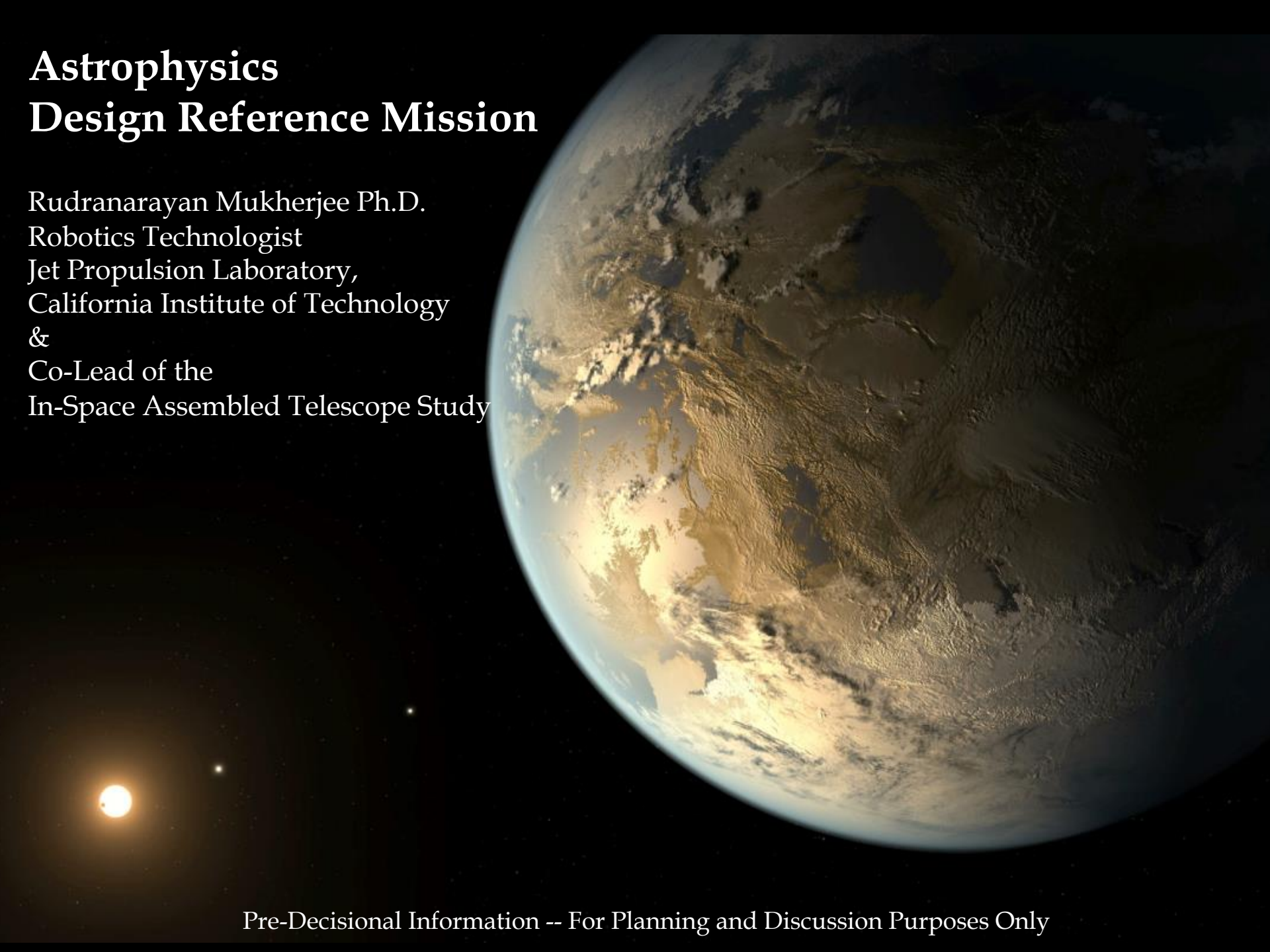
Astrophysics Design Reference Mission

Rudranarayan Mukherjee Ph.D.
Robotics Technologist
Jet Propulsion Laboratory,
California Institute of Technology
&
Co-Lead of the
In-Space Assembled Telescope Study



Exoplanet Science Strategy Report

Released September 5, 2018 by the National Academies

Recommendation #1:

NASA should lead a large strategic direct imaging mission capable of measuring the reflected-light spectra of temperate terrestrial planets orbiting Sun-like stars.

