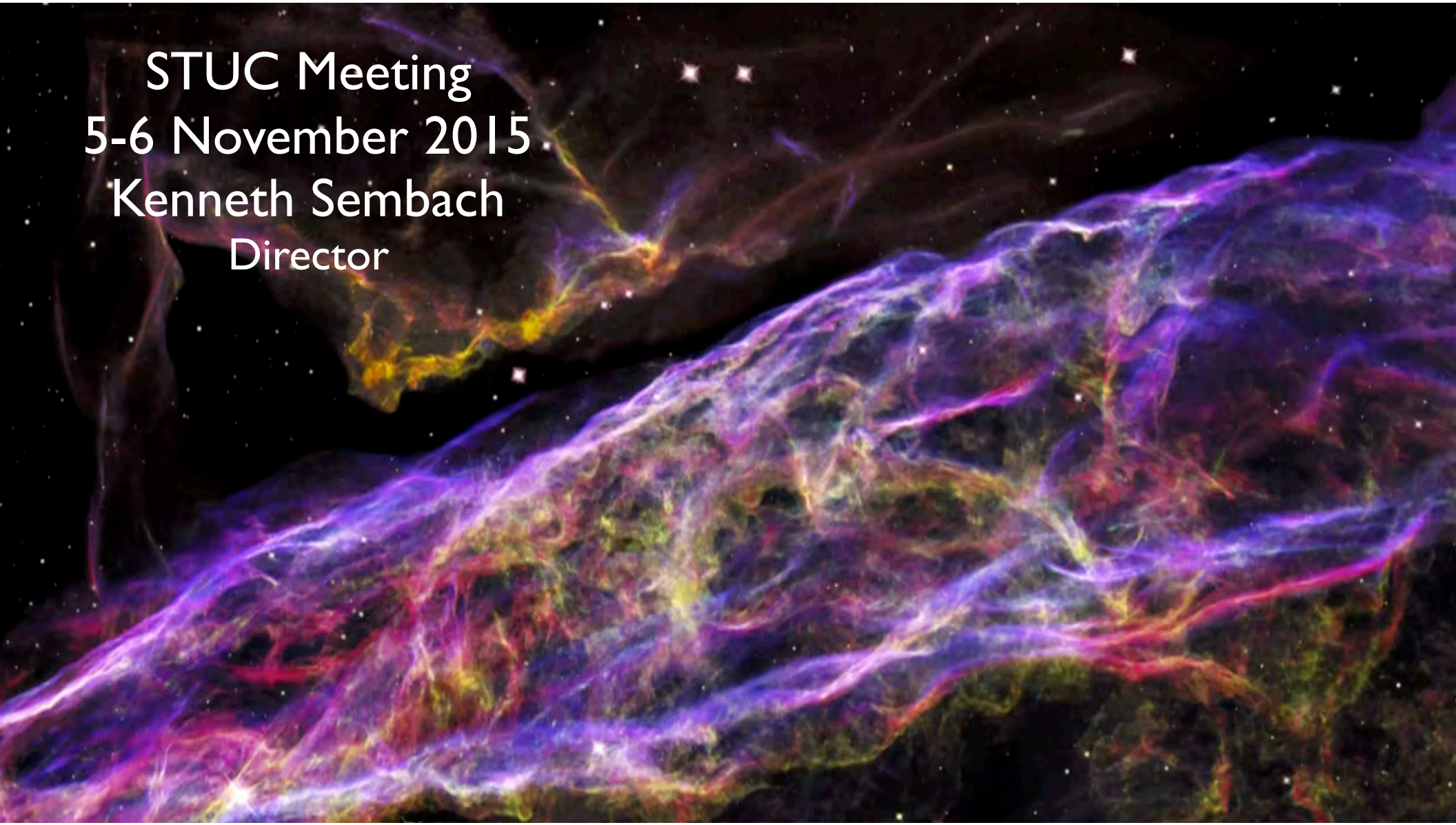
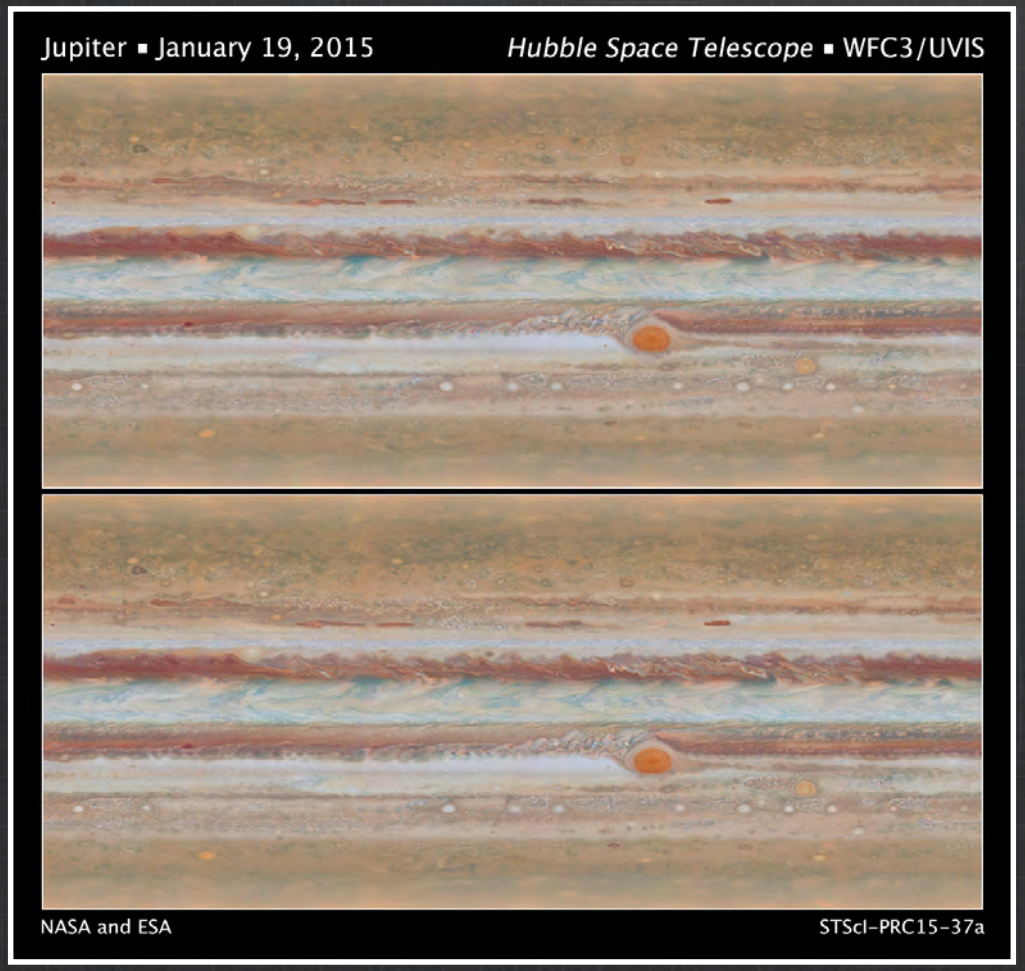

STUC Meeting
5-6 November 2015
Kenneth Sembach
Director

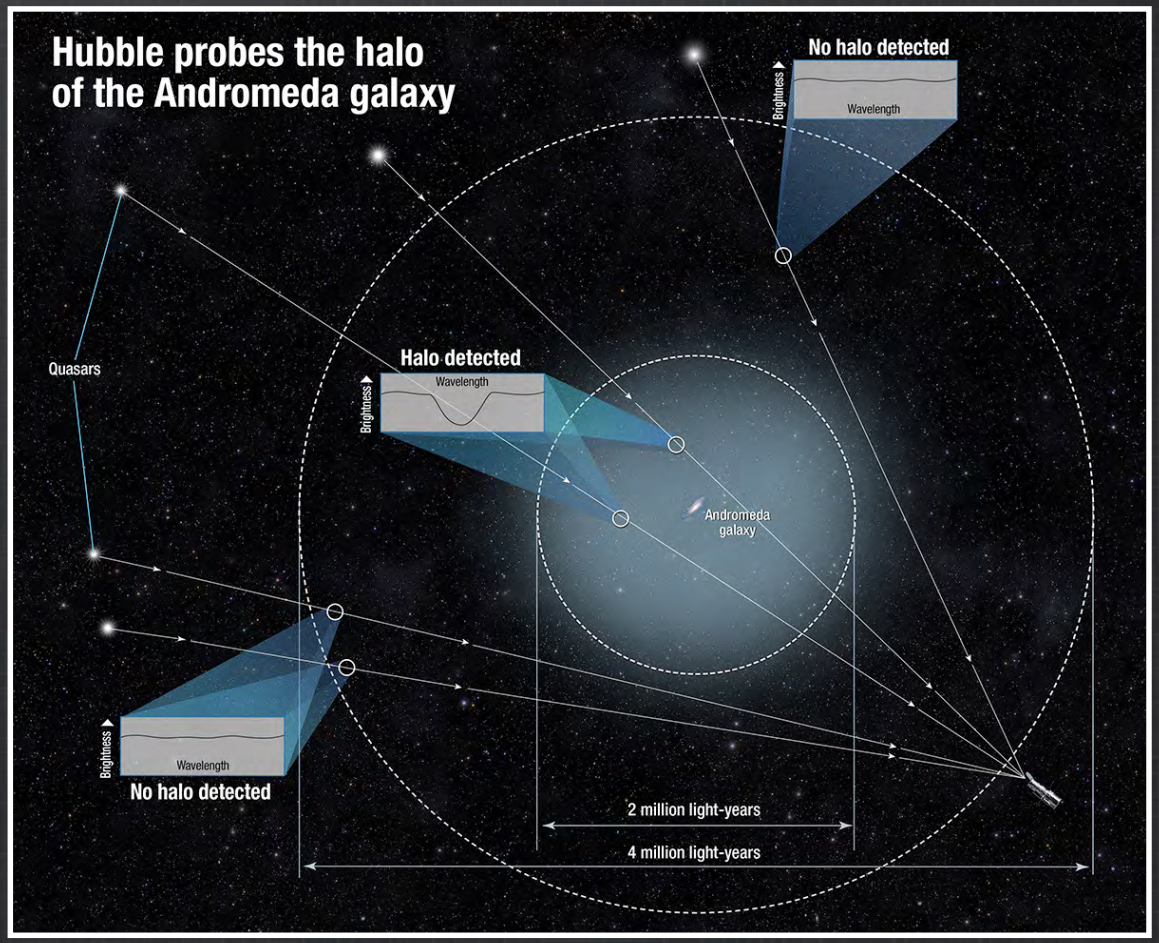
Hubble's Planetary Portrait Captures New Changes in Jupiter's Great Red Spot



