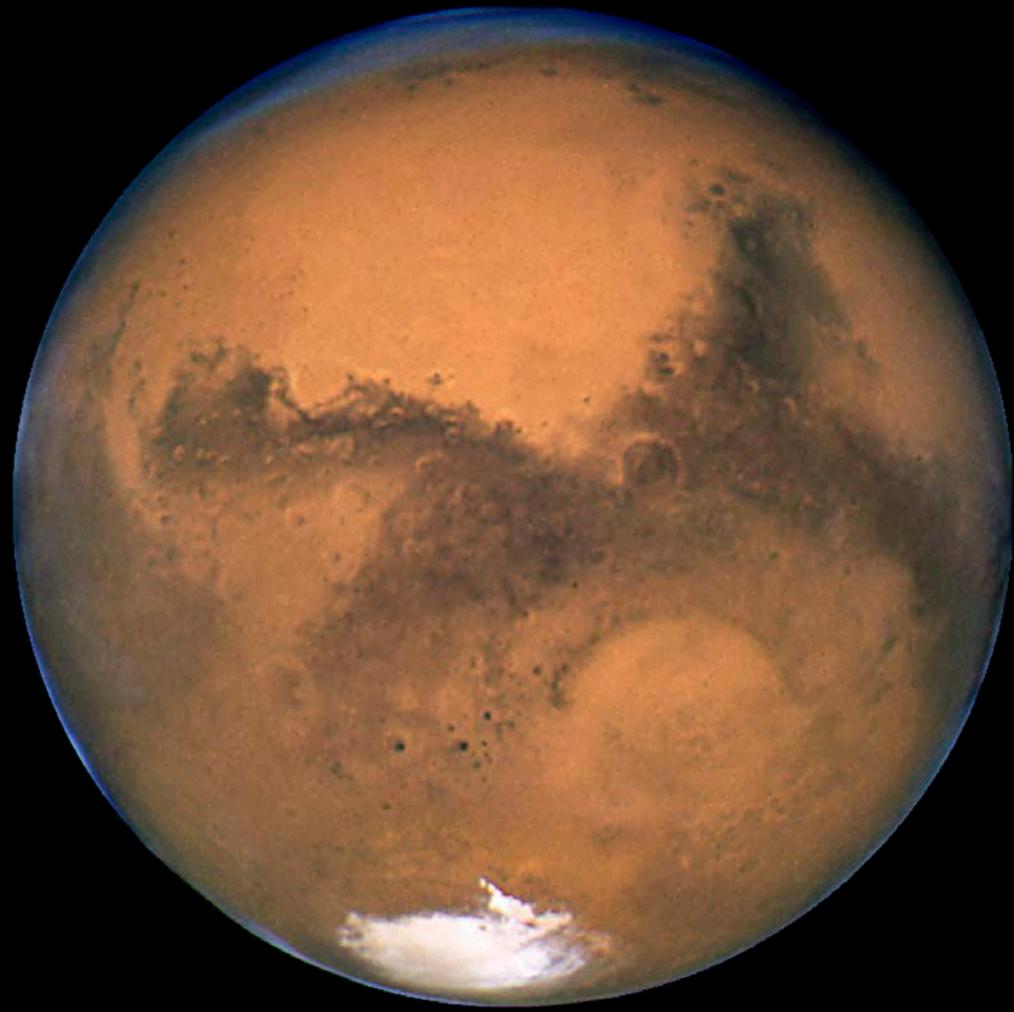


Three guys holding a spacecraft



A lot of these didn't work





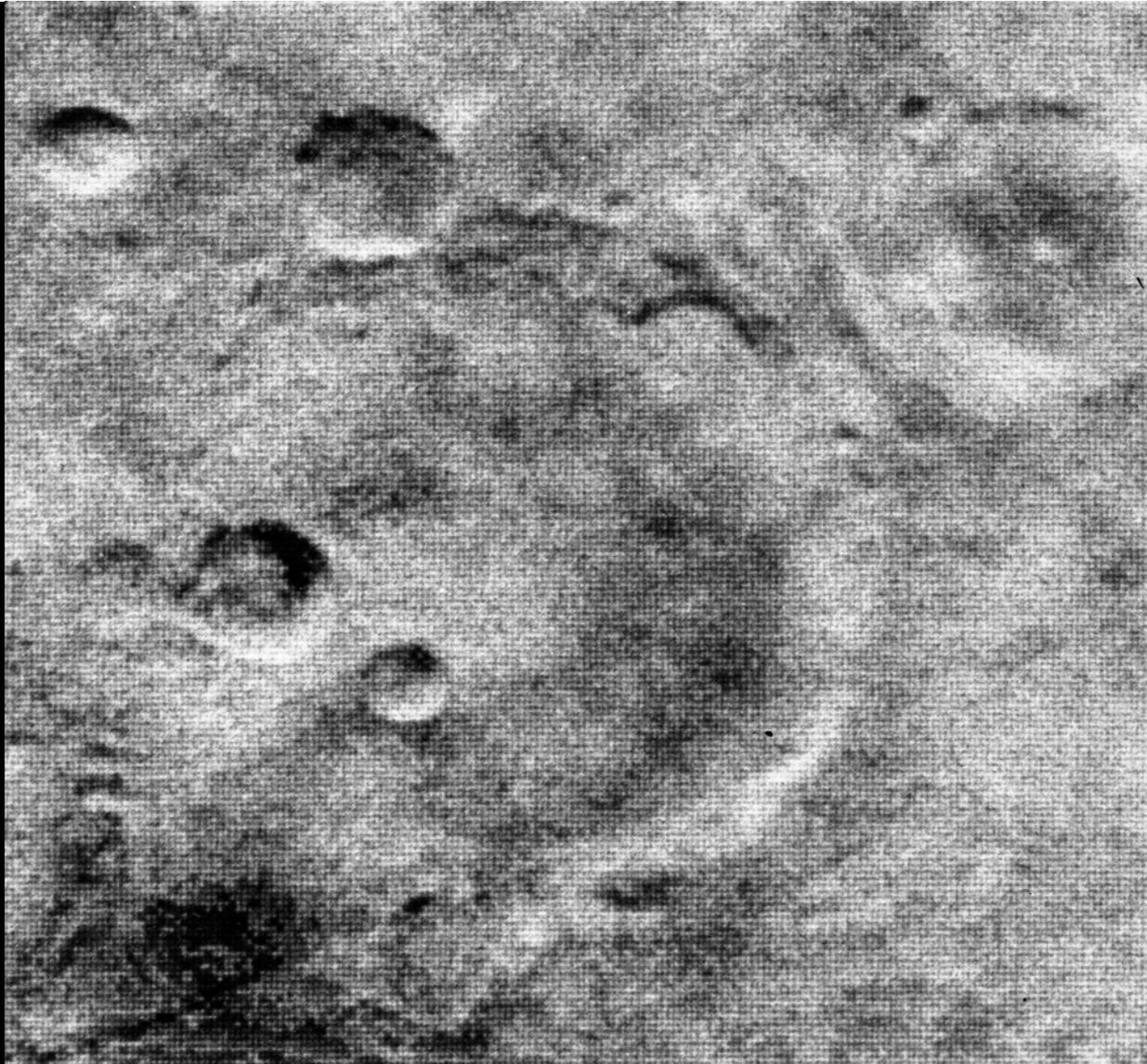


Image Credit: NASA/JPL

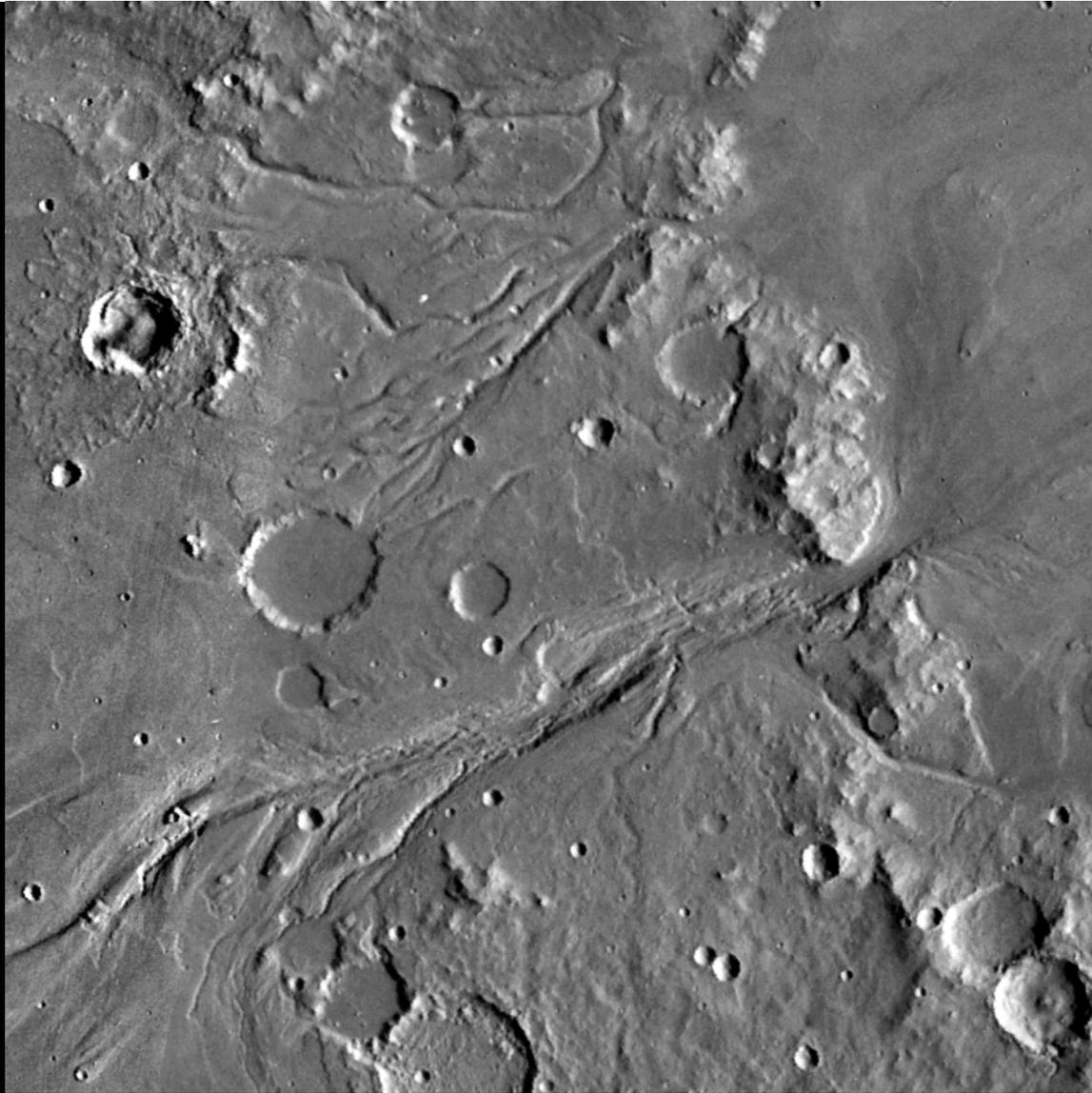
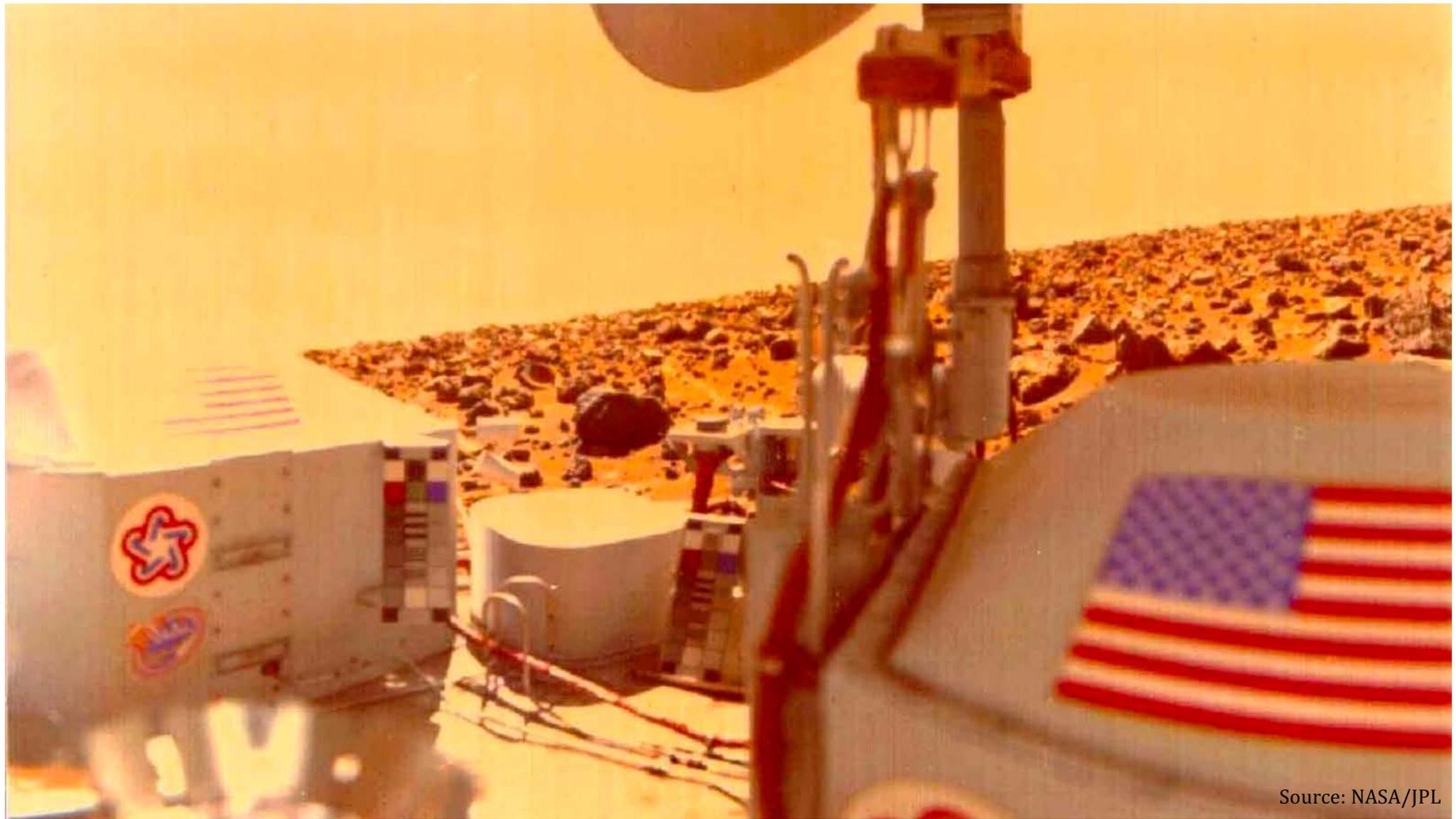


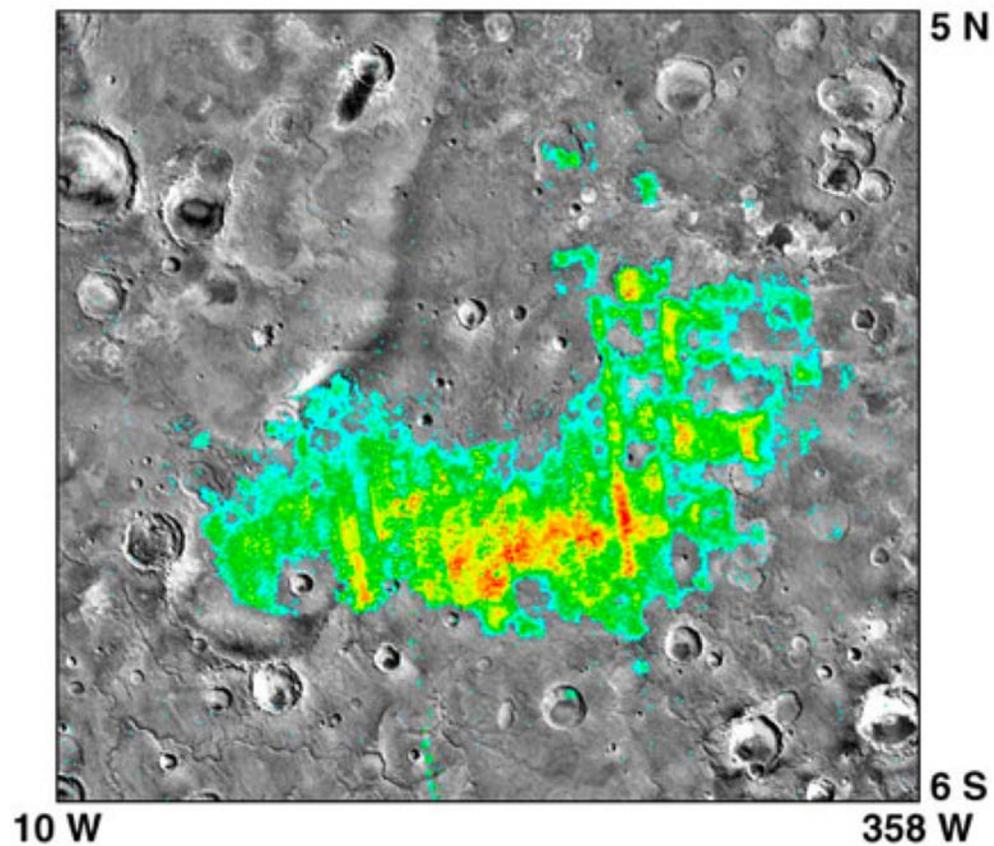
Image Credit: NASA/JPL



Source: NASA/JPL

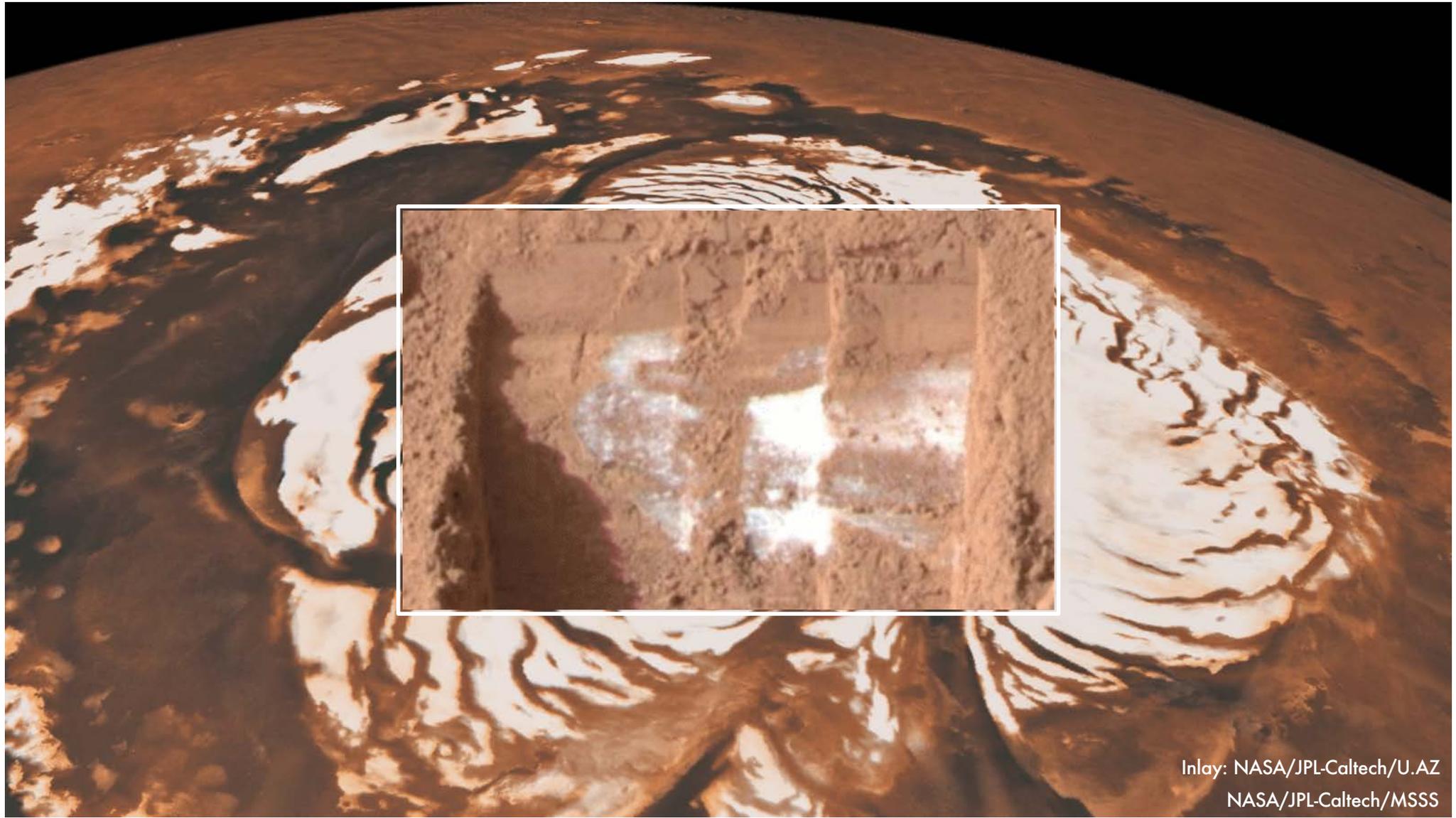


TES Hematite Abundance





Credit: NASA/JPL/
Cornell/US Geological Survey



Inlay: NASA/JPL-Caltech/U.AZ
NASA/JPL-Caltech/MSSS



Mission	Country	Launch	Result
Mars 2	USSR	1971	Failed during descent
Mars 3	USSR	1971	Operated for 110s
Mars 6	USSR	1973	Failed during descent
Mars 7	USSR	1973	Flew past Mars
Viking 1	USA	1975	Success
Viking 2	USA	1975	Success
Mars '96 (2)	USSR	1996	Launch vehicle failure
Mars Pathfinder	USA	1996	Success
Mars Polar Lander	USA	1998	Lithobraking / premature landing
DS-2 Microprobes (2)	USA	1998	No signal
Beagle II	UK / EU	2003	Solar array failure / loss of con
MER Spirit	USA	2003	Success
MER Opportunity	USA	2003	Success
Mars Phoenix	USA	2007	Success
Mars Curiosity	USA	2011	Success
Schiaparelli EDM	EU	2016	Lithobraking / prem