David Charbonneau (Harvard) Scott Gaudi (Ohio State University)

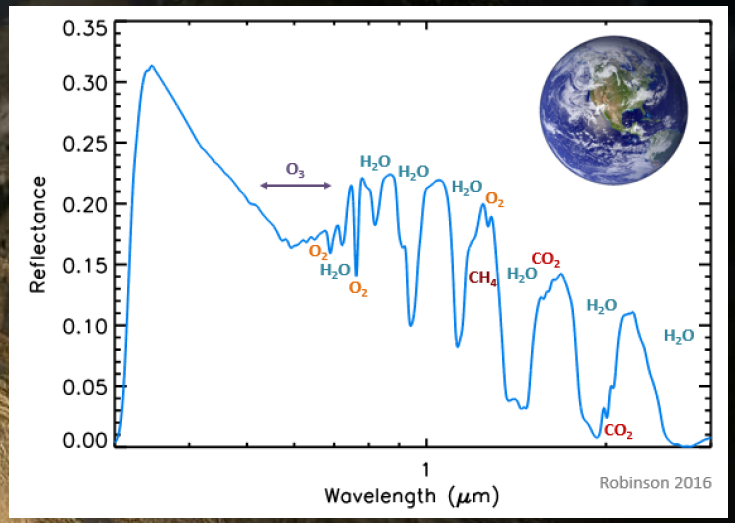
We now know that in our Galaxy…

Planets are common
(> 1 per star)

Planets with sizes
0.5-2 times Earth
are the most common

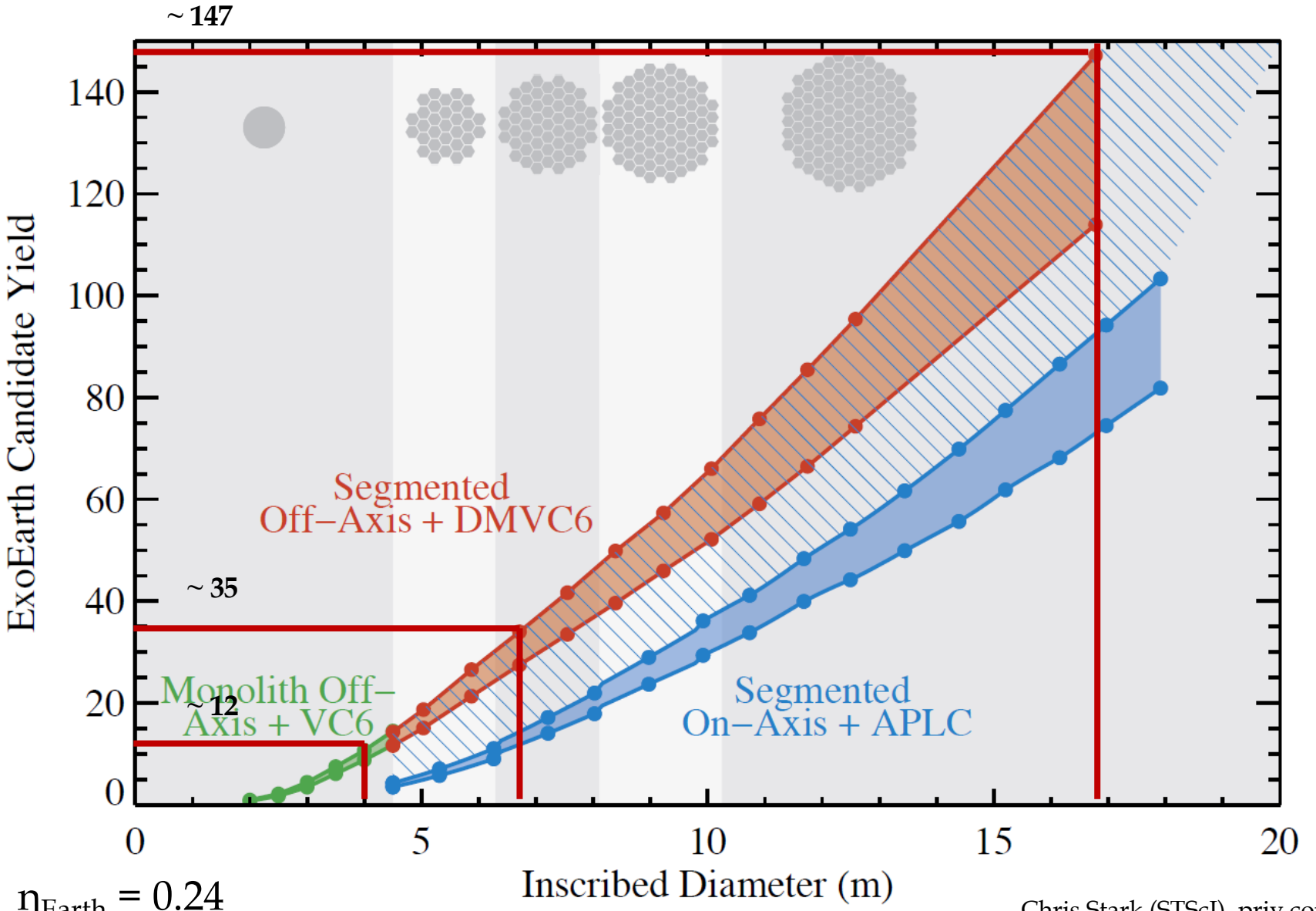
Earth-size planets in the
Habitable Zone are
common

