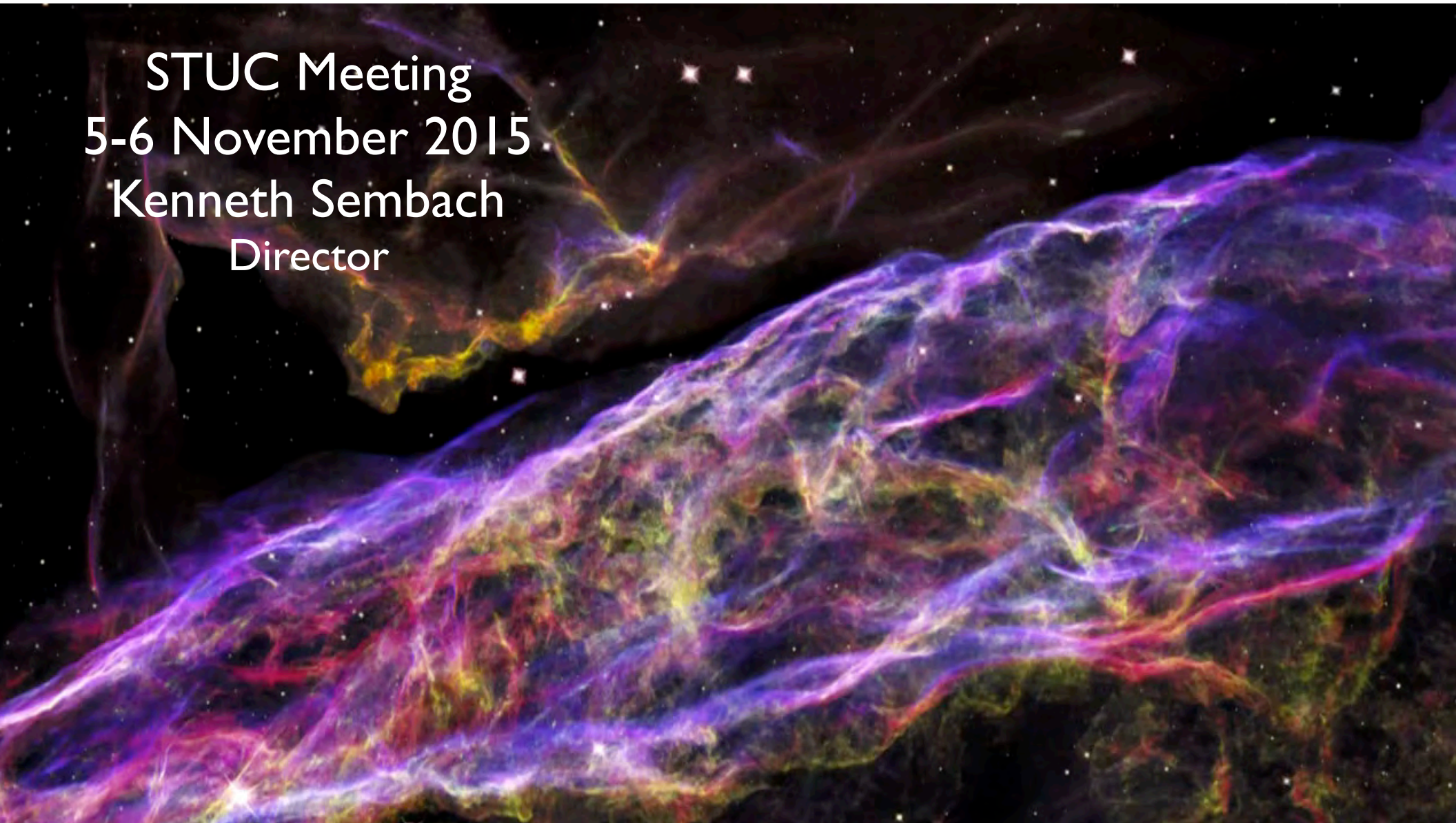