Hubble Outer Planet Atmospheres Legacy (OPAL) program

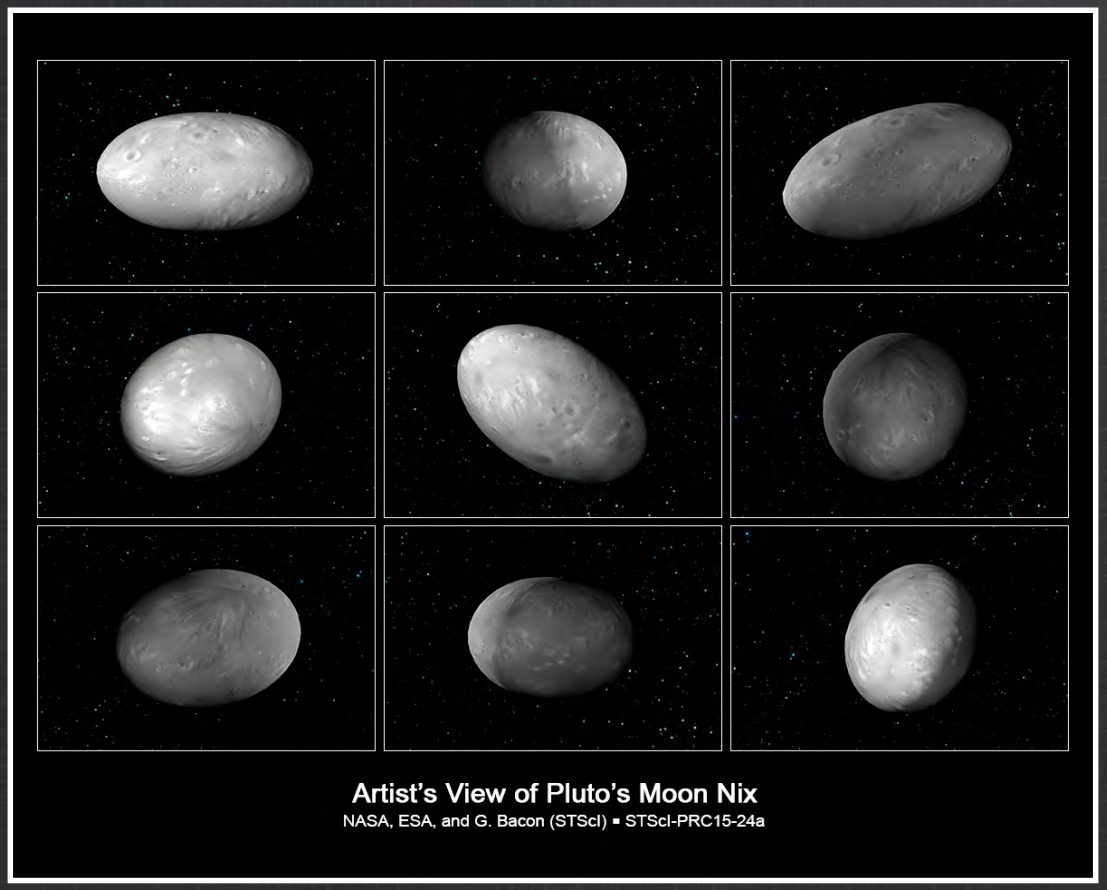
Simon, Wong, & Orton

Hubble Finds Giant Halo Around the Andromeda Galaxy

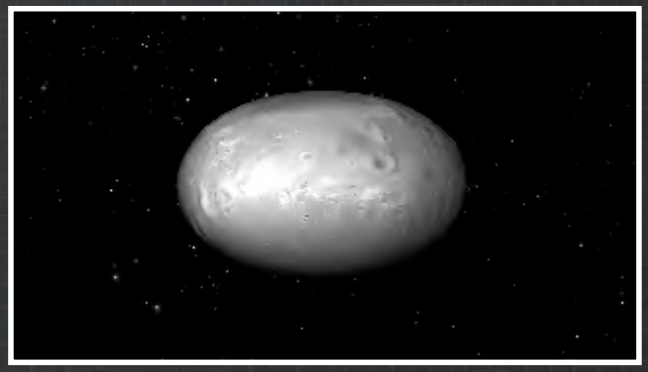


Lehner, Howk, & Wakker

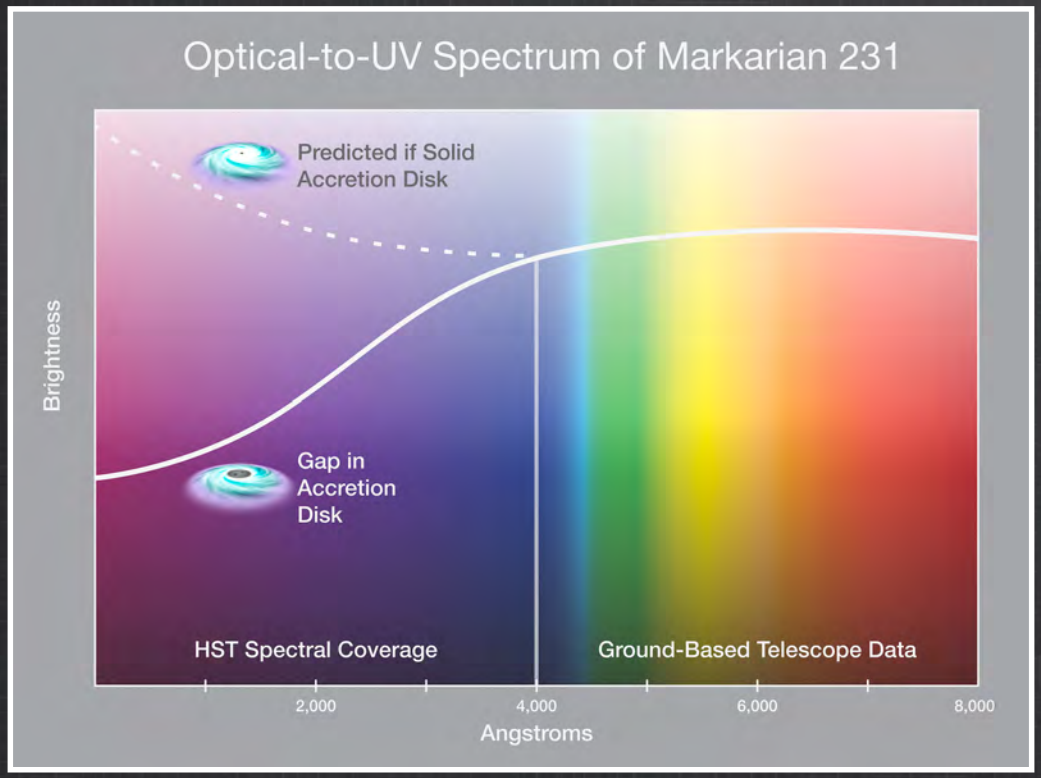
Hubble Finds Two Chaotically Tumbling Pluto Moons



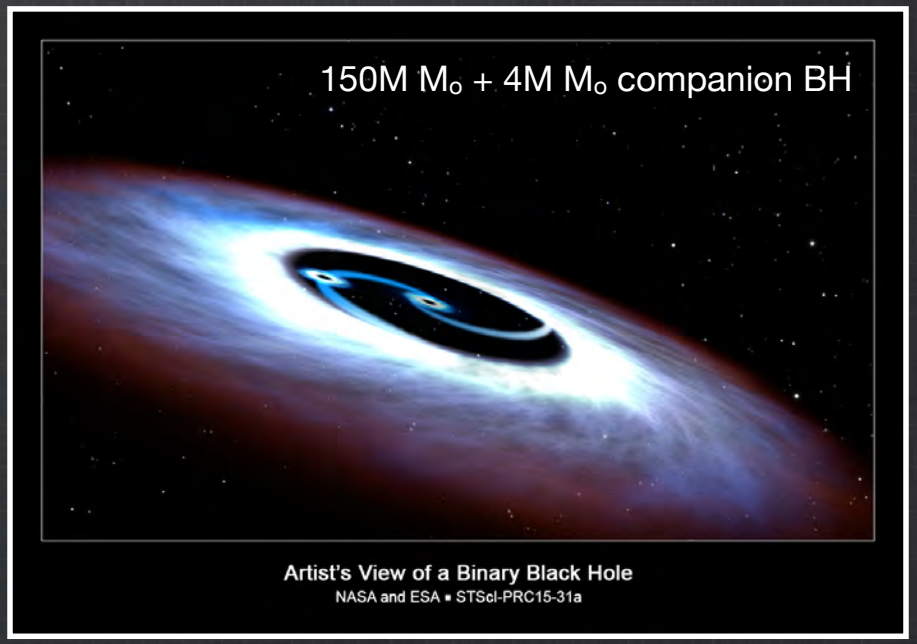
Showalter, Hamilton



Hubble Finds That the Nearest Quasar Is Powered by a Double Black Hole

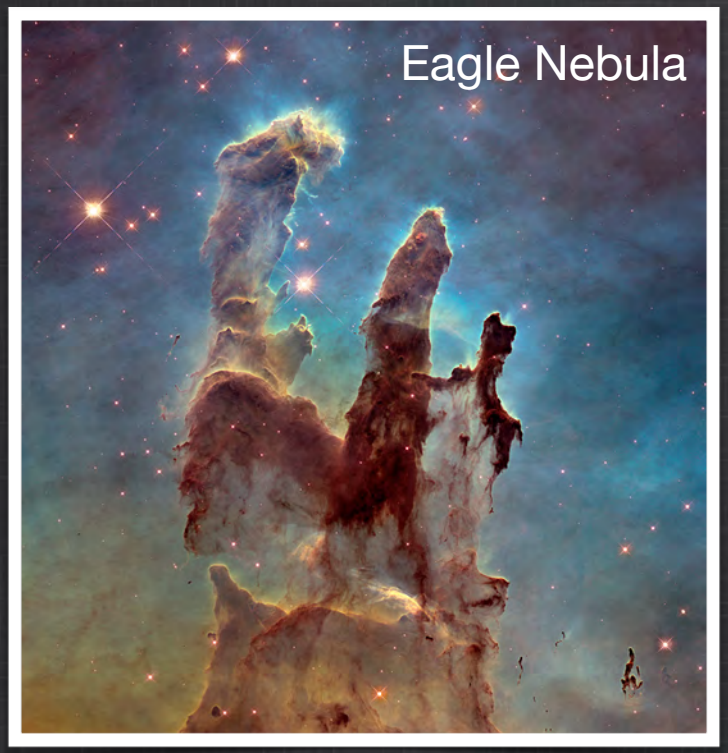


Yan, Lu, Dai, & Yu



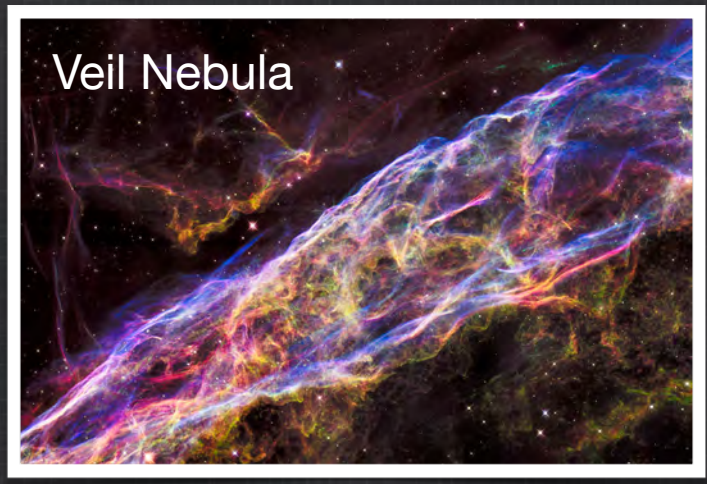
Companion black hole has cleared out a donut hole in the accretion disk, and the smaller black hole has its own mini-disk with an ultraviolet glow.