…we're ready for the search for life



Exo-Earth Model Predictions

As a function of telescope aperture size; coronagraph architecture



η_{Earth} = 0.24

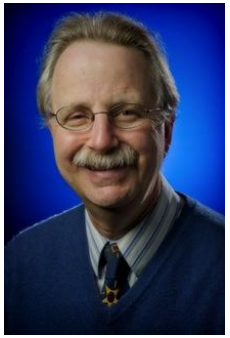
Chris Stark (STScI), priv comm

In-Space Assembly and Servicing Workshop, GSFC Nov 2017

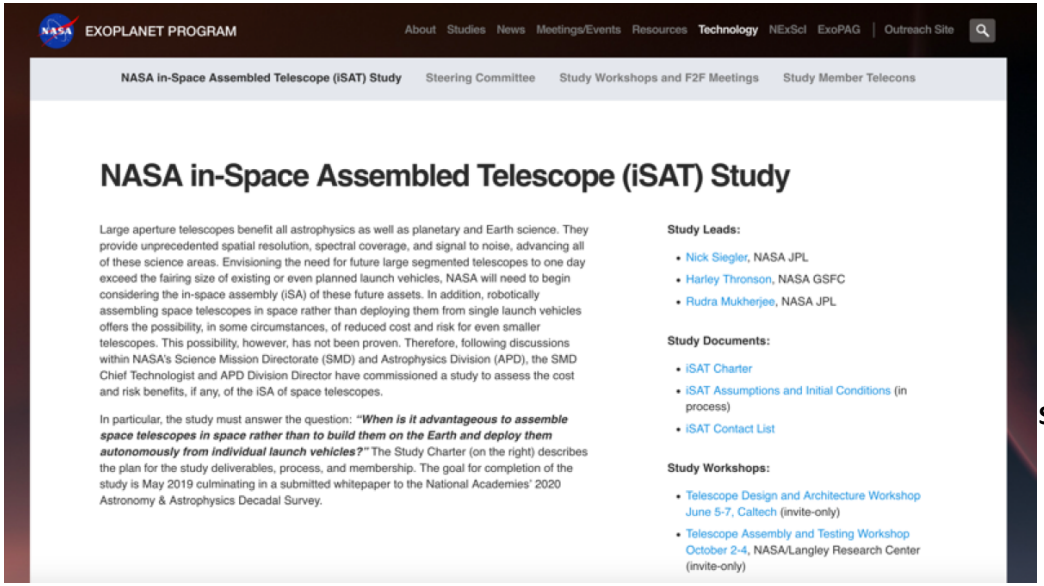
70+ participants from government, industry, and academia