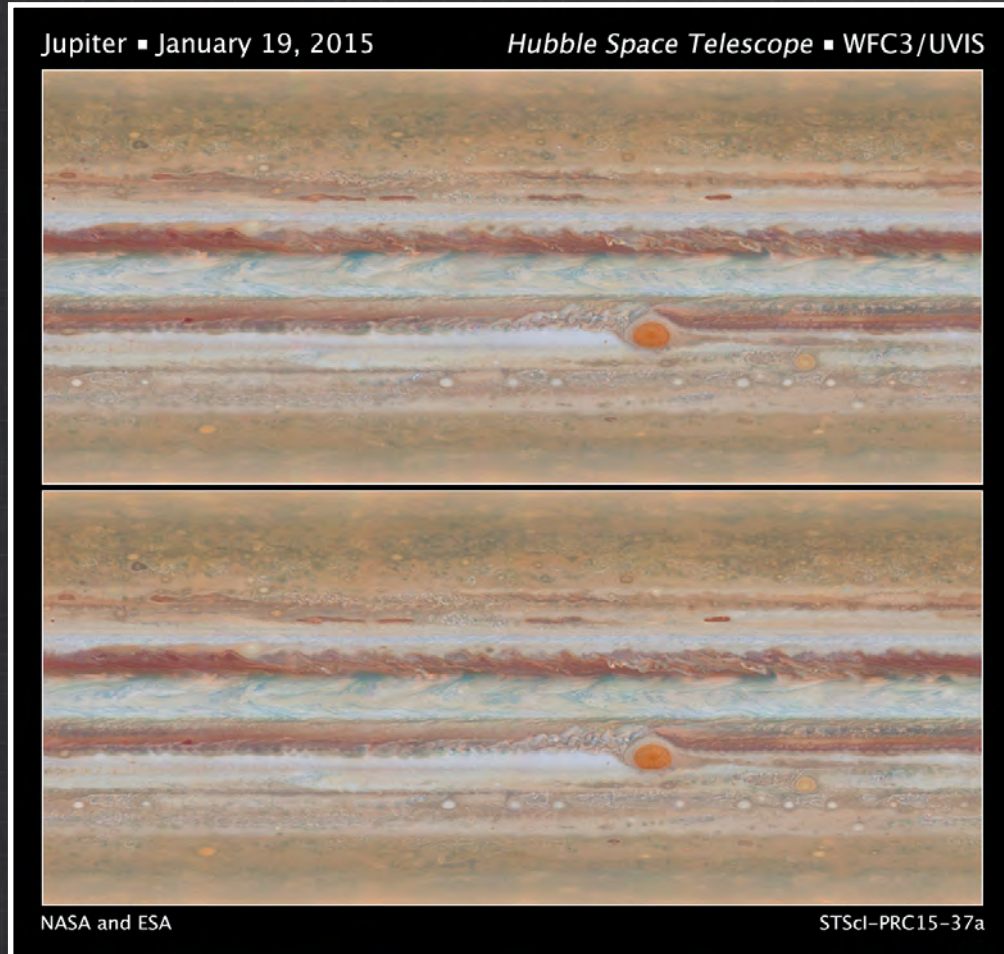