Hubble's 25th Anniversary Releases



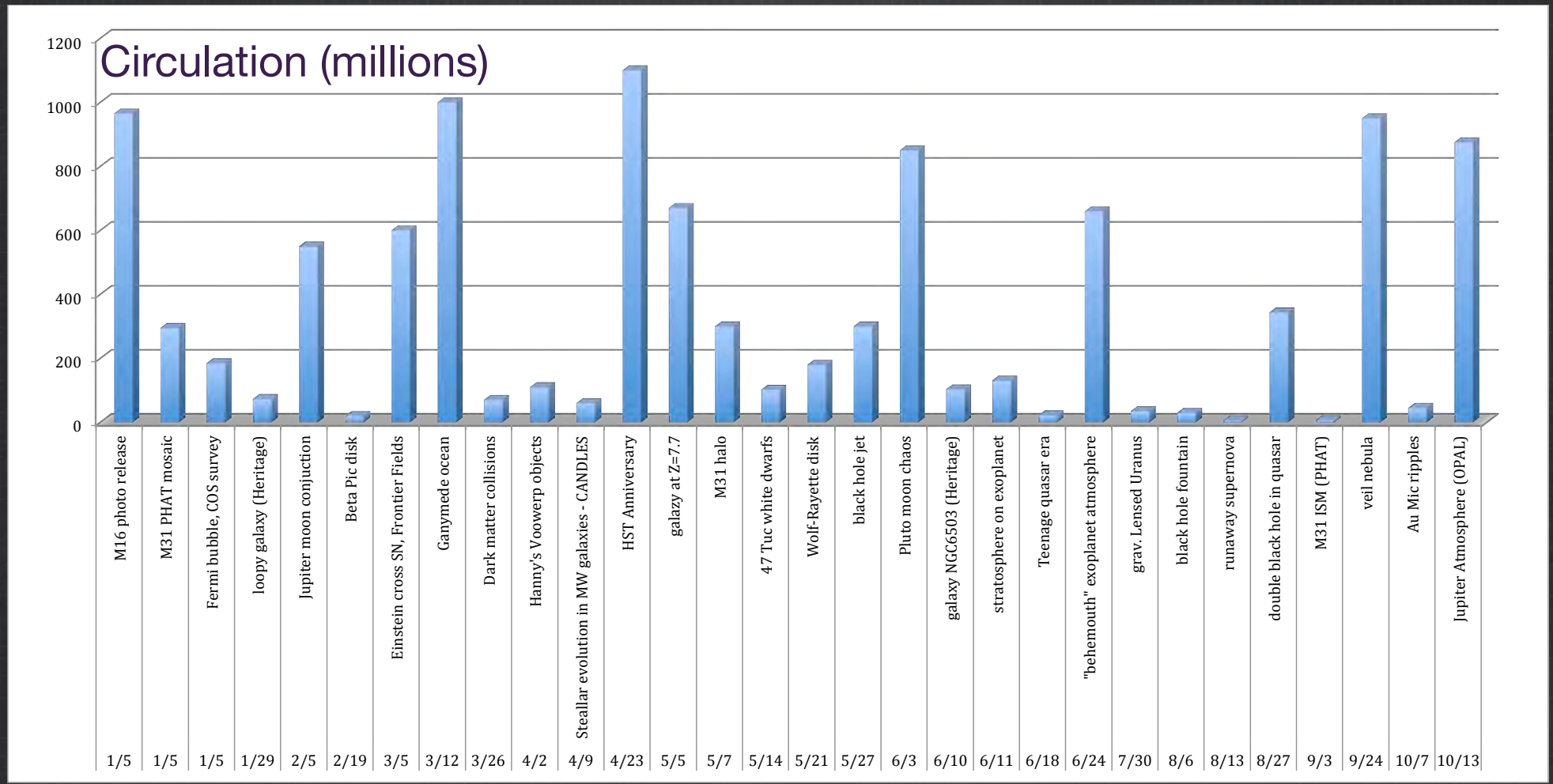
January 2015

April 2015

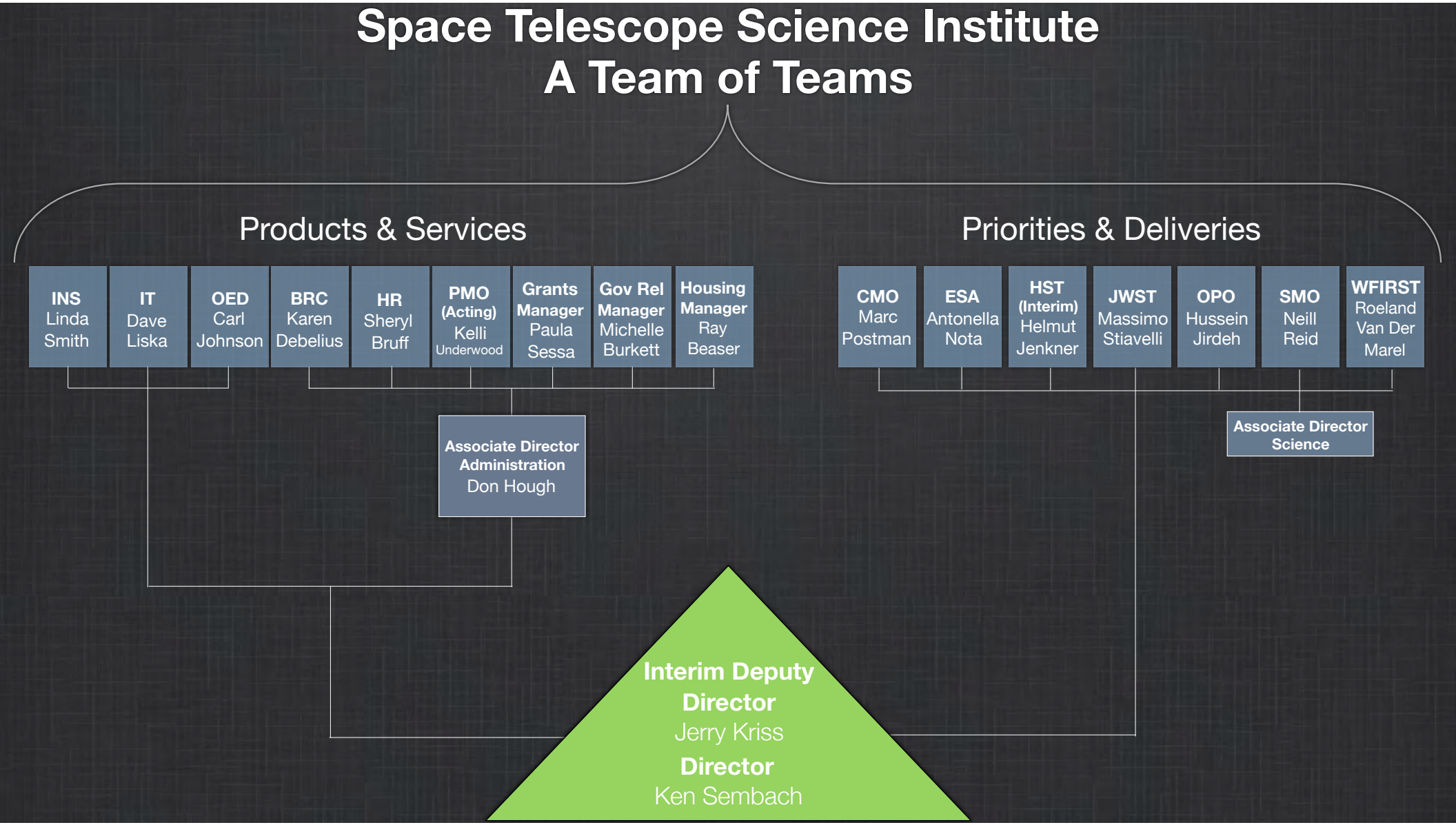


September 2015

2015 Hubble Press Releases



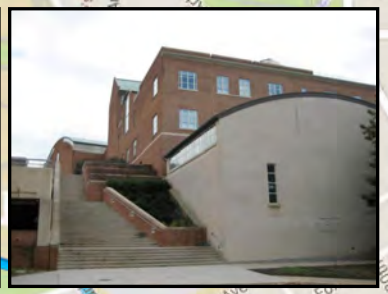
Space Telescope Science Institute
A Team of Teams