NASA In-Space Assembled Telescope (ISAT) Study

https://exoplanets.nasa.gov/exep/technology/in-space-assembly/iSAT_study/



Sponsor
Dr. Paul Hertz
Director
Astrophysics Division
NASA Headquarters



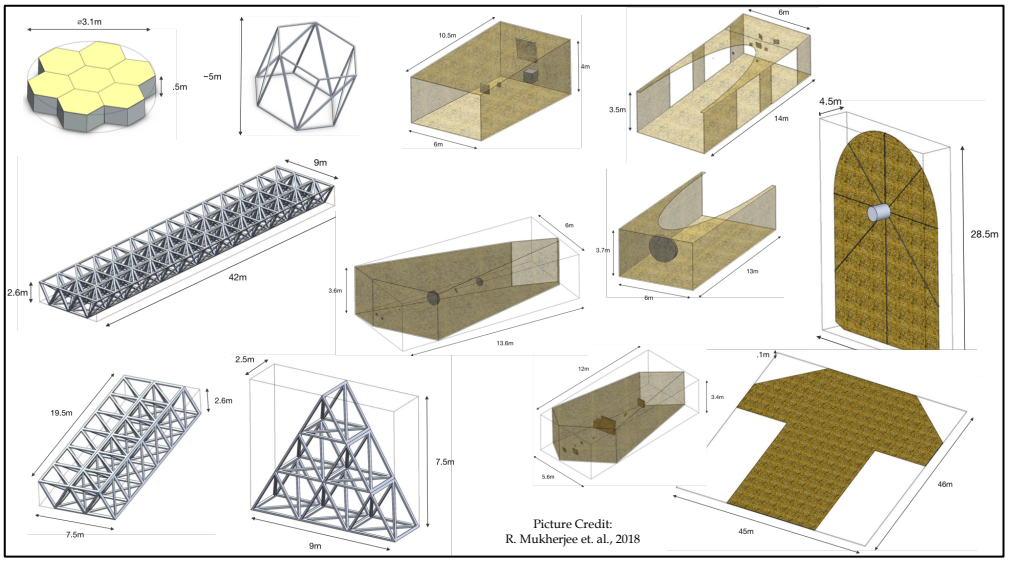
Sponsor
Mike Seablom
Chief Technologist
Science Mission Directorate
NASA Headquarters

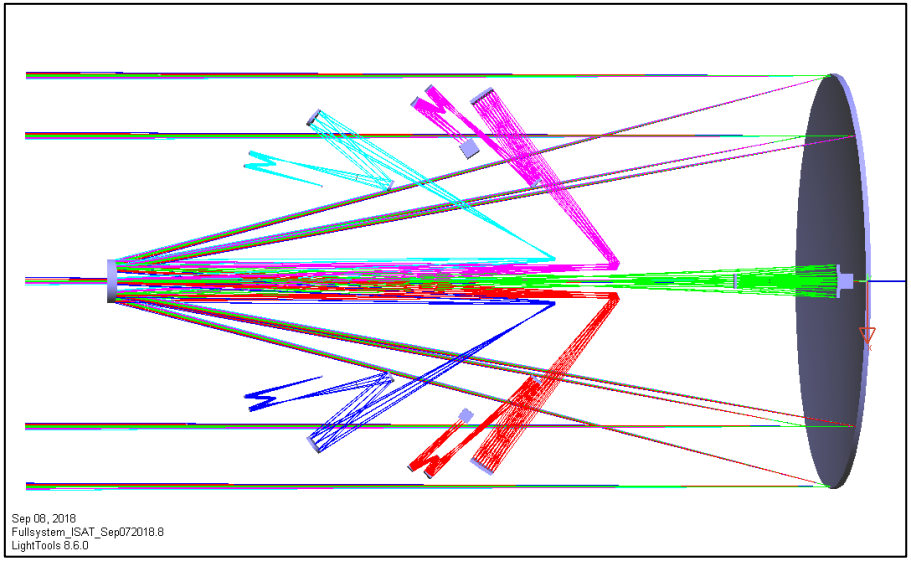
Study Objective:

"When is it worth assembling space telescopes in space rather than building them on the Earth and deploying them autonomously from single launch vehicles?"