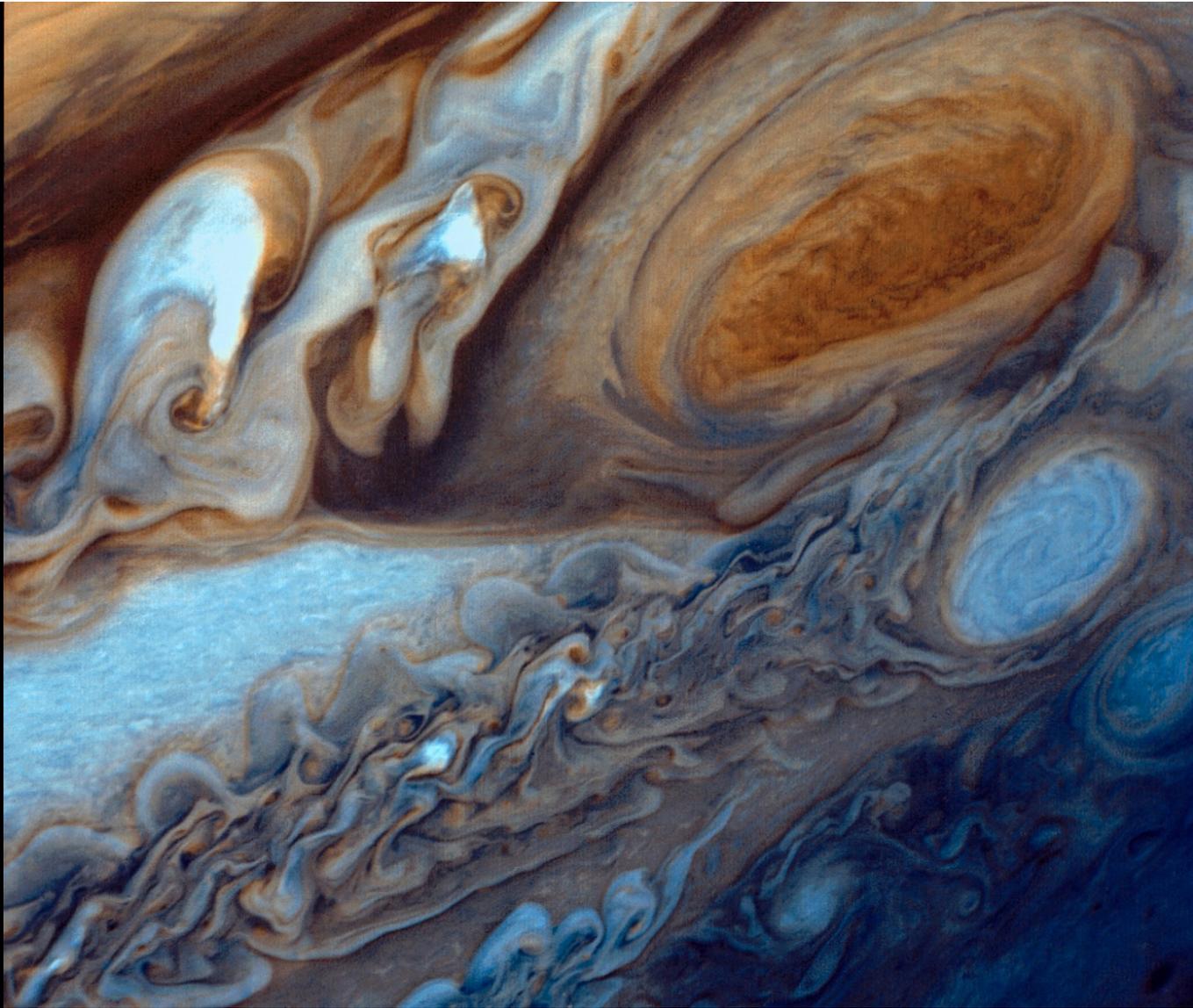


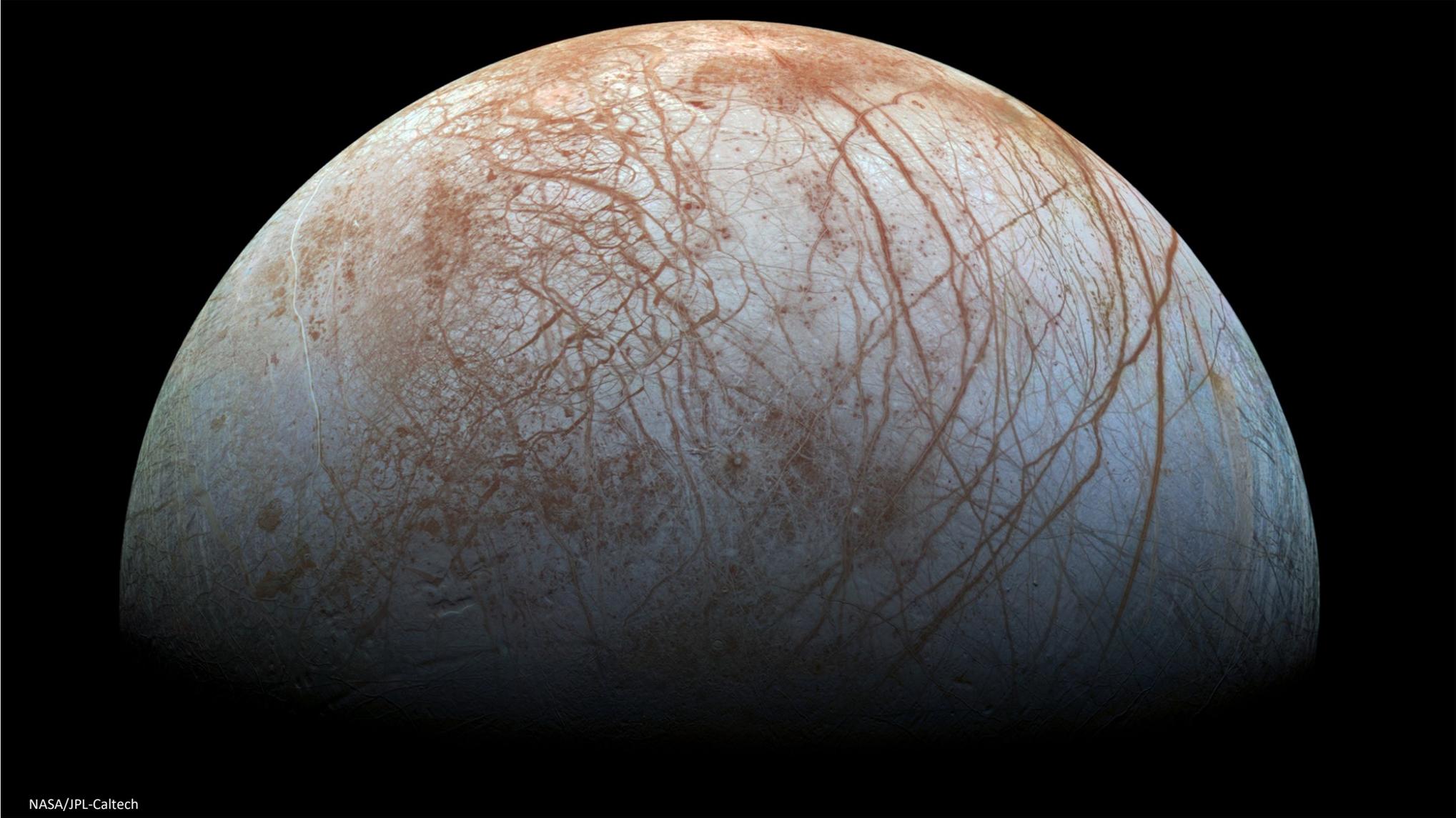


10 cm



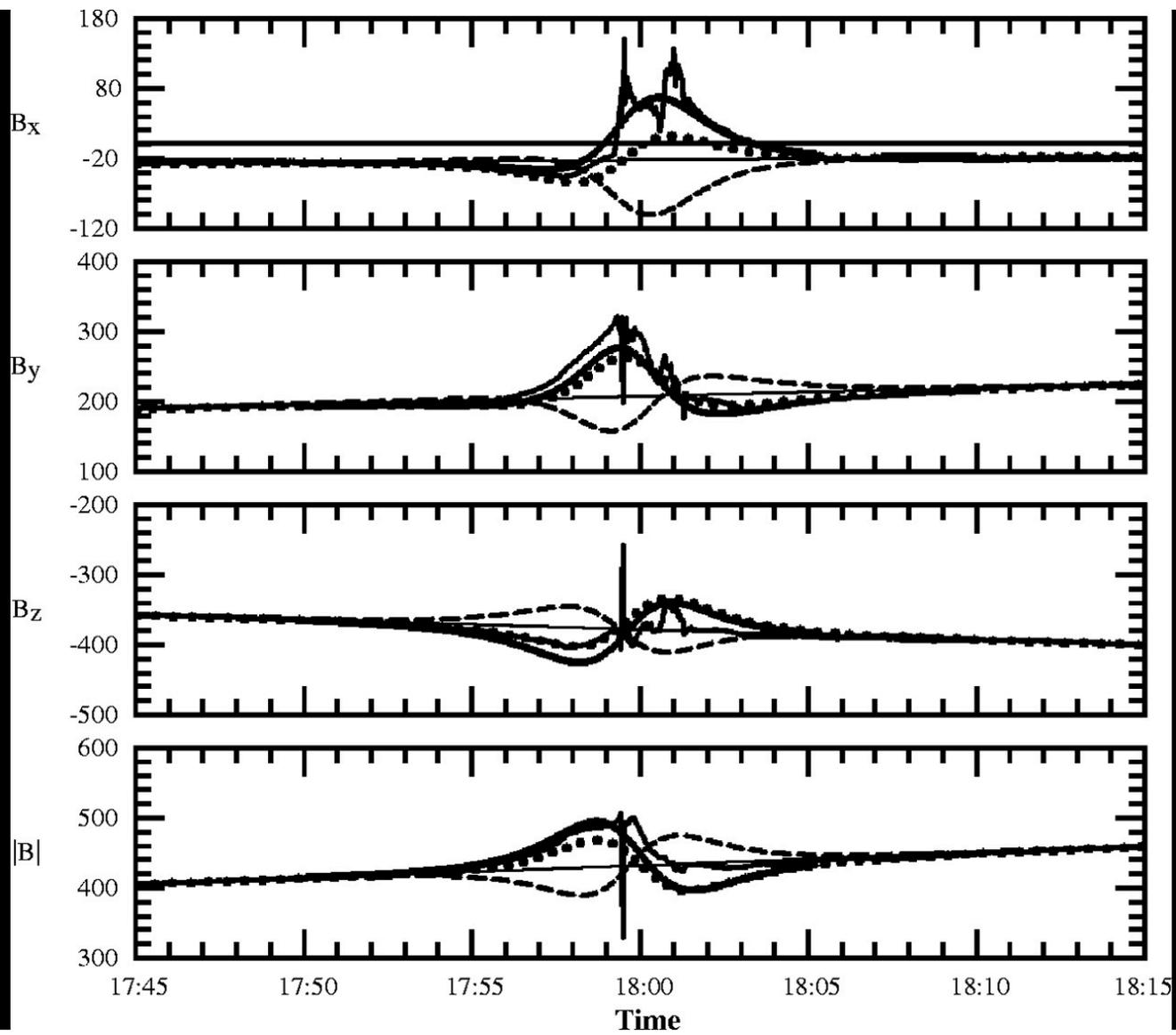
1 cm

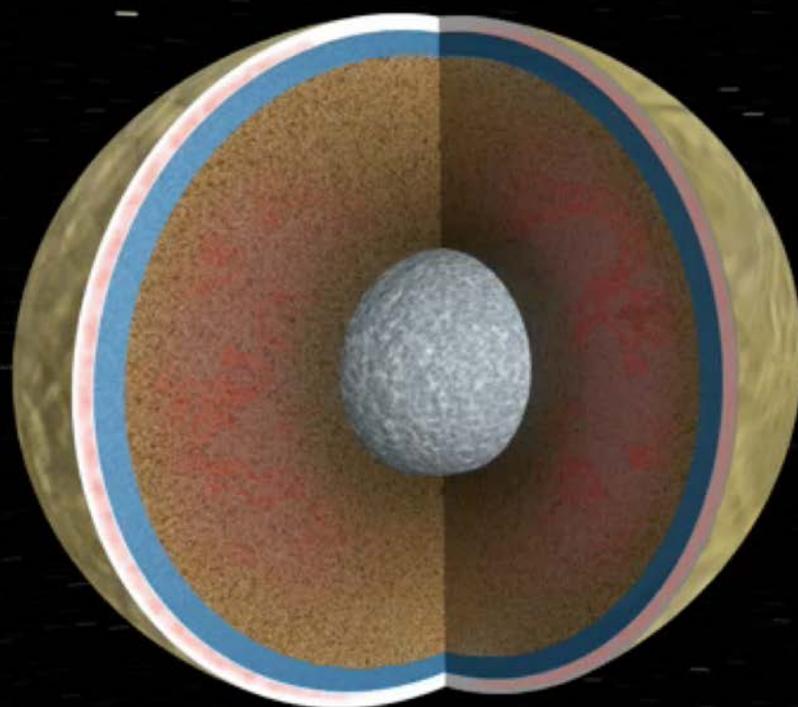