~650 people in FY16

Muller

Bloomberg

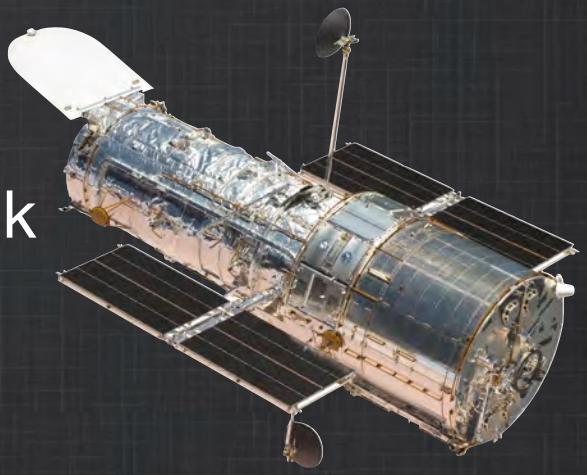


Stieff

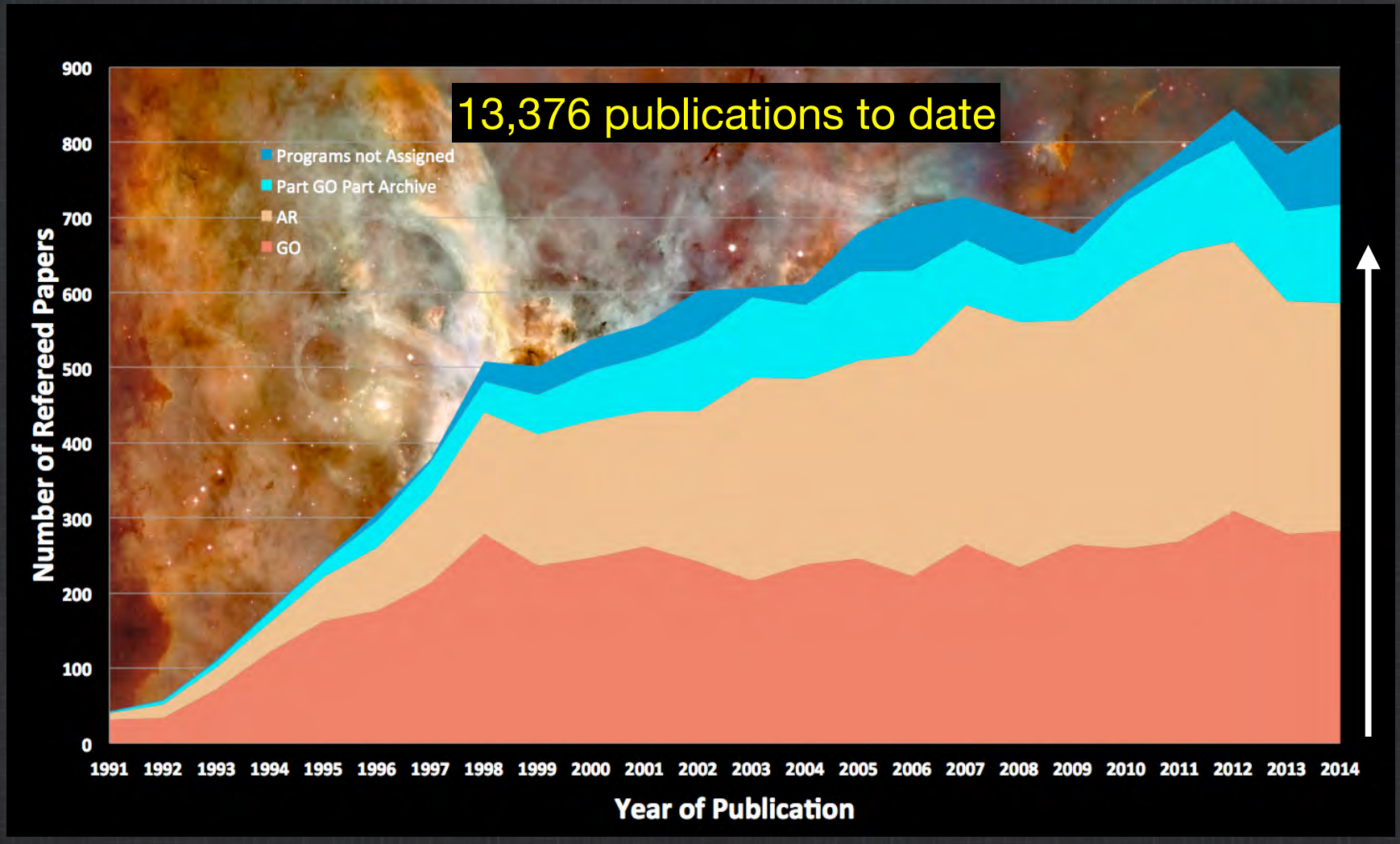
Rotunda

Noteworthy Hubble Items

- Observatory Performance - see MacKenty and Crouse talks
- 5 Year Contract Extension (2016-2021) - see Jenkner talk
  - Proposal to be submitted this week
  - Current contract runs through April 30, 2016
- Cycle 23 Proposal Statistics - see Leitherer talk
- GO/AR funding set at $28.9M for Cycle 23
- HST 2020 Vision and Cycle 24 Plans - see Reid talk

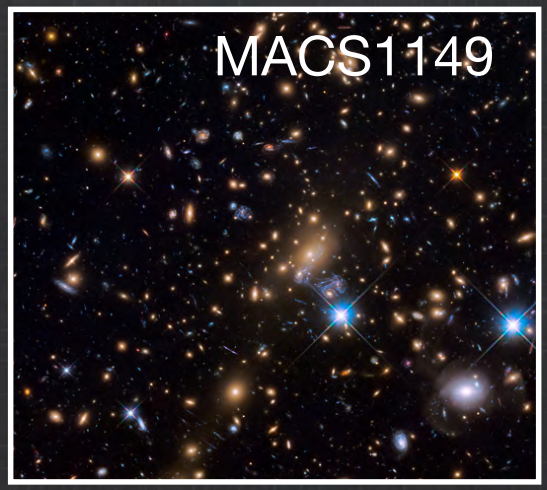


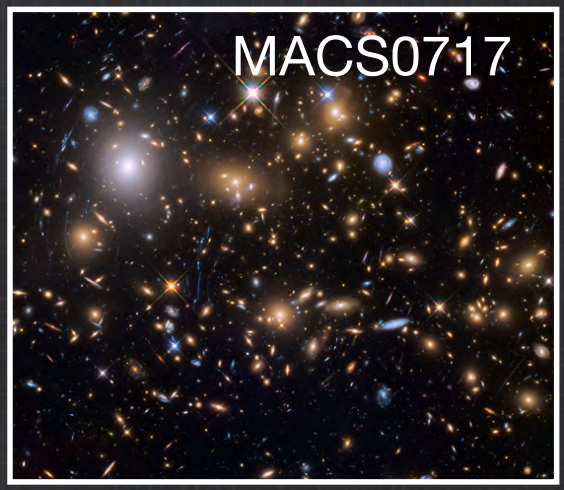
Hubble Science Productivity Remains Outstanding



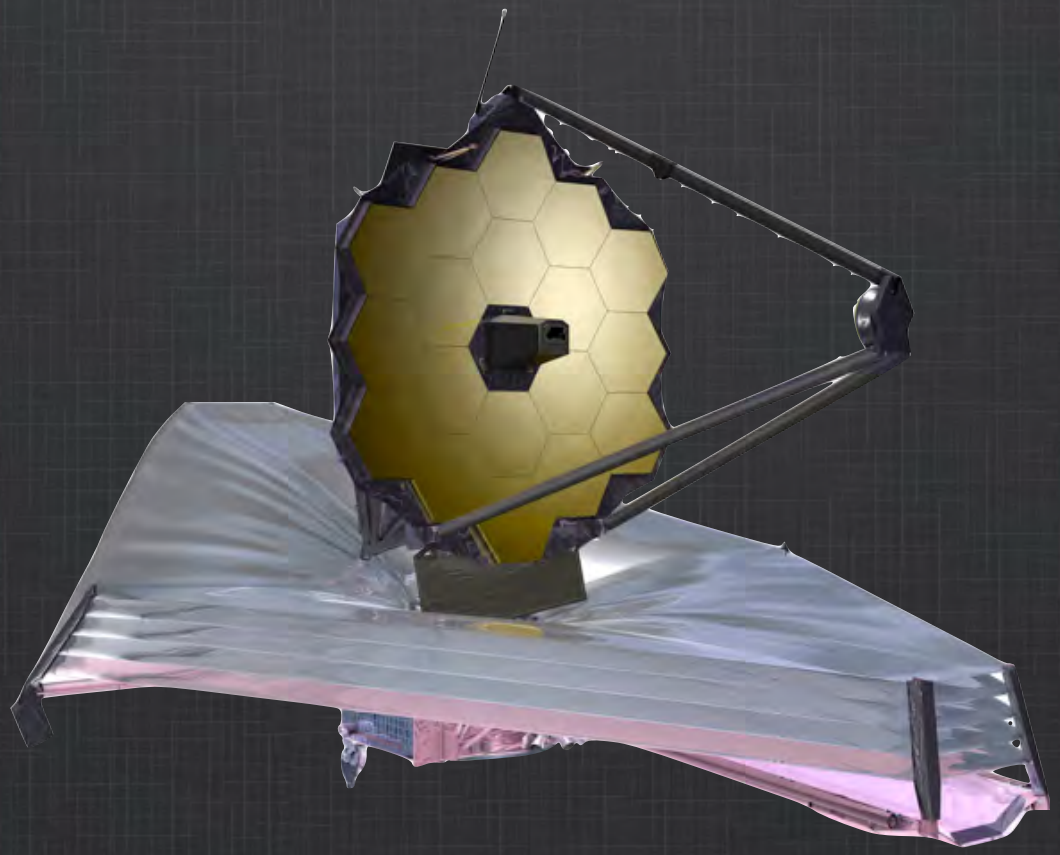
Frontier Fields

- Four clusters (+ four parallel deep fields) complete
- Continuing with final two clusters in Cycle 23
  - Abell S1063 - first epoch almost complete
  - Abell 370 - starting soon

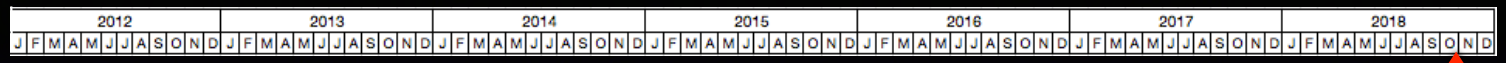




JWST



JWST schedule - 8.75 months of funded schedule reserve available



OTE = Optical Telescope Element
OTIS = Optical Telescope + ISIM

k months of critical path (mission pacing) slack

Spacecraft

Cryocooler — 3 → Spacecraft I & T — 2 → Observe I&T — 3 → 1

Spacecraft Component Development | Spacecraft Fabrication and Assembly — 3.5 → Spacecraft Structure to I&T

Sunshield Des. & Development | Flight Sunshield Fabrication, Assembly and Test — 3.25 → I & T

Science Instruments

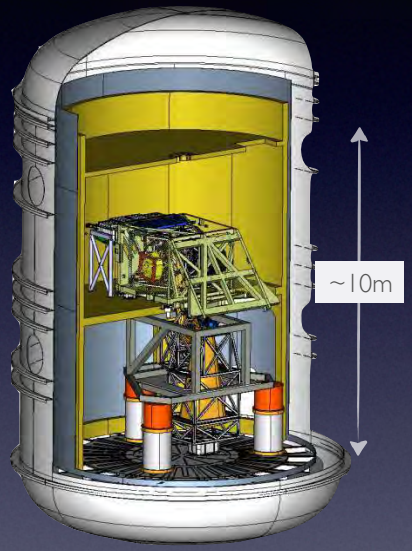
ISIM Integration | ISIM Cryo Testing & Detector Changeout — 1.75 → OTIS — 3

Telescope

Segment Gear Motor replacement → OTE — 2.5

Optical Telescope Element Fabrication and Testing

- Northrop-Grumman
- Goddard Space Flight Center
- Ball Aerospace
- ATK
- Johnson Space Center
- Guiana Space Center