STUC Meeting
5-6 November 2015
Kenneth Sembach
Director



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



Hubble Outer Planet
Atmospheres Legacy
(OPAL) program

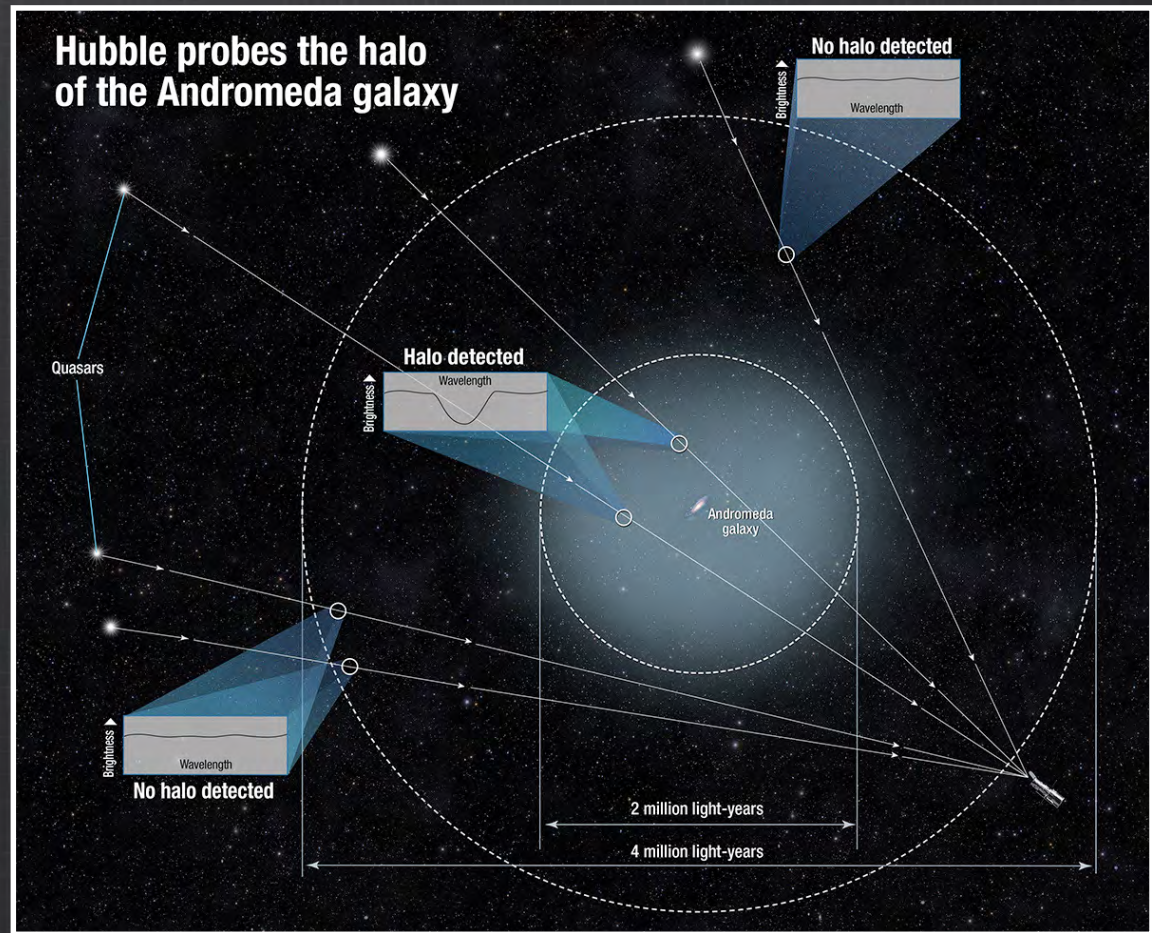


Simon, Wong, & Orton

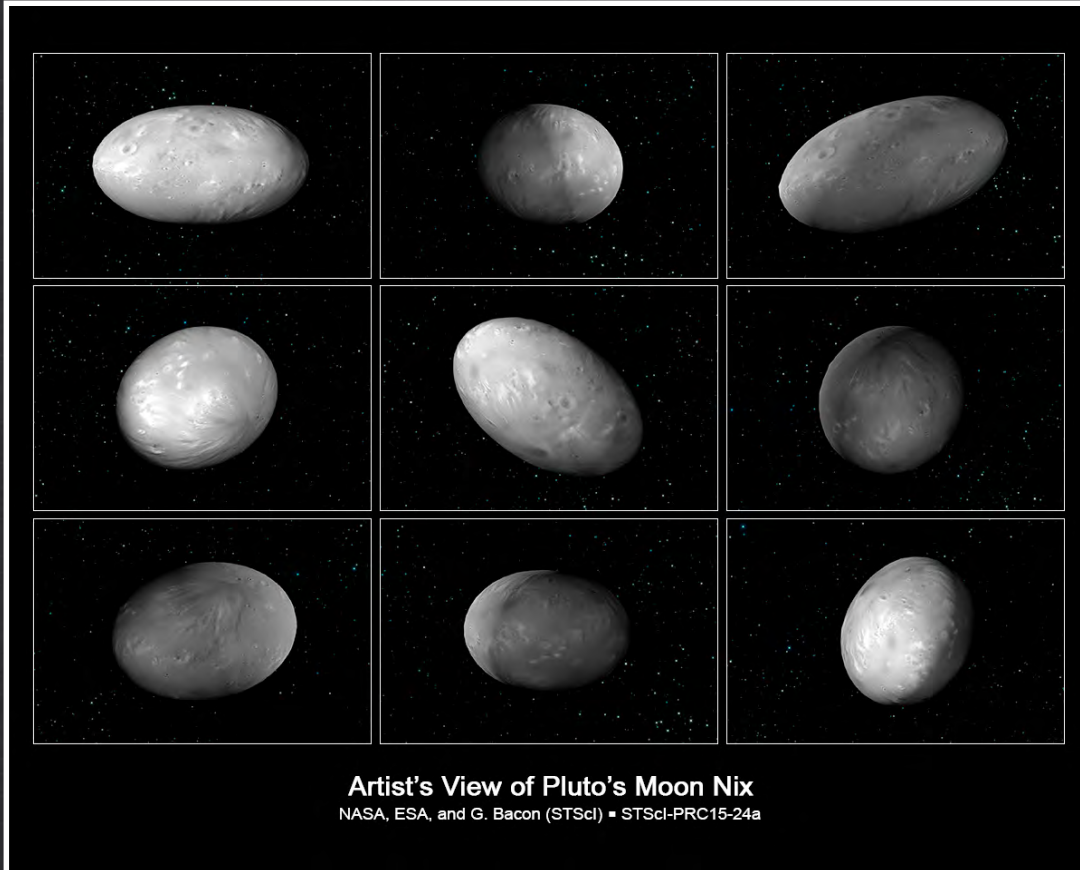
Hubble Finds Giant Halo Around the Andromeda Galaxy