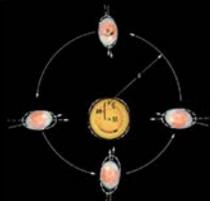


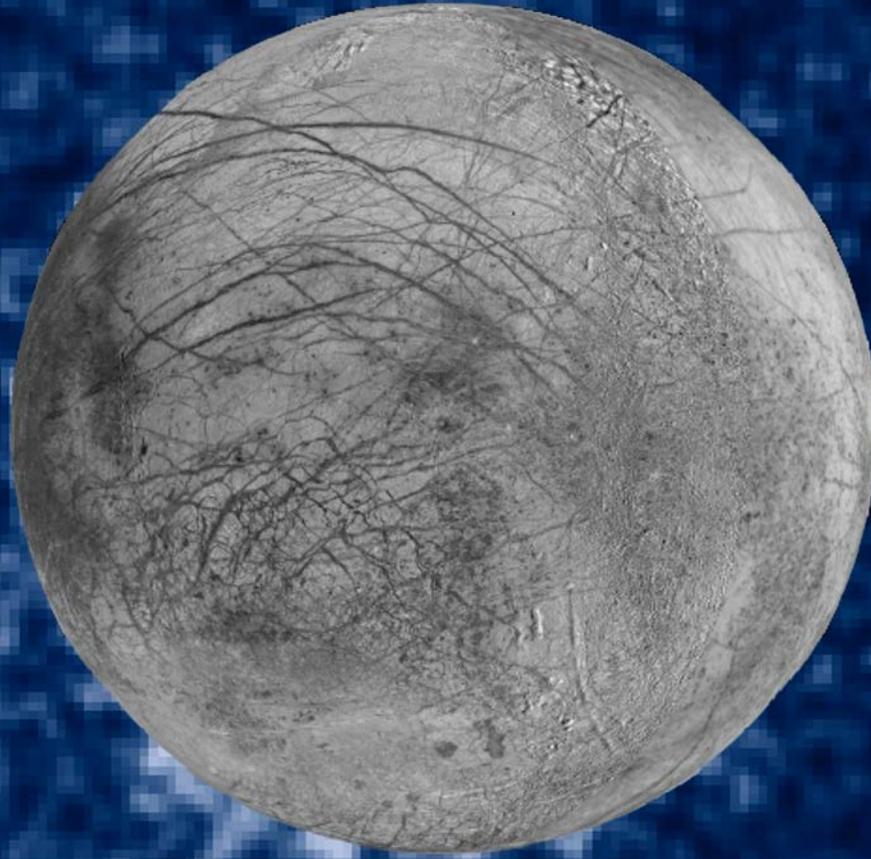


Margaret G. Kivelson*,
Krishan K. Khurana,
Christopher T. Russell,
Martin Volwerk,
Raymond J. Walker,
Christophe Zimmer