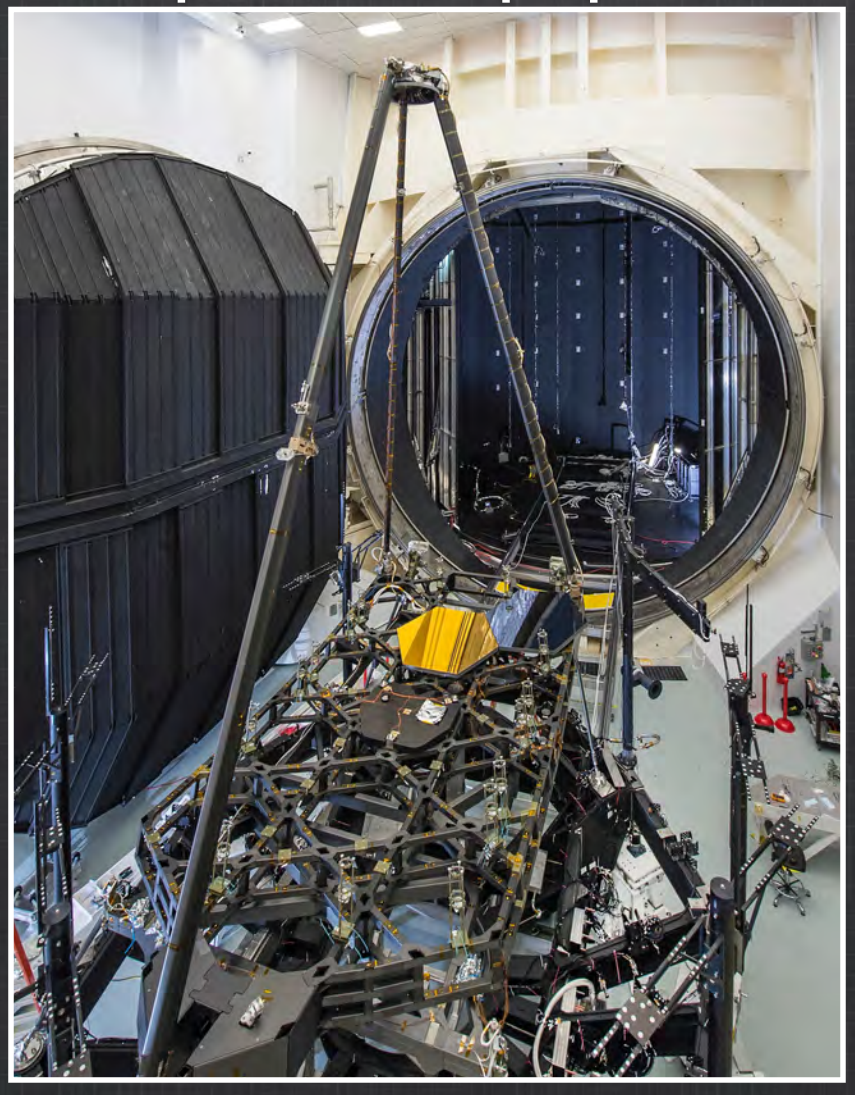


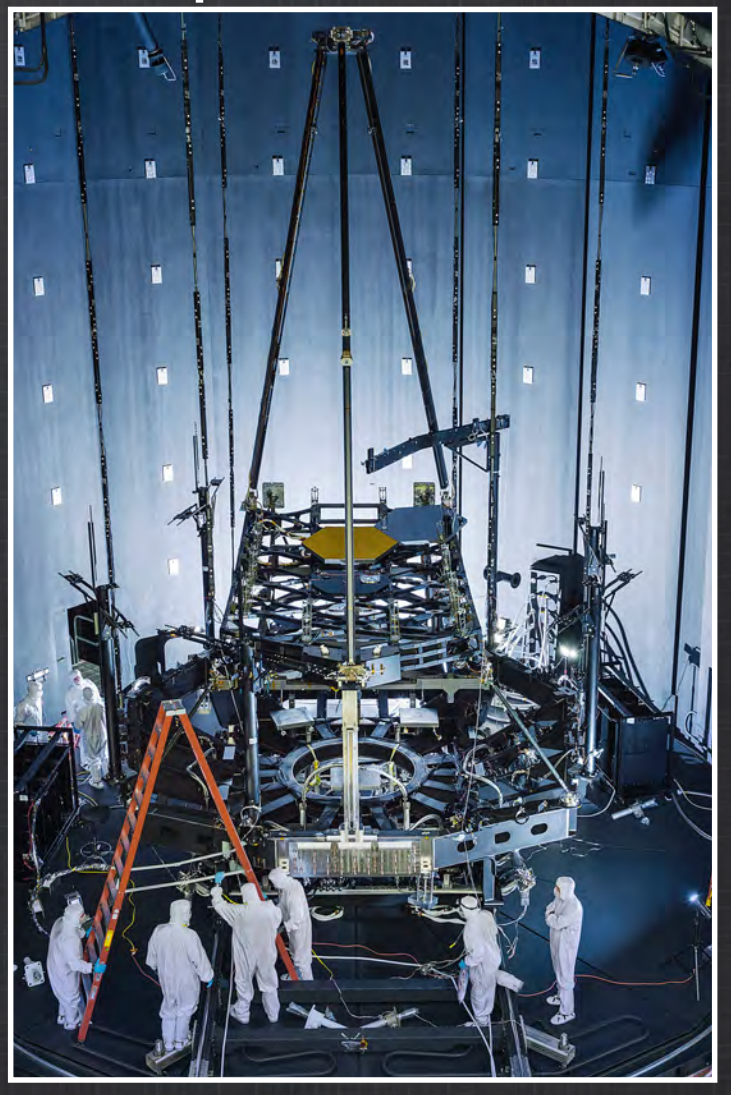
GSFC Space Environment Simulator

Optical Telescope Simulator (OSIM) + ISIM @ GSFC

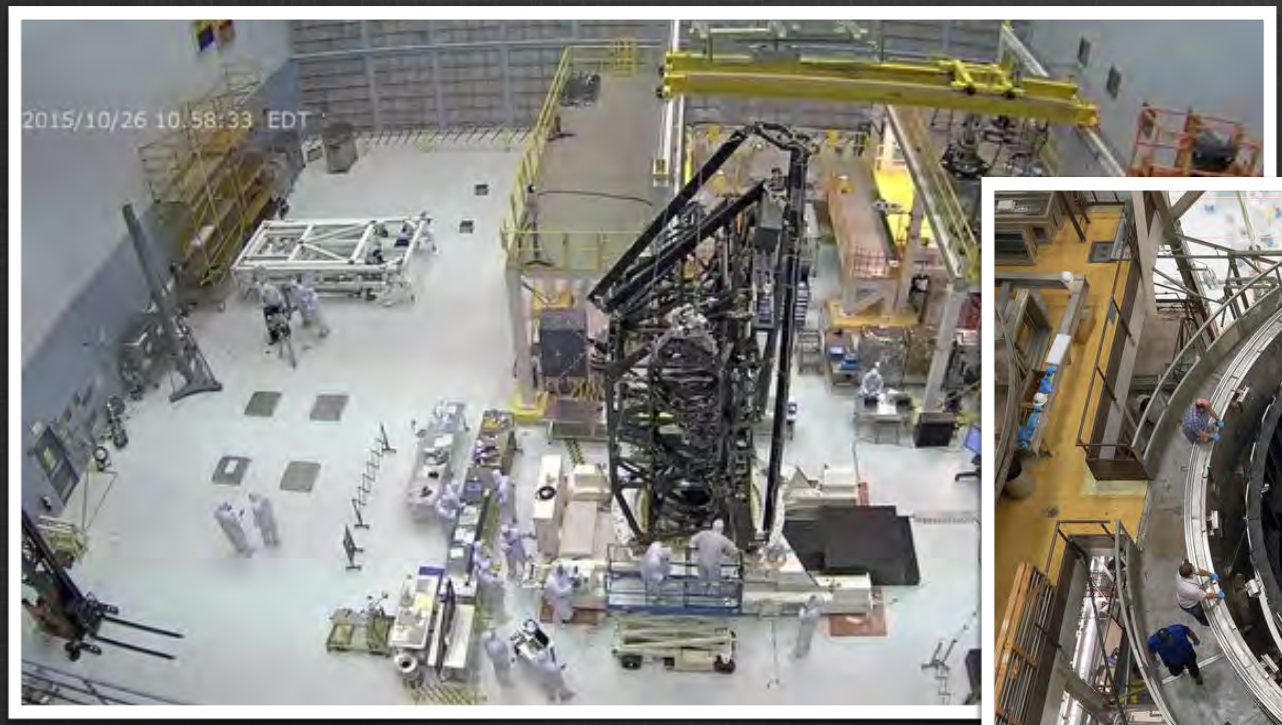
October'15

Testing of the Optical Equipment Completed at JSC

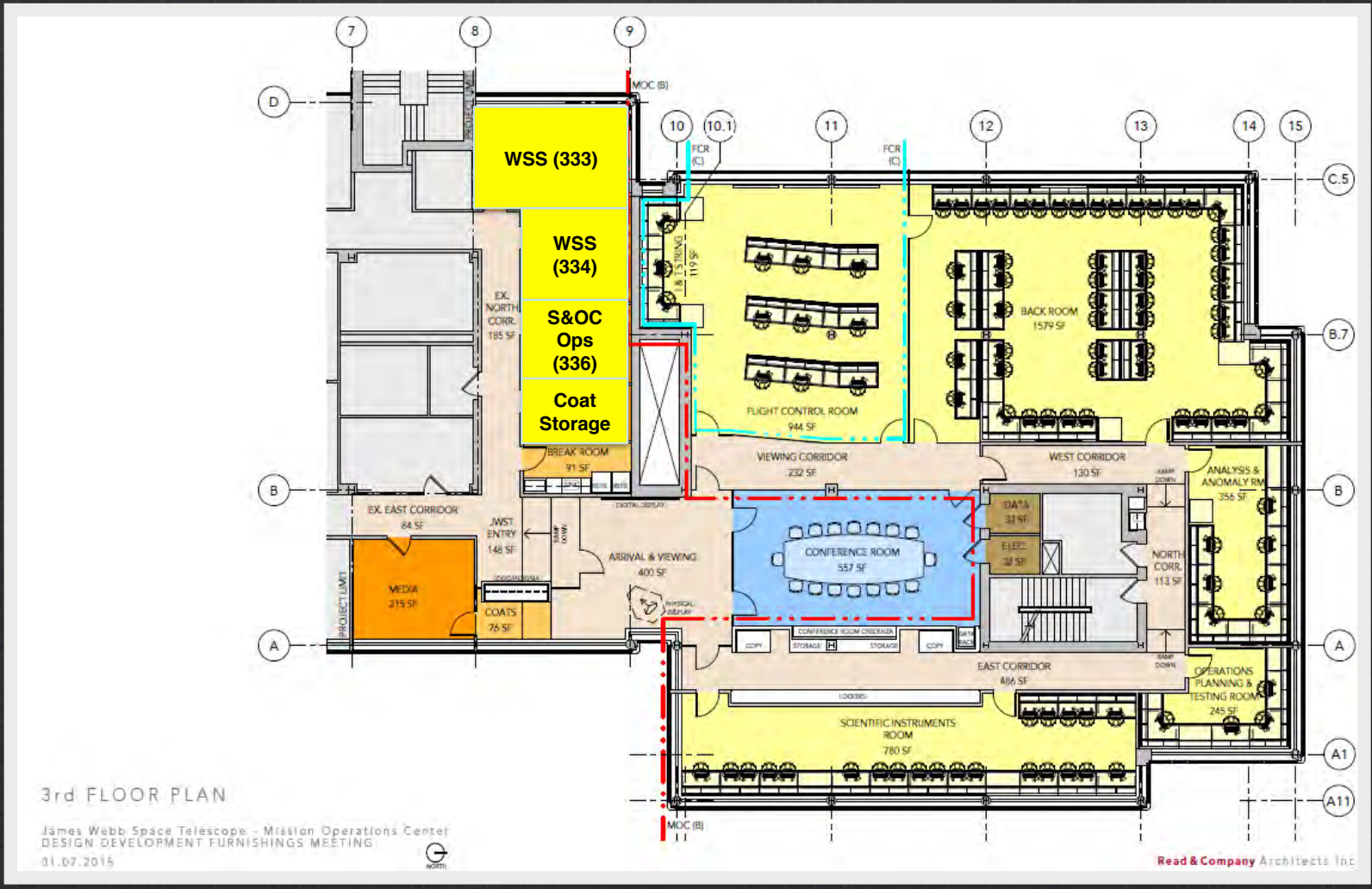




Assembling the Mirror and Testing the Instruments are Underway at GSFC

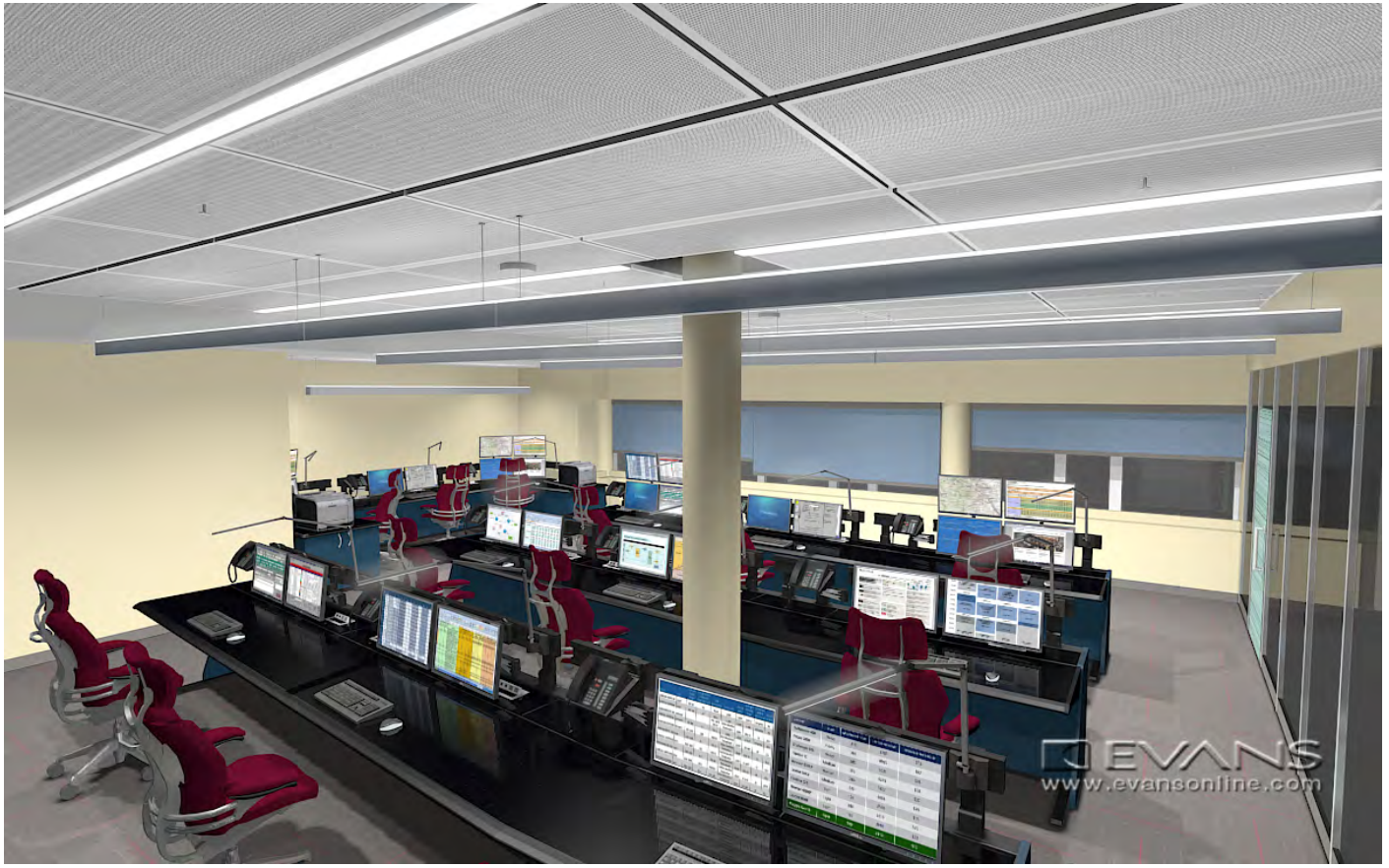


JWST Mission Operations Center at STScI

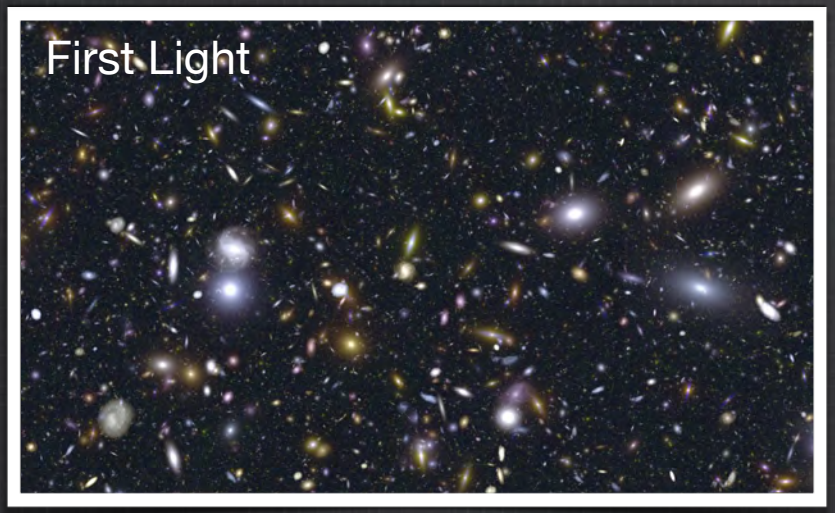


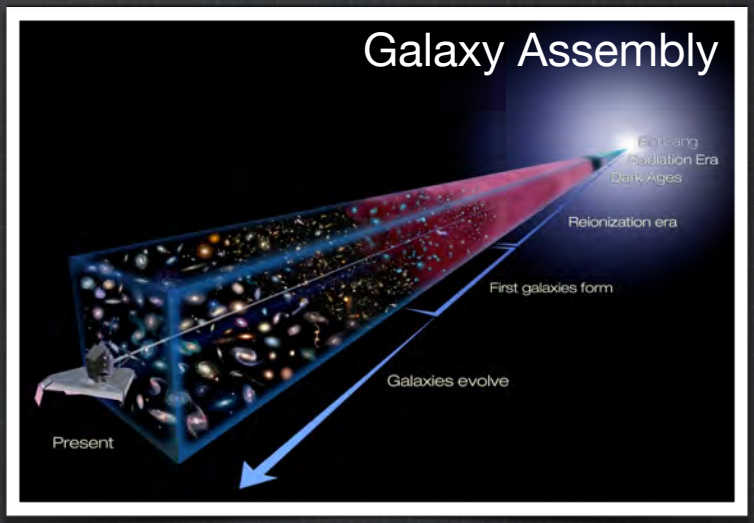
JWST Mission Operations Center at STScI

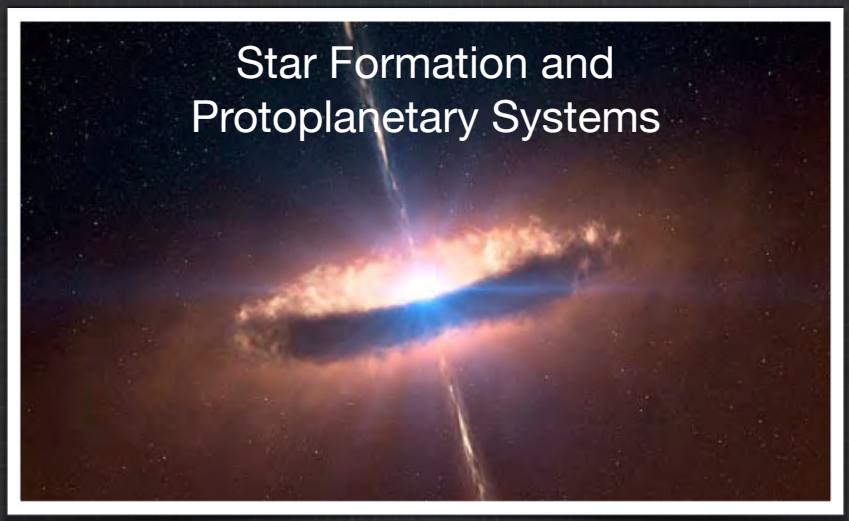
Flight Control Room



JWST Science Themes







Looking Forward to Cycle 1 Science

First Light and Reionization (also mid IR)

Ultra Faint Dwarf Galaxies

IFUs and the Distant Universe

Warm Molecular Hydrogen at High-z

Star Formation in the Magellenic Clouds

Protoplanetary Disks

Interpreting near IR SEDs of Galaxies

Physics of Brown Dwarfs

Direct Imaging of Exoplanets

Formation of Super Star Clusters

Galaxy Assembly with Gravitational Lensing

Planet Formation

Galaxy Assembly and Physics of Galaxy Formation

Organic Material in the Circumstellar Media

Mid-IR Spectroscopy of the Epoch of Galaxy Assembly

Solid Icy Material in Star Forming Regions

Star Forming Galaxies from z = 4 to 10

Core Collapse Supernovae and Ejecta

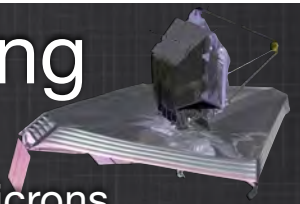
High Redshift Galaxy Clusters

Debris Disks

T"