Telescope Design and Architecture F2F Meeting I, Caltech, June 2018

47 Invited Participants from government, industry, and academia with primary expertise in astrophysics

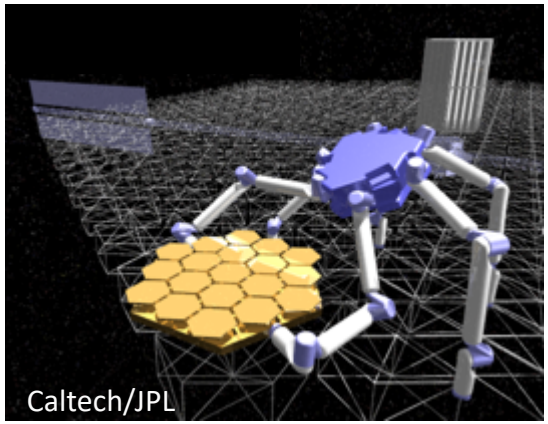


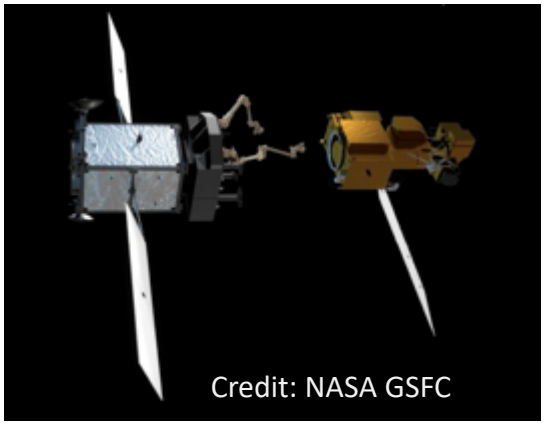


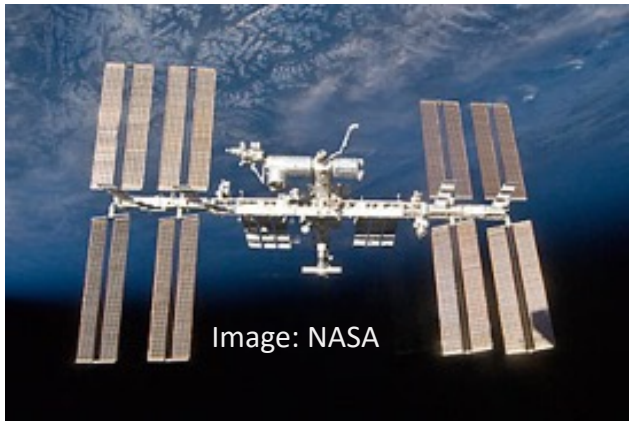
A 20-meter, filled-aperture, non-cryogenic, serviceable telescope operating at UV/V/NIR with coronagraph

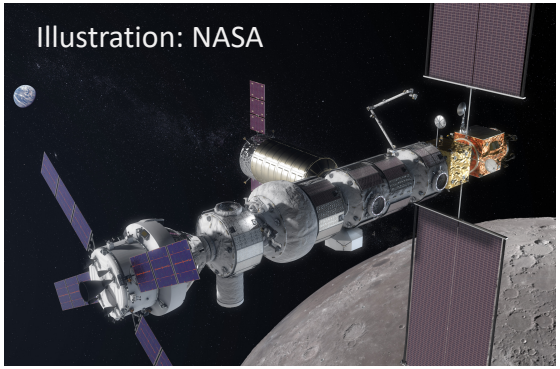
Telescope Assembly and Infrastructure Face- to-Face Meeting
NASA Langley Research Center, Oct 2-4, 2018

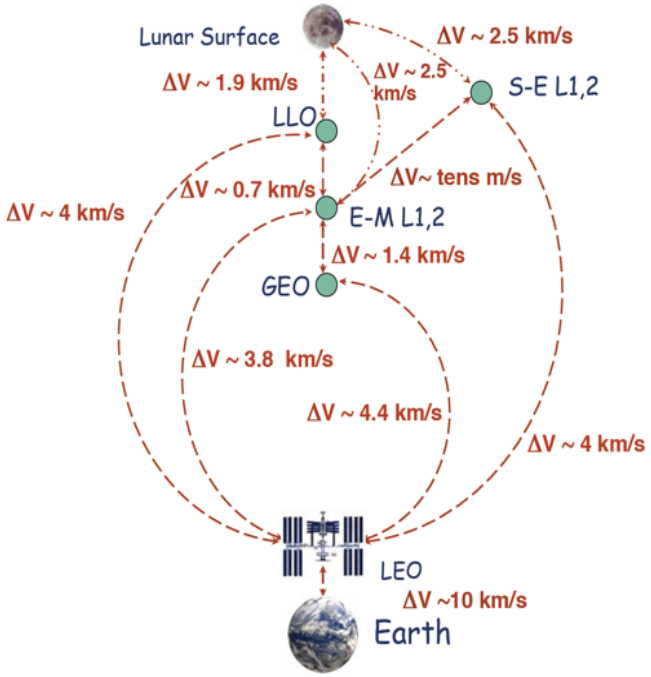
60~ participants from 5 NASA centers, 14 companies, 4 gov't agencies, 4 professors & graduate students