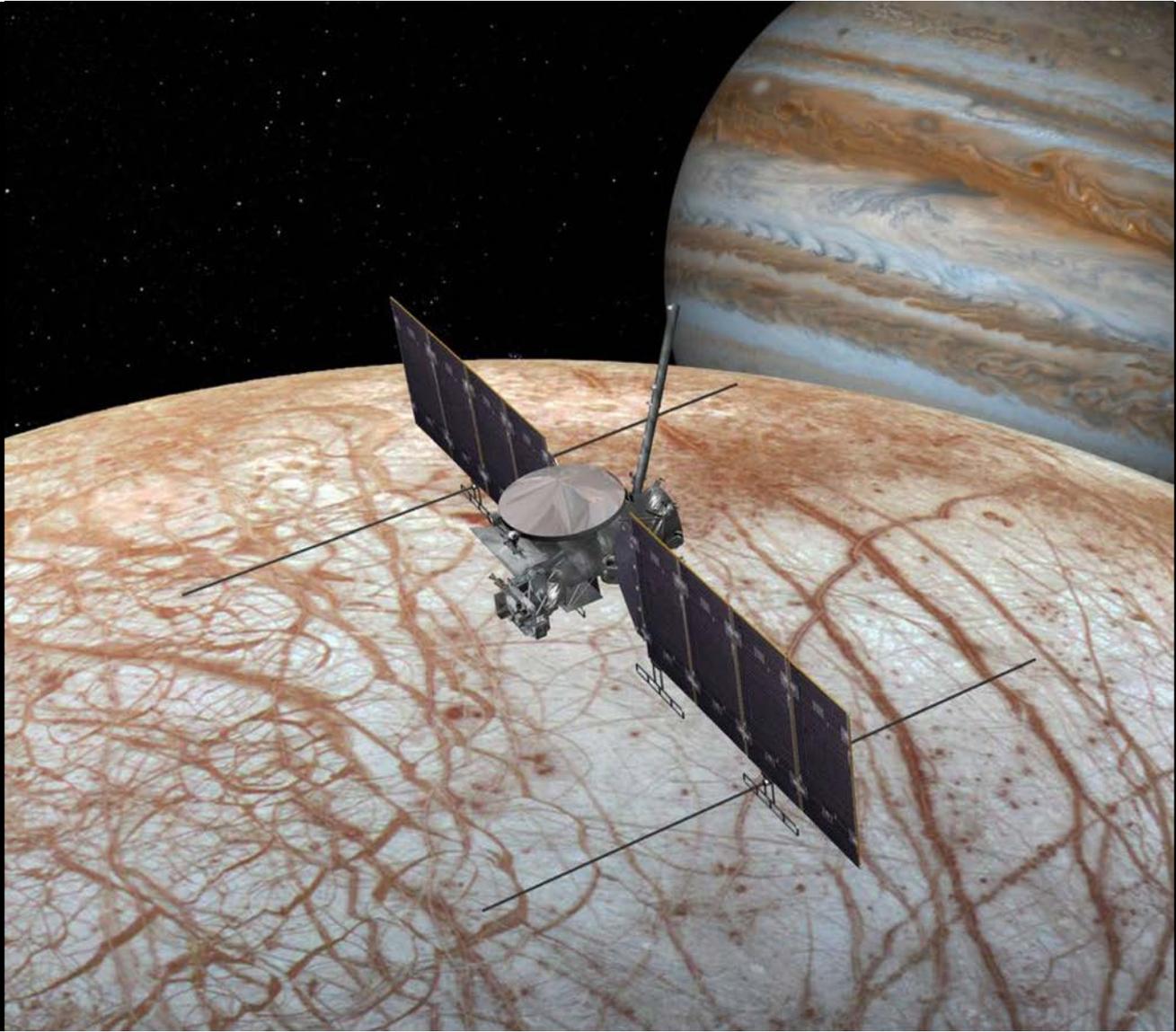
NASA/JPL

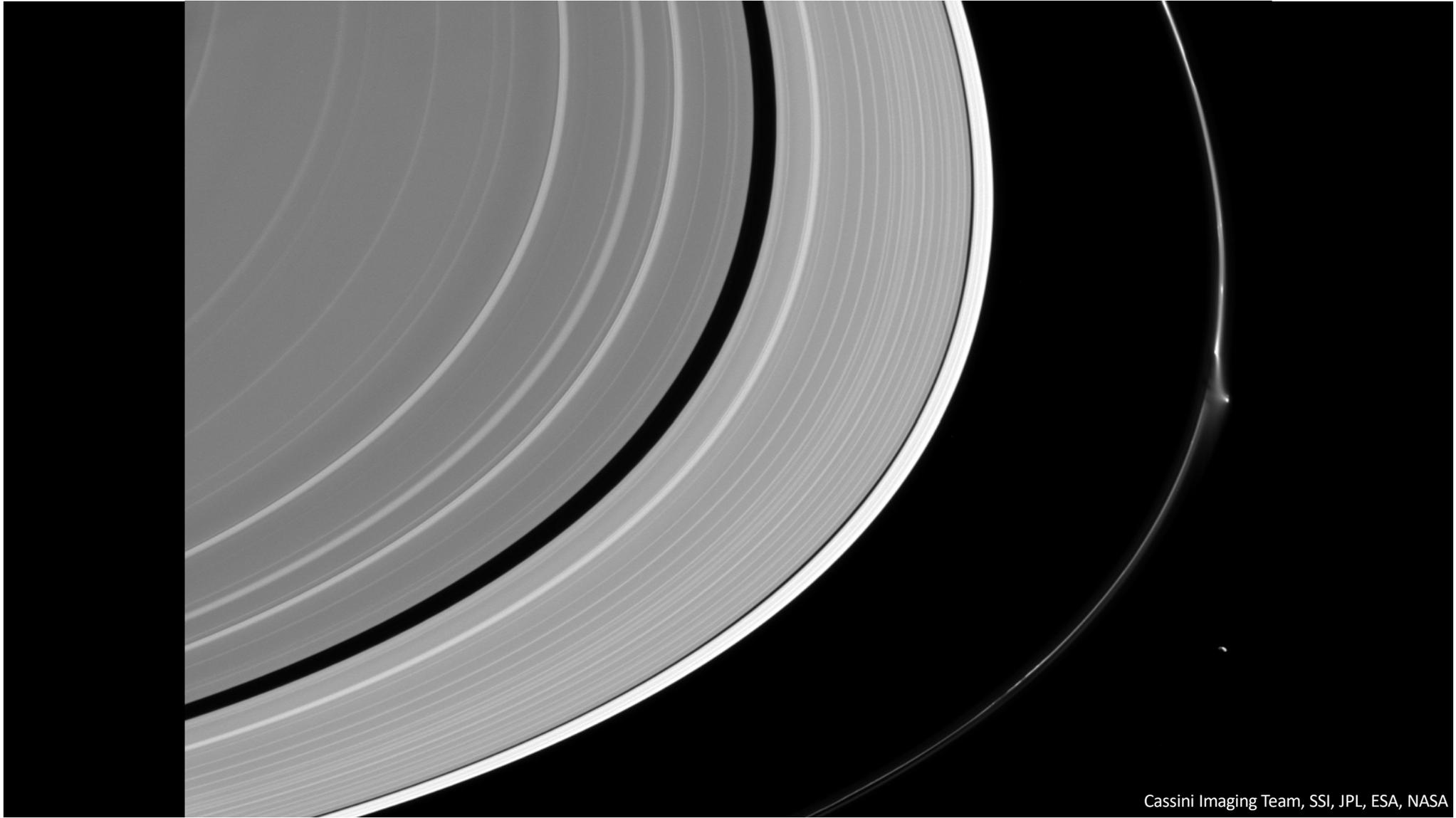




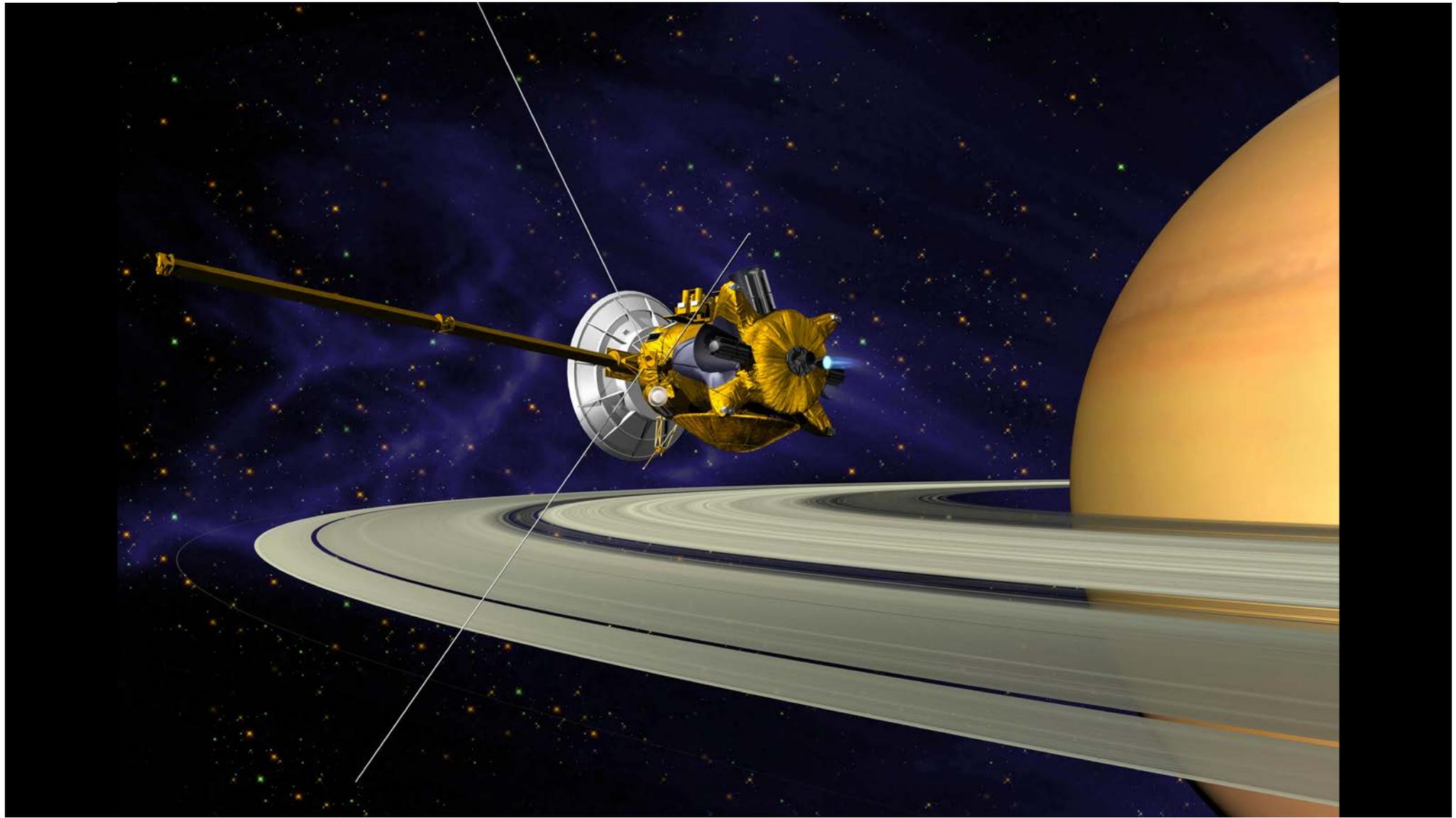


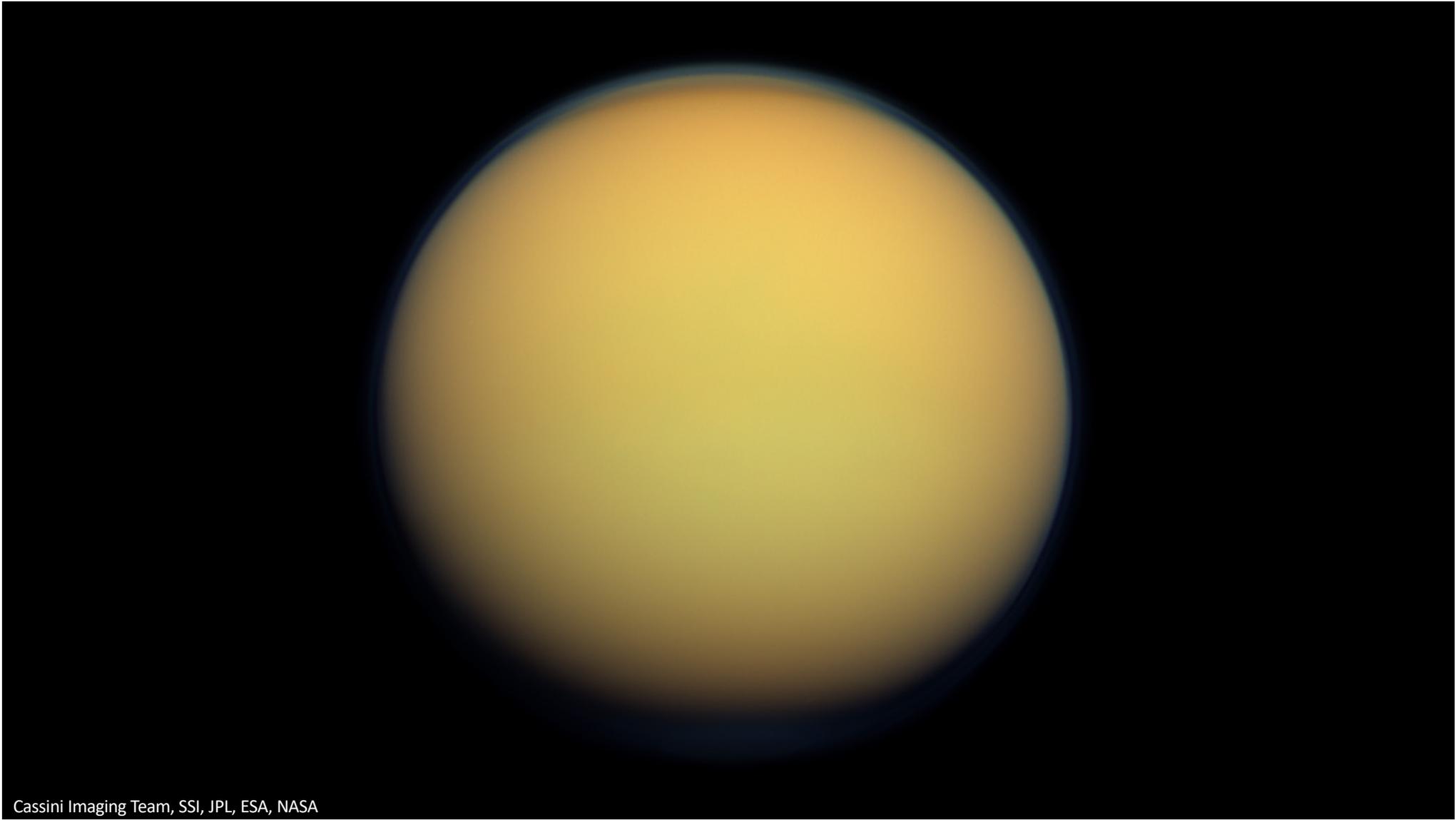
NASA, ESA, W. Sparks (STScI),
and the USGS Astrogeology Science Center