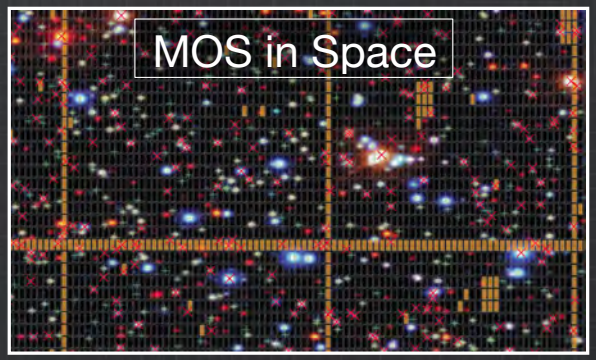
Conference in [illegible] 16, 2015)

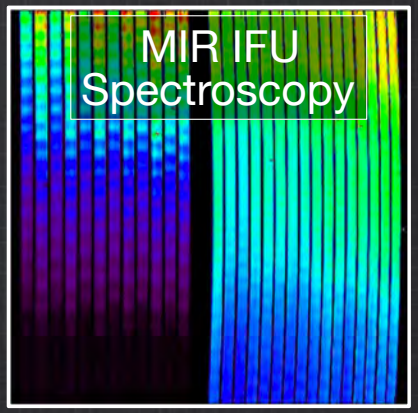
New Challenges for Science Systems Engineering

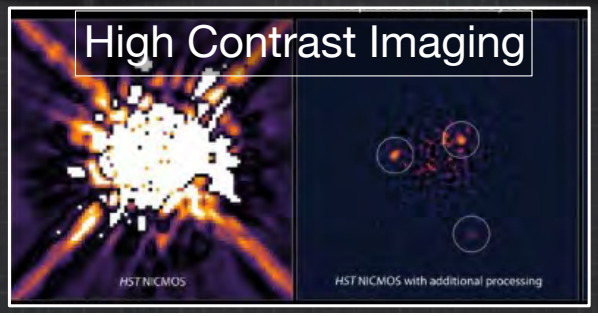


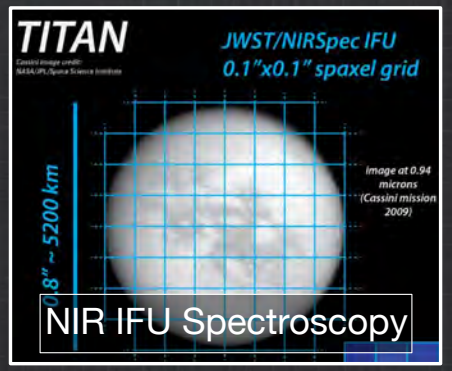
Complex Instruments

40+ imaging filters from 0.6 to 28.5 microns
Nyquist sampling at the diffraction limit
Many modes for single and multi-object spectroscopy
IFU spectroscopy at 5 wavelengths
6 modes of coronagraphy





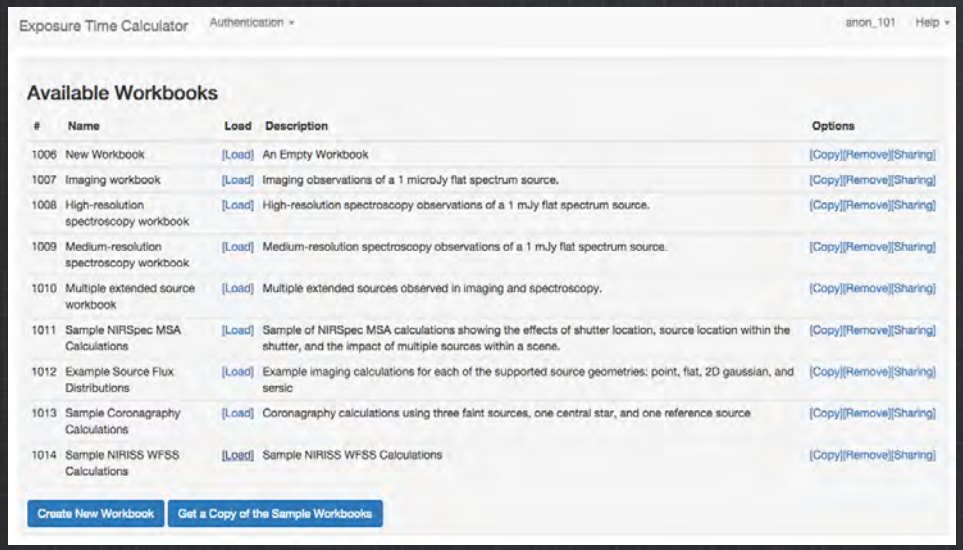


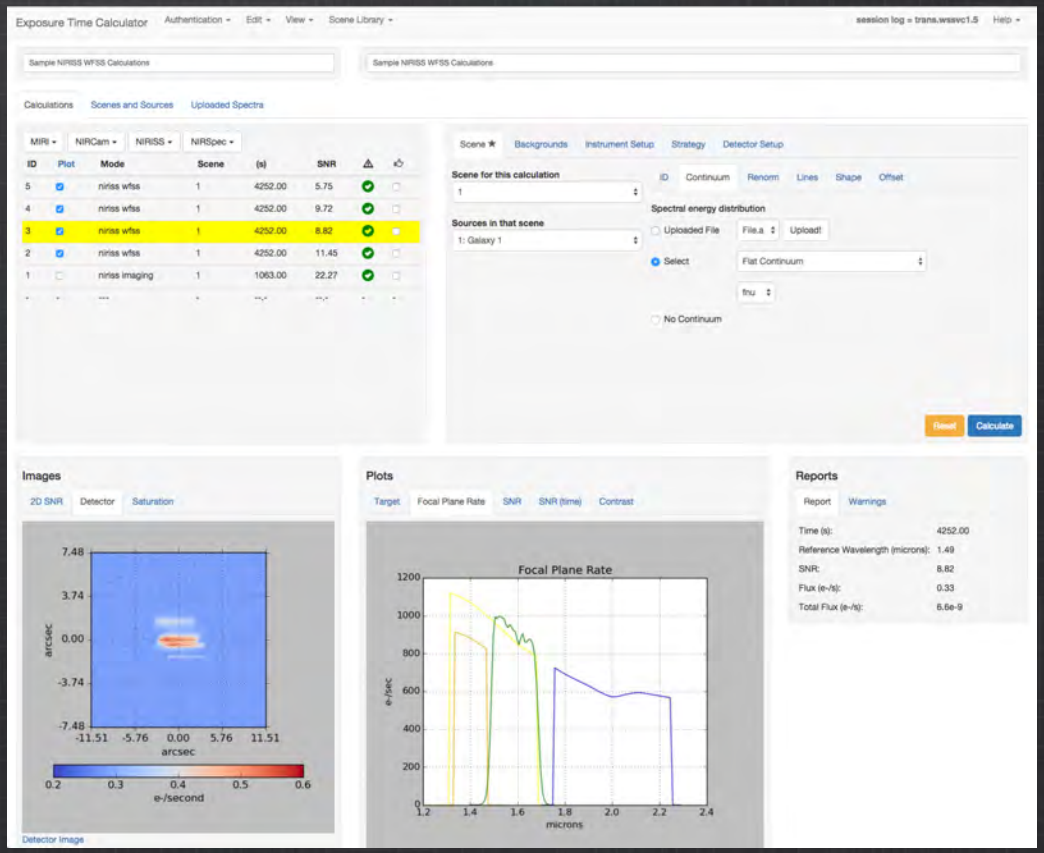


JWST User Tools:
Exposure Time Calculator & Simulators

Status

- All observing modes supported in ETC engine.
- User interface complete for about half of modes.
- First user-facing build to be delivered to integration and testing, April 2016, released in January 2017
- Image simulator being prepared for release.



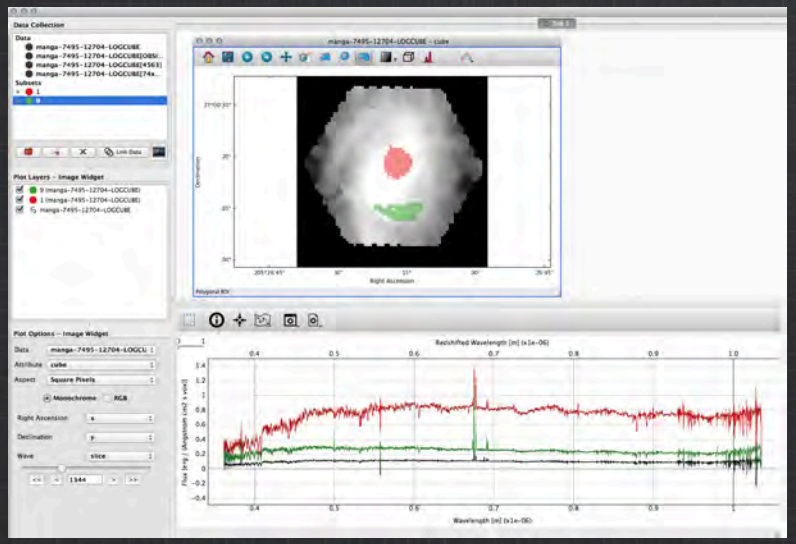


JWST User Tools: Data Analysis

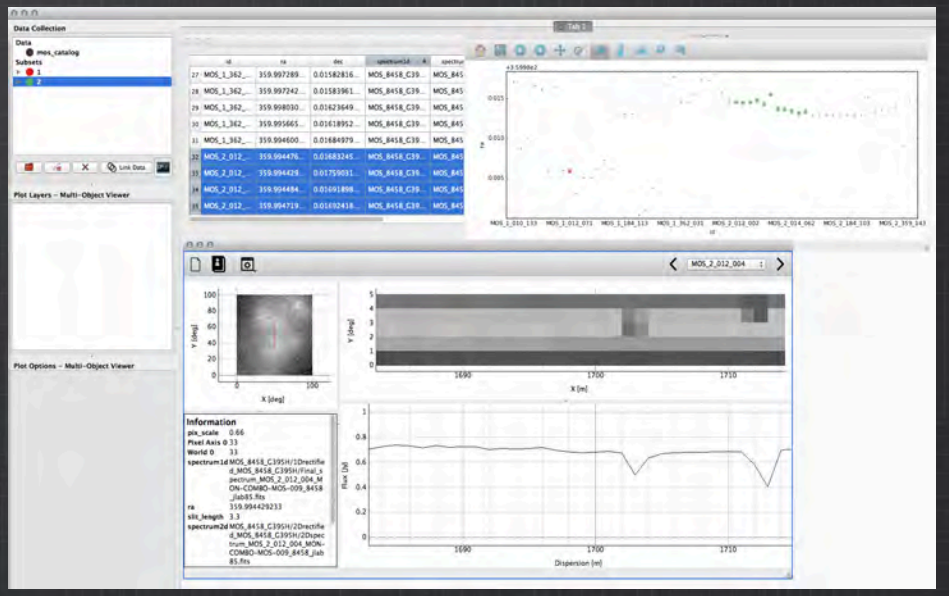
Data analysis tools include

- 1D spectrum viewer
- 2D image viewer and ramp inspection tool
- Multi-object spectroscopy analysis tool
- 3D cube viewer
- Various PSF/WCS/Photometry tools
- Uses existing Python frameworks, astropy, Glue and GINGA.