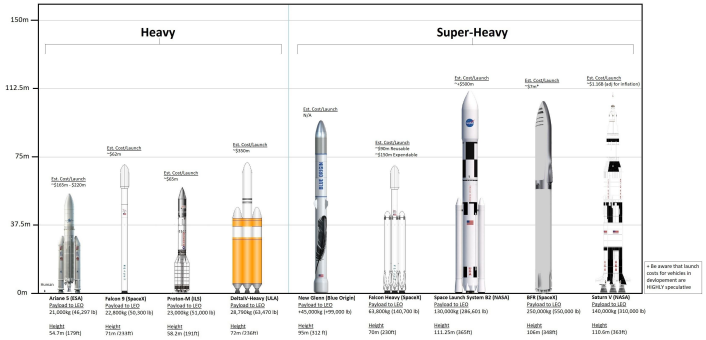












DRM: A 20-meter, filled-aperture, non-cryogenic, serviceable telescope with coronagraph operating at UV/V/NIR assembled at Cis-Lunar environment using supervised autonomy robotics for >30 year operations at SE-L2

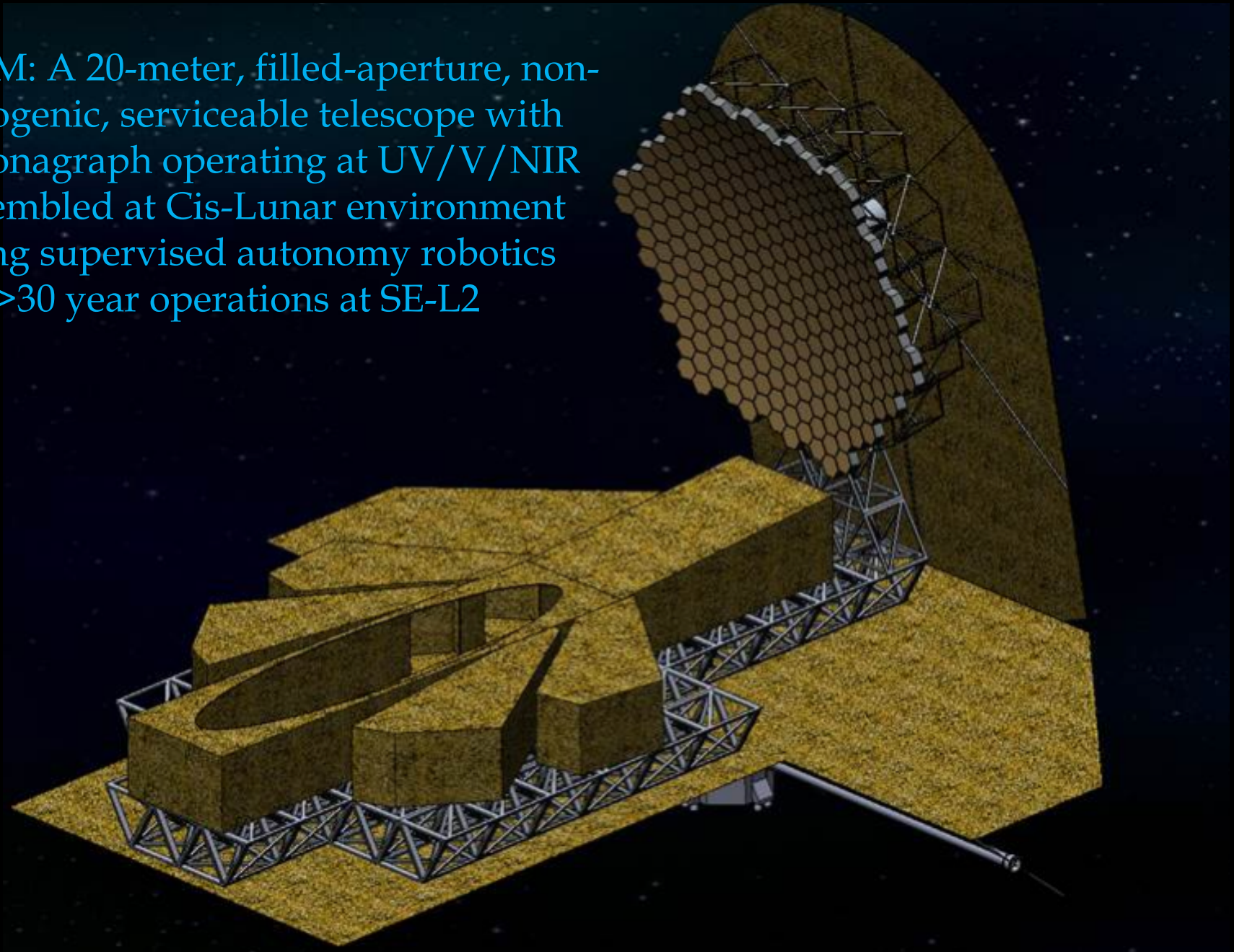


Image Credit: R. Mukherjee et. al. 2018