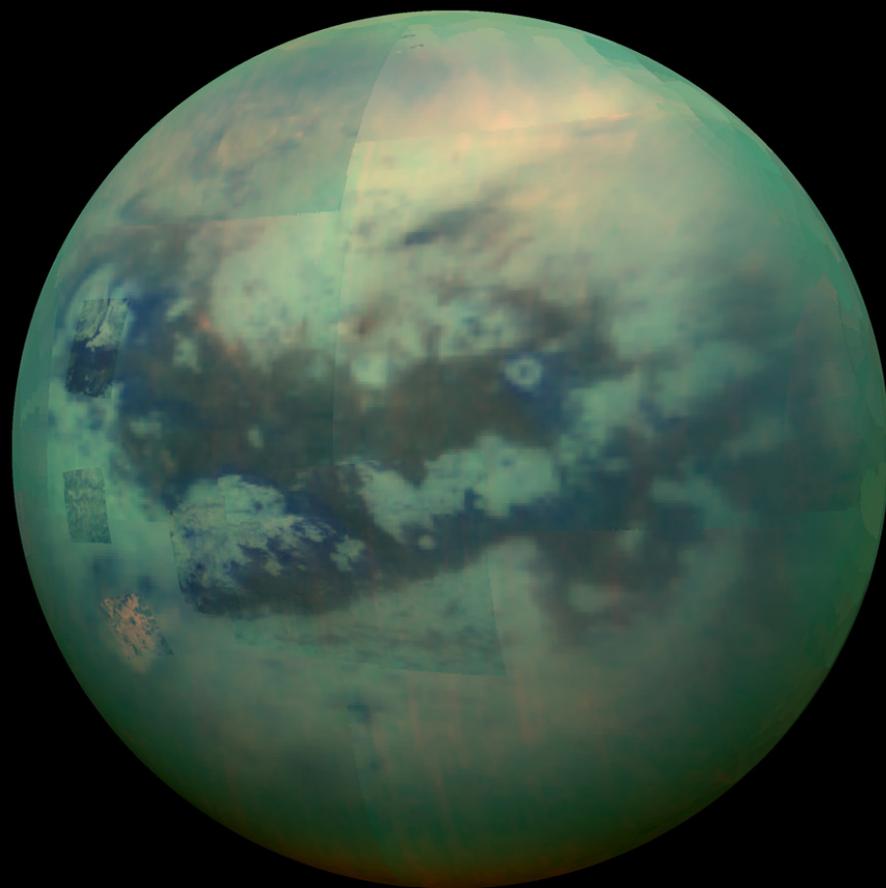


Cassini Imaging Team, SSI, JPL, ESA, NASA

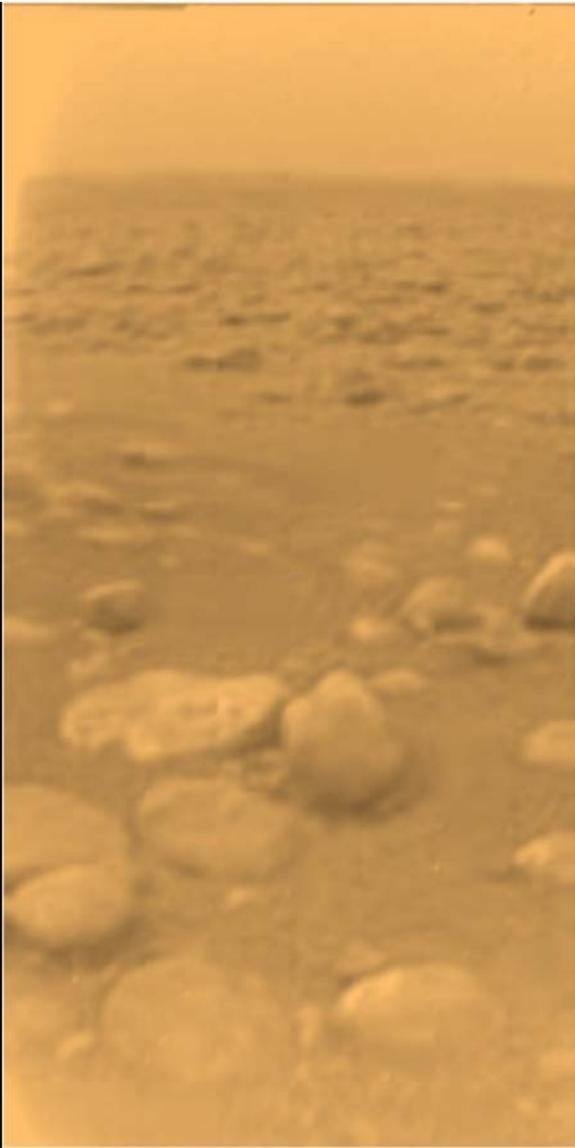


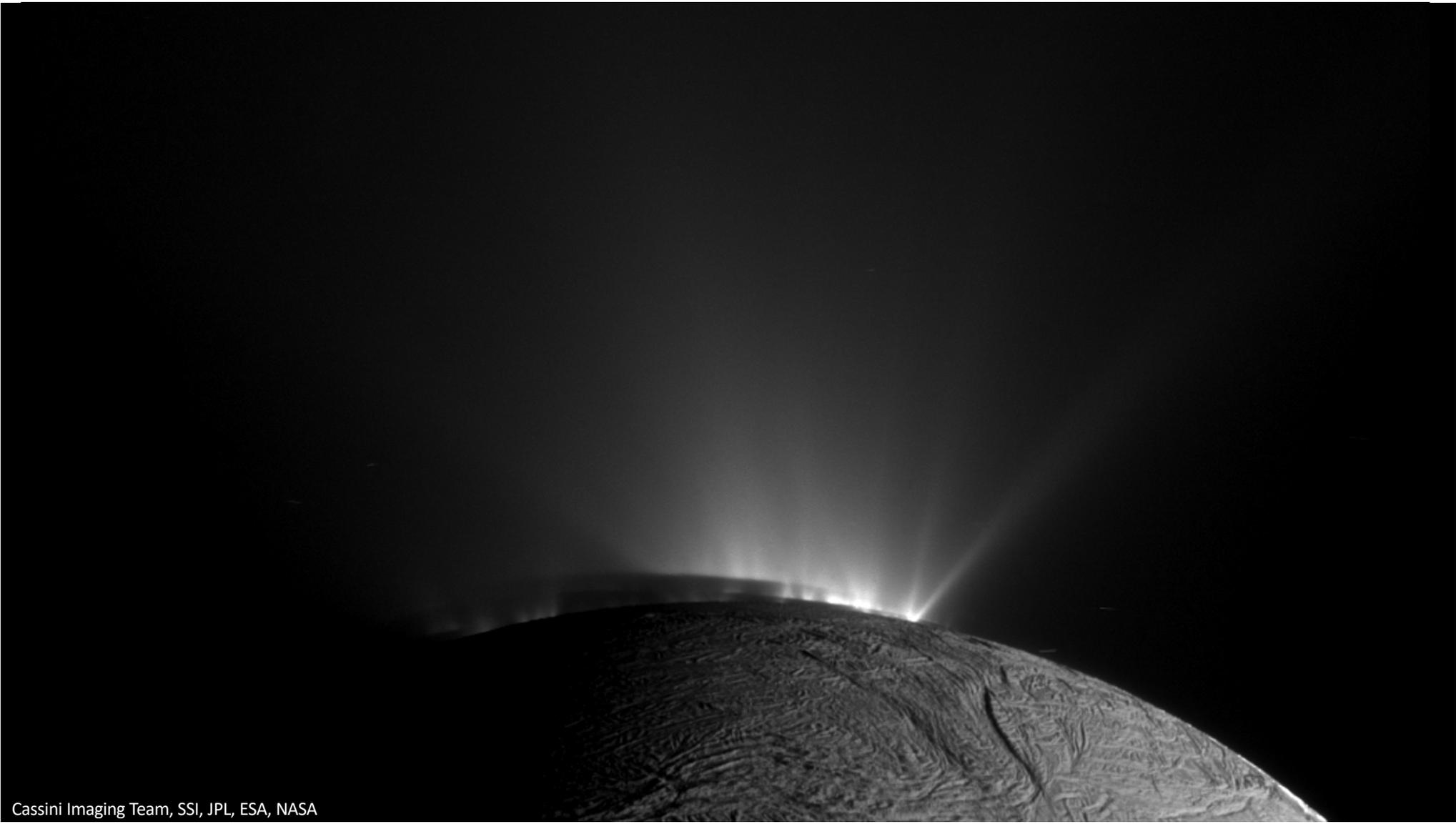


Cassini Imaging Team, SSI, JPL, ESA, NASA



Cassini Imaging Team, SSI, JPL, ESA, NASA

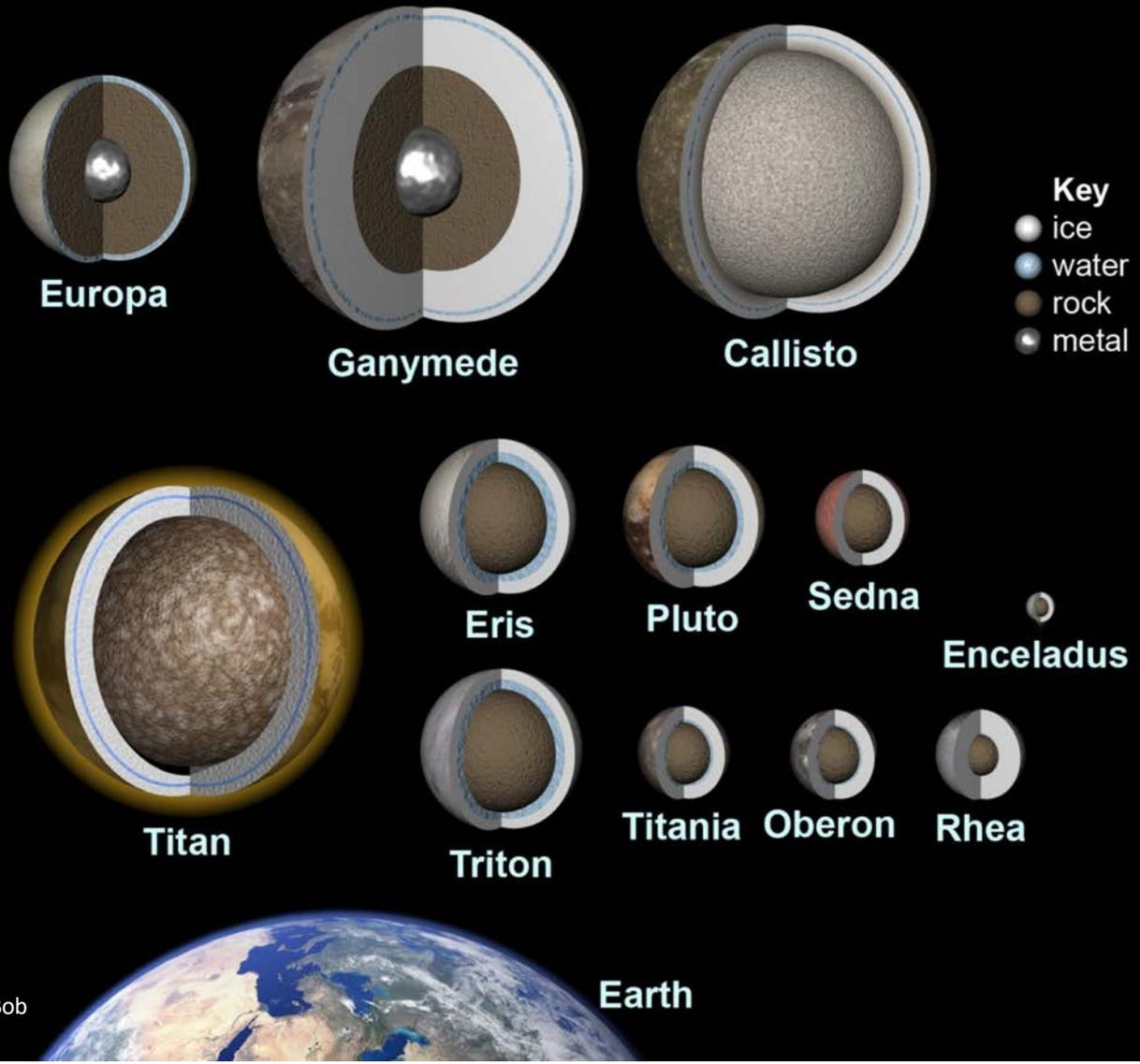




Cassini Imaging Team, SSI, JPL, ESA, NASA