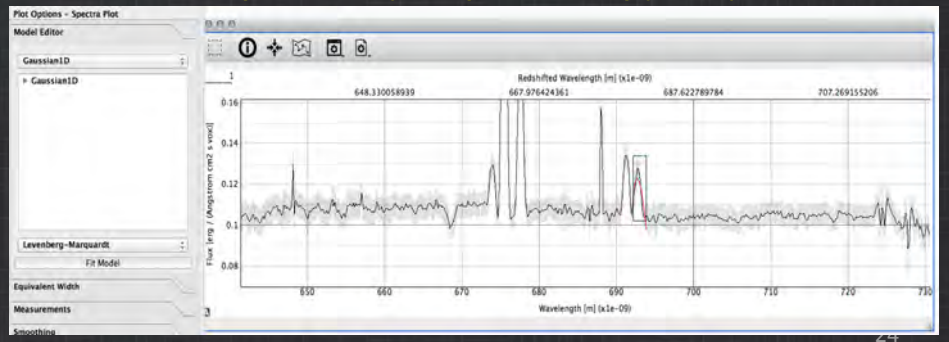
ST Cube (Cube tool)



Multi-object spectroscopy tool



SpecView (1D spectroscopy tool)

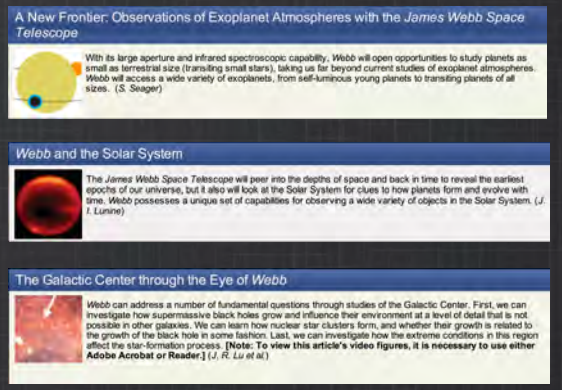


Getting the Community Ready for JWST

AAS, DPS, SPIE, IAU meetings
(Town Halls, Science Session, User Training, Interactive Demos, Booth, etc.)

Topical Fliers
(Community led one page science programs)

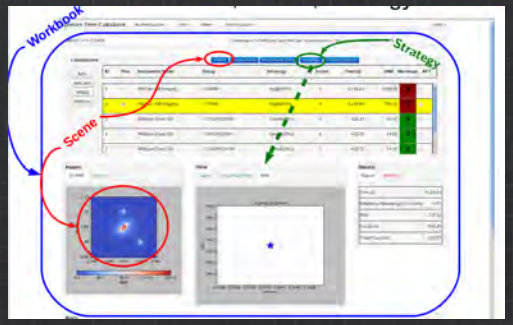
Science Literature
(Community Newsletter contributions, JWST Science Corner, White Papers, etc.)



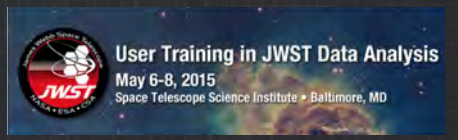
Building a New "Science Oriented" JWST Website

Strategic JWST Threads on Science-Oriented Social Media Streams

Building Modern User Tools
(3D Exposure Time Calculators, PSF Tools, and General Data Simulators)



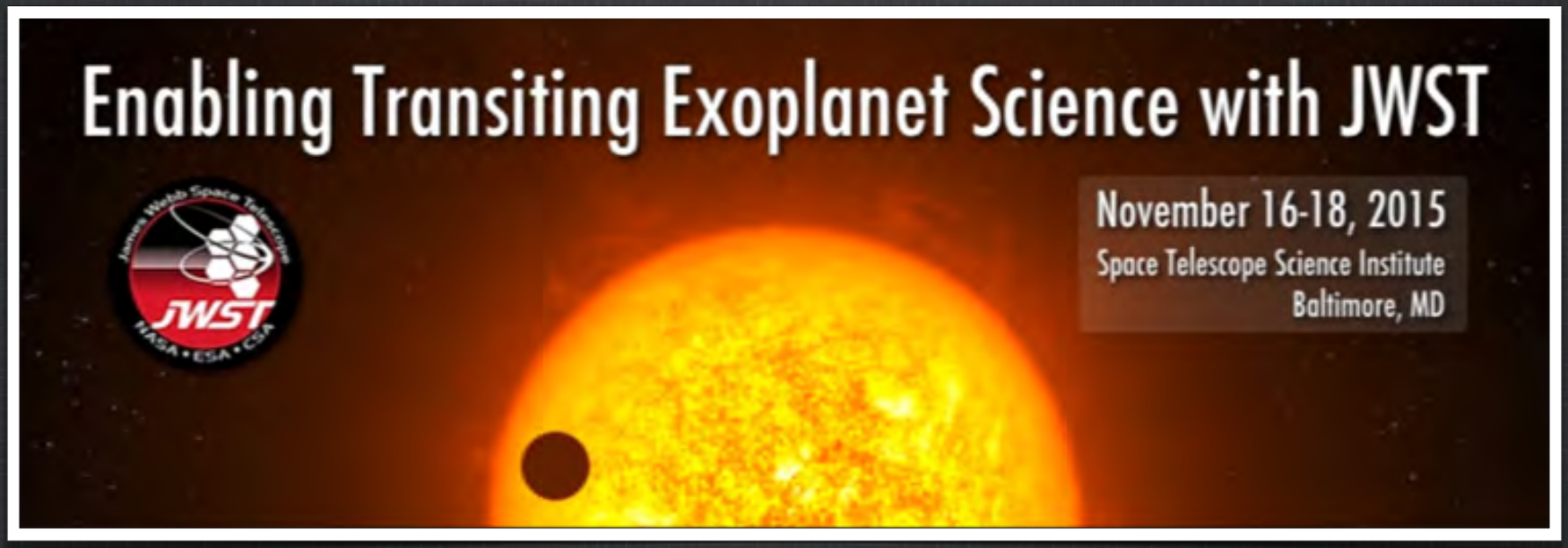
Annual Data Analysis and Training Workshops



*Direct Community Engagement Initiative (2016 - 2018)

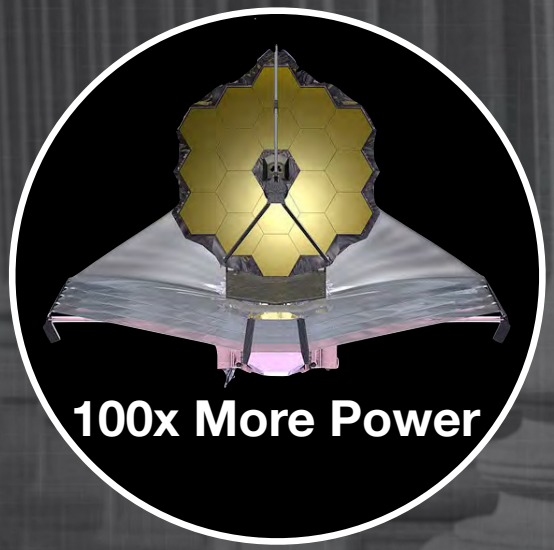
JWST Project Science at STScI will give JWST focused colloquia at most large US institutions that make up our user community

Coming Up



Nov 2015 - "Enabling Transiting Exoplanet Science with JWST" Workshop (STScI)
Chair: Nikole Lewis

The Astrophysics Frontier
JWST + WFIRST



Hubble: The Foundation

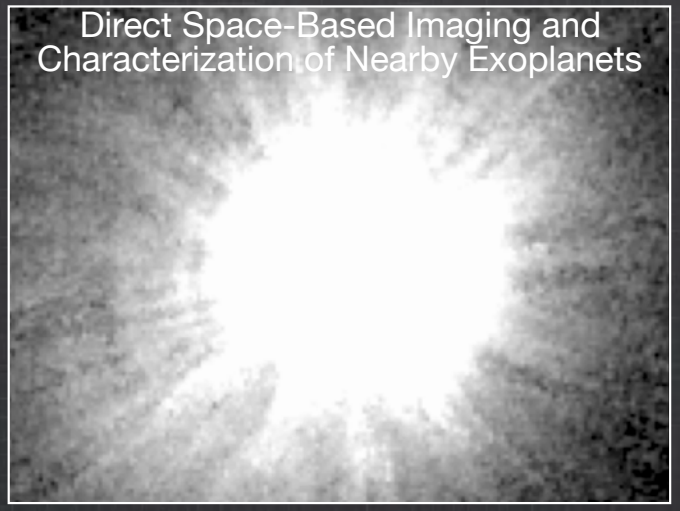
Wide Field Infrared Survey Telescope (WFIRST)

WFIRST

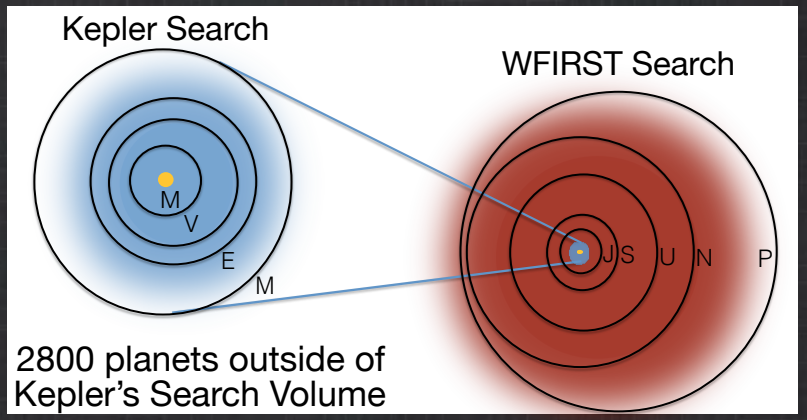
- Hubble's power
- Hubble's resolution and image clarity
- 100x larger field of view than Hubble
- **2.4 meter telescope donated from NRO**
- Coronagraph - "proof of concept" for "Life Finding" telescope

A Snapshot of WFIRST Science

Measuring the History of Dark Energy


Direct Space-Based Imaging and Characterization of Nearby Exoplanets


2700 Supernovae Across Cosmic Time (Distance Ladder)



Hubble - a spectacular start

The Hubble Ultra Deep Field
seeing the Universe, 10,000 galaxies at a time

WFIRST - Hubble X 100

An AFTA/WFIRST Deep Field
A New Window on the Universe - **1,000,000** galaxies at a time

The Cycle Begins Again...

AURA