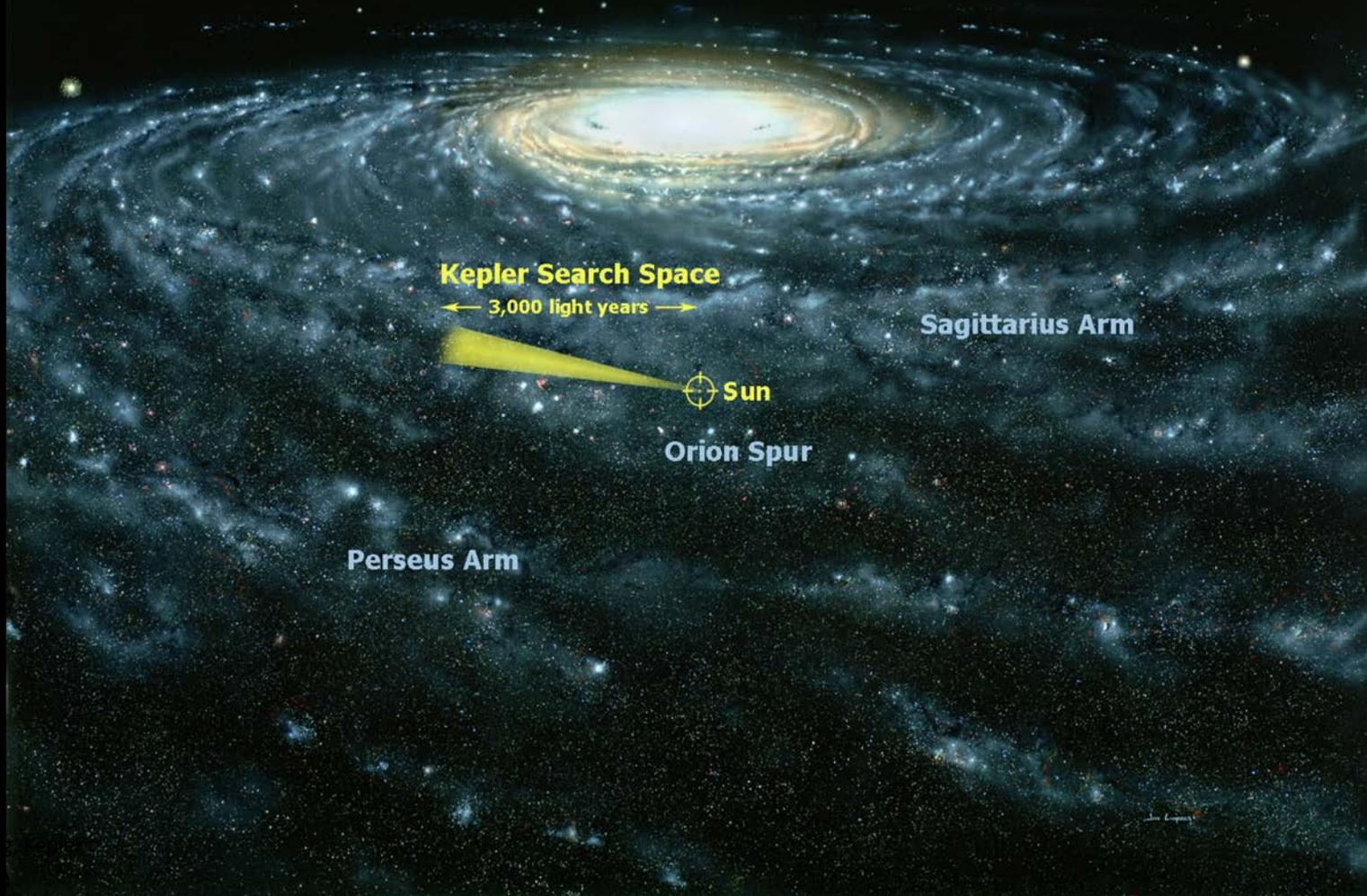


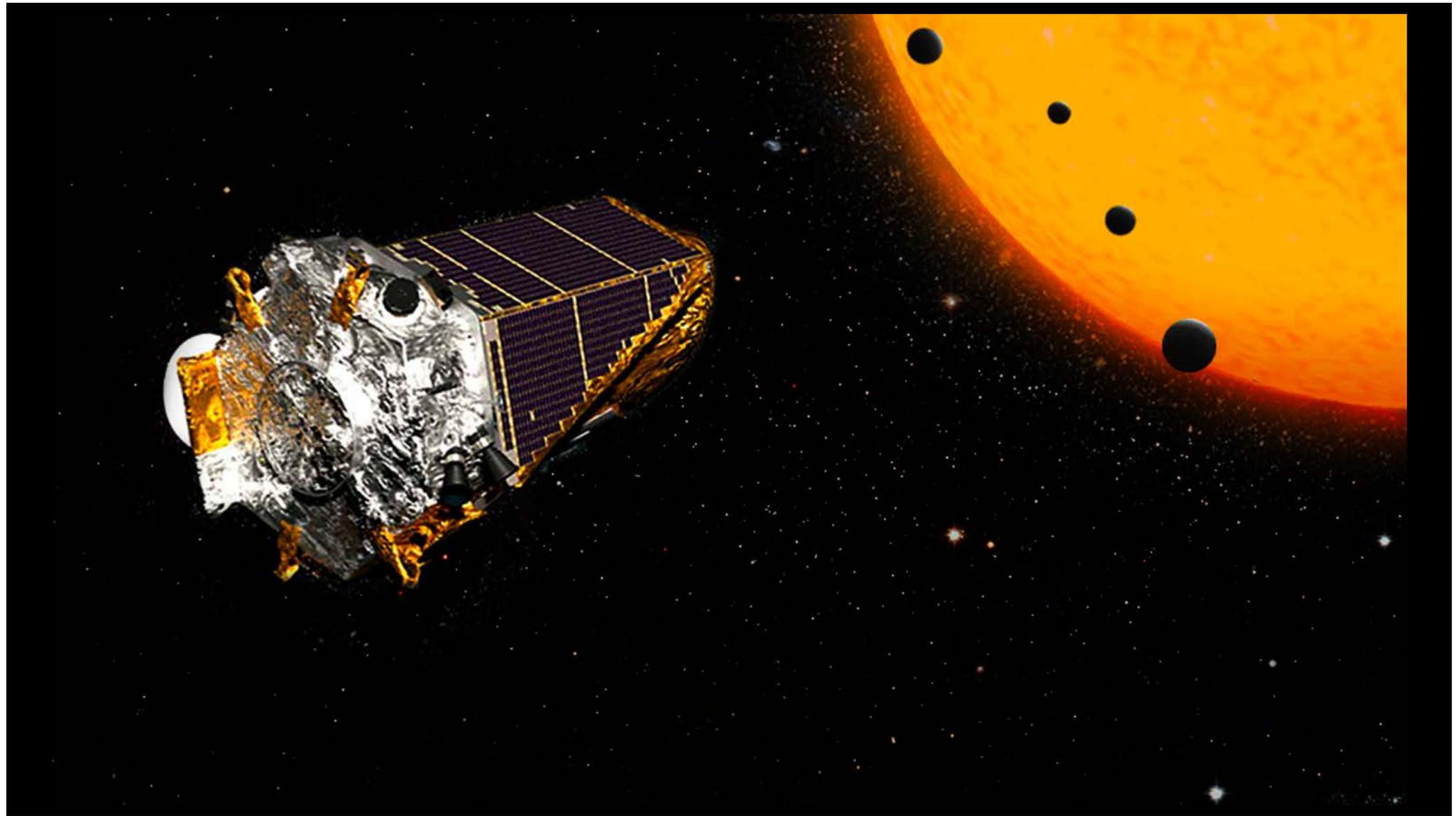
NASA / JHUAPL / SwRI

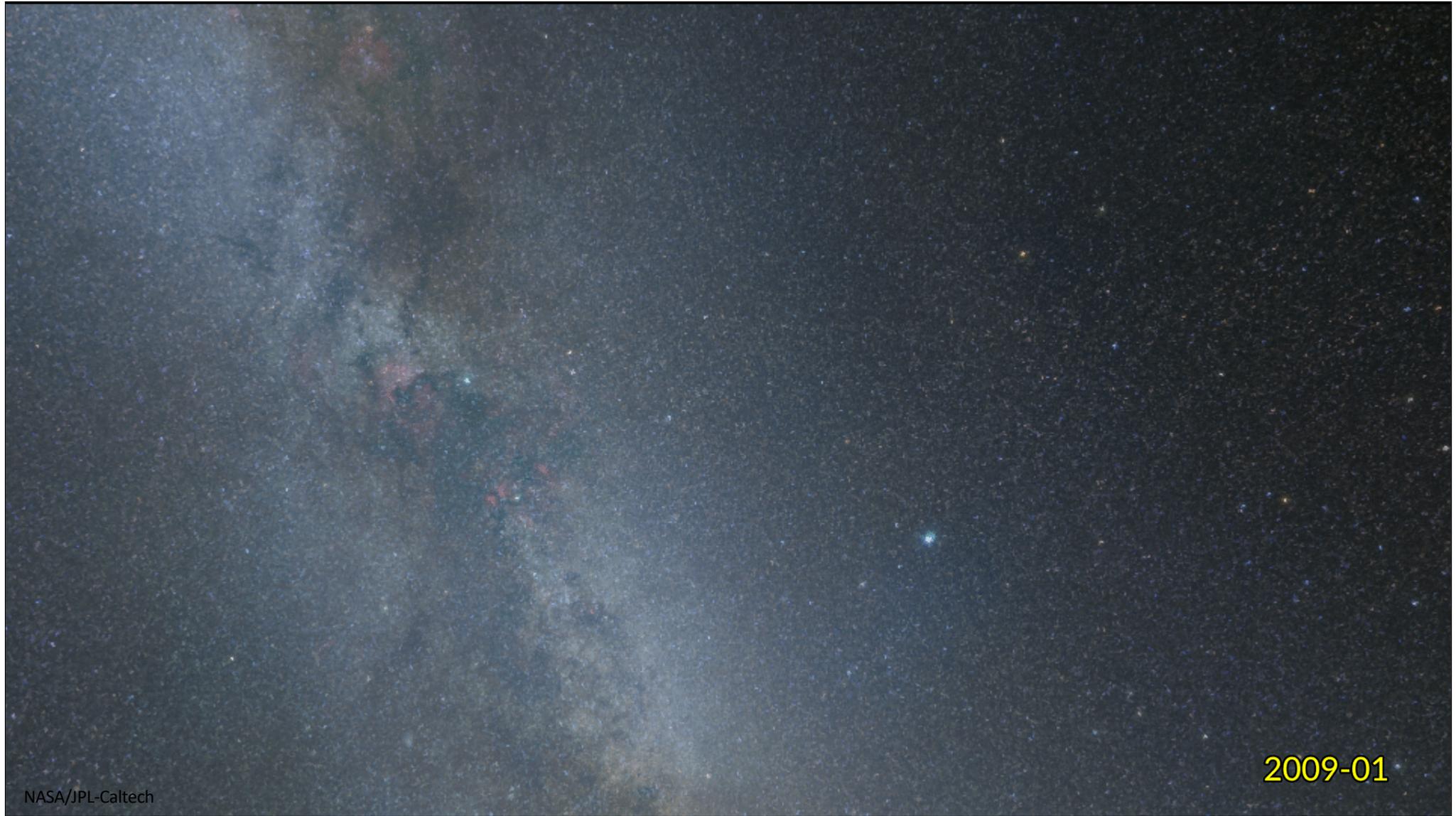


Doug Ellison, Emily Lakdawalla, and Bob Pappalardo

Milky Way Galaxy





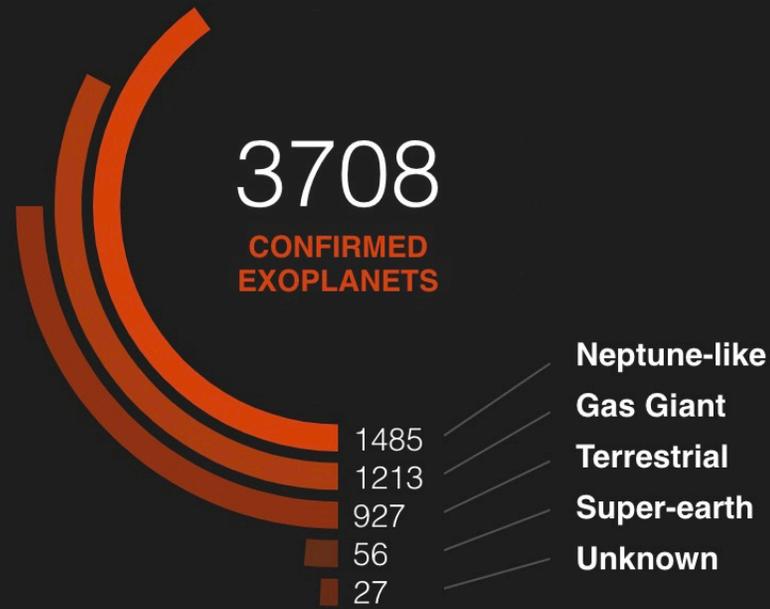


NASA/JPL-Caltech

2009-01

Planet Types

All Planets Kepler Candidates

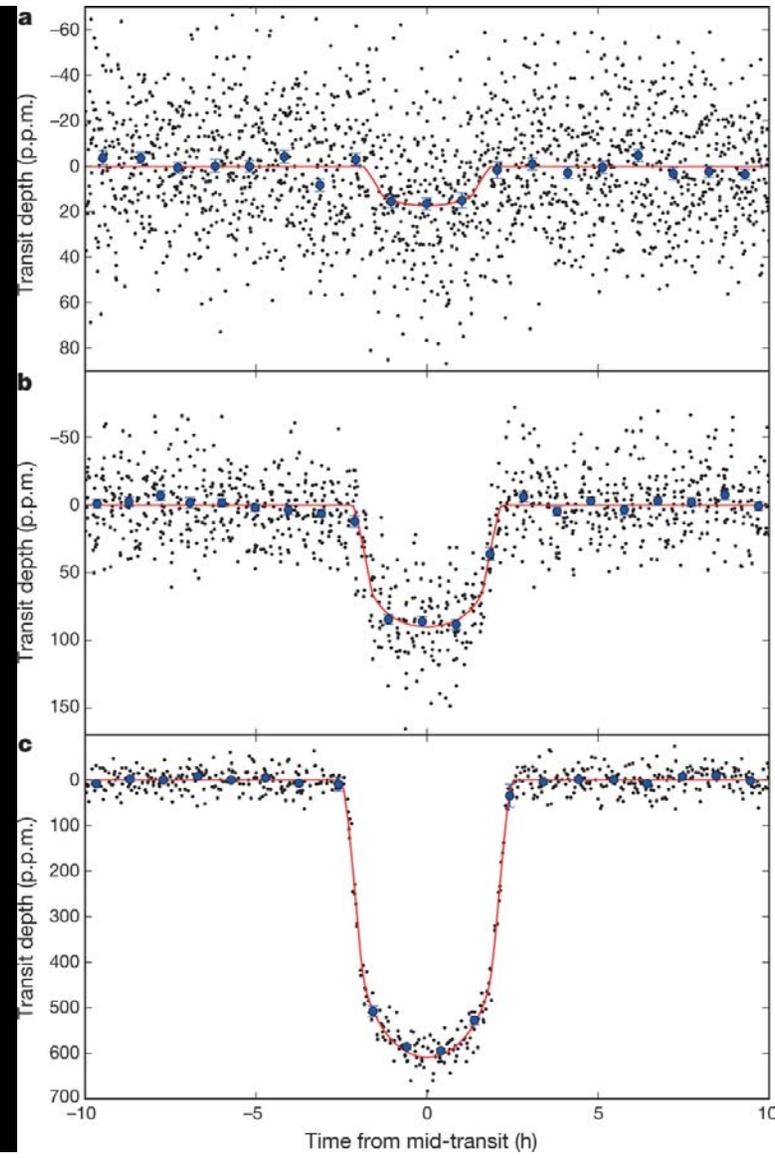


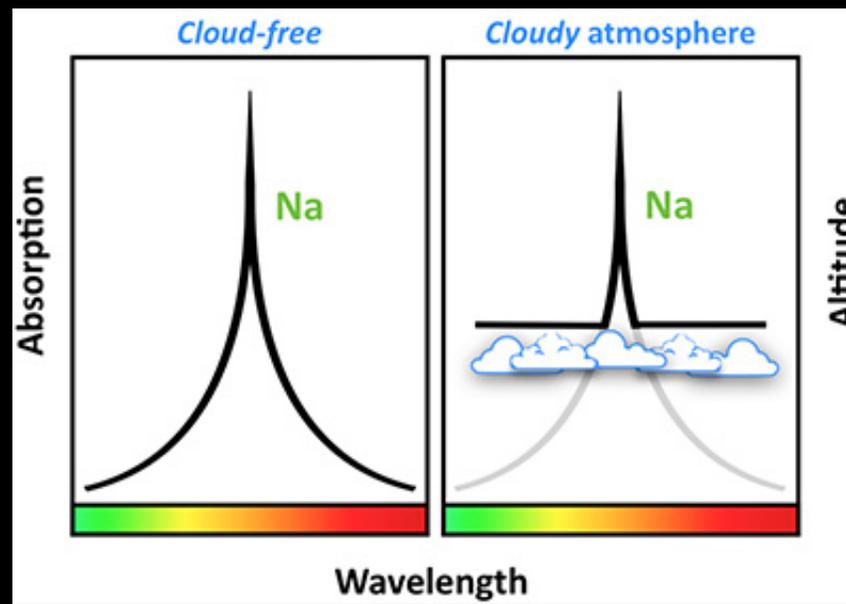


TRAPPIST-1 Star

TRAPPIST-1b

TRAPPIST-1c





Are we alone?

Probably not.

SOMETIMES I THINK THE
SUREST SIGN THAT INTELLIGENT
LIFE EXISTS ELSEWHERE IN
THE UNIVERSE IS THAT NONE
OF IT HAS TRIED TO CONTACT US.

by WATERSON