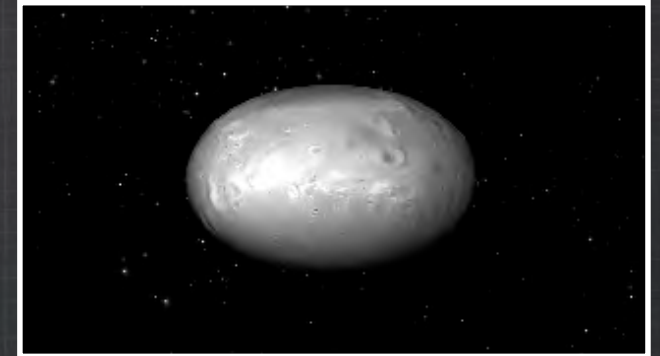
Lehner, Howk, & Wakker



Hubble Finds Two Chaotically Tumbling Pluto Moons

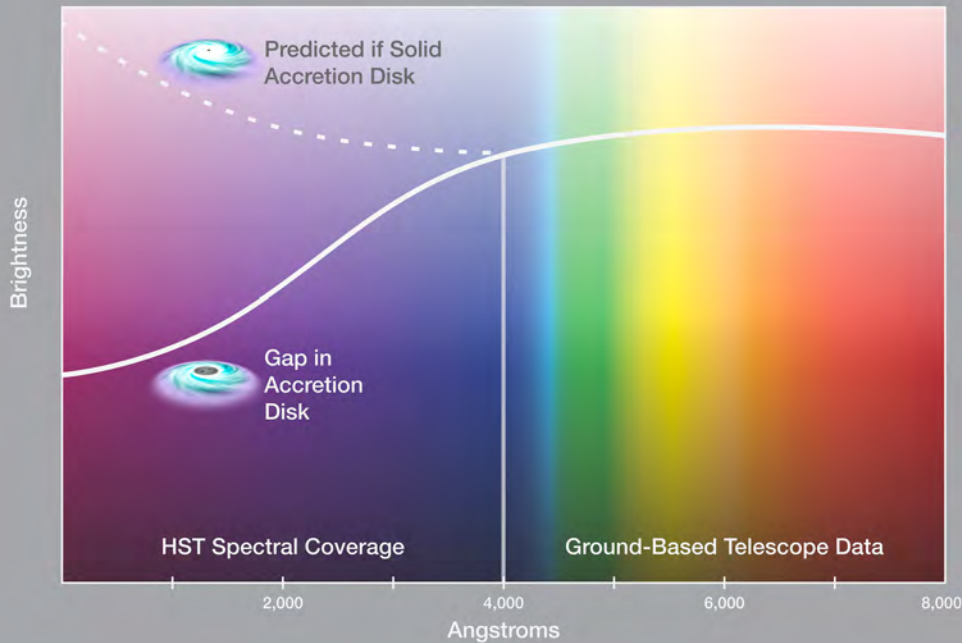


Showalter, Hamilton

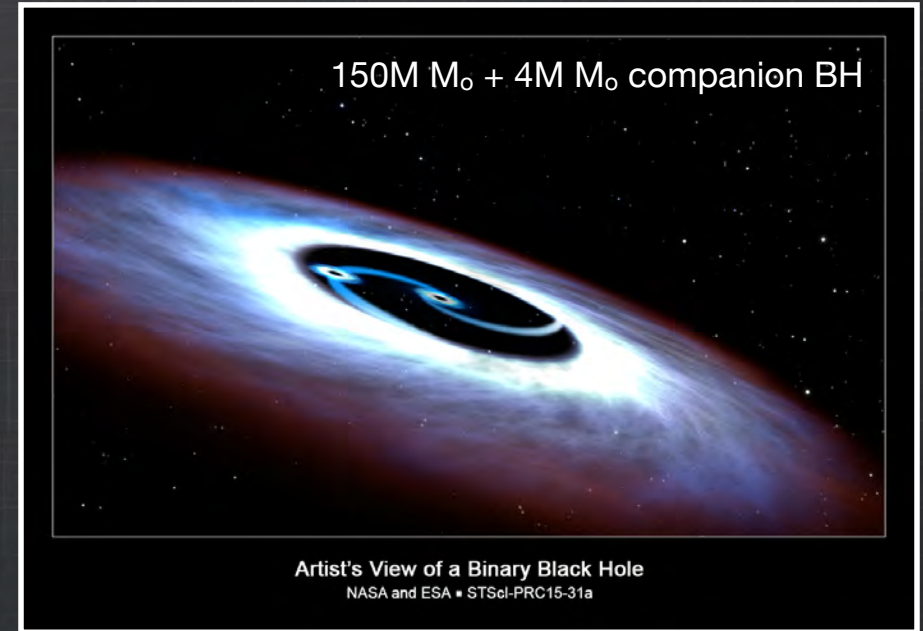


Hubble Finds That the Nearest Quasar Is Powered by a Double Black Hole

Optical-to-UV Spectrum of Markarian 231



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

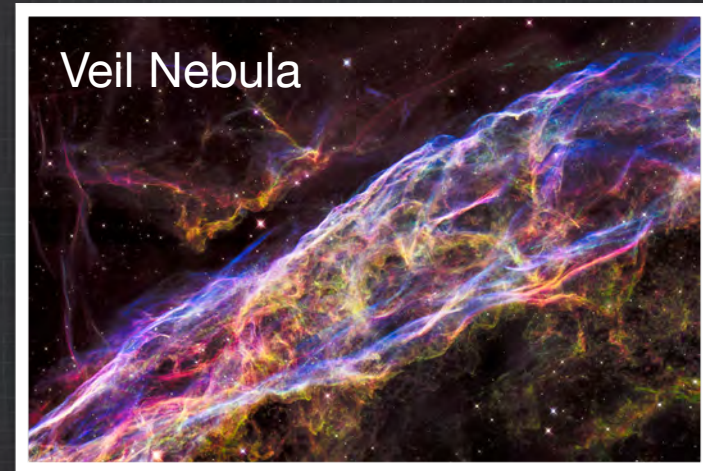


January 2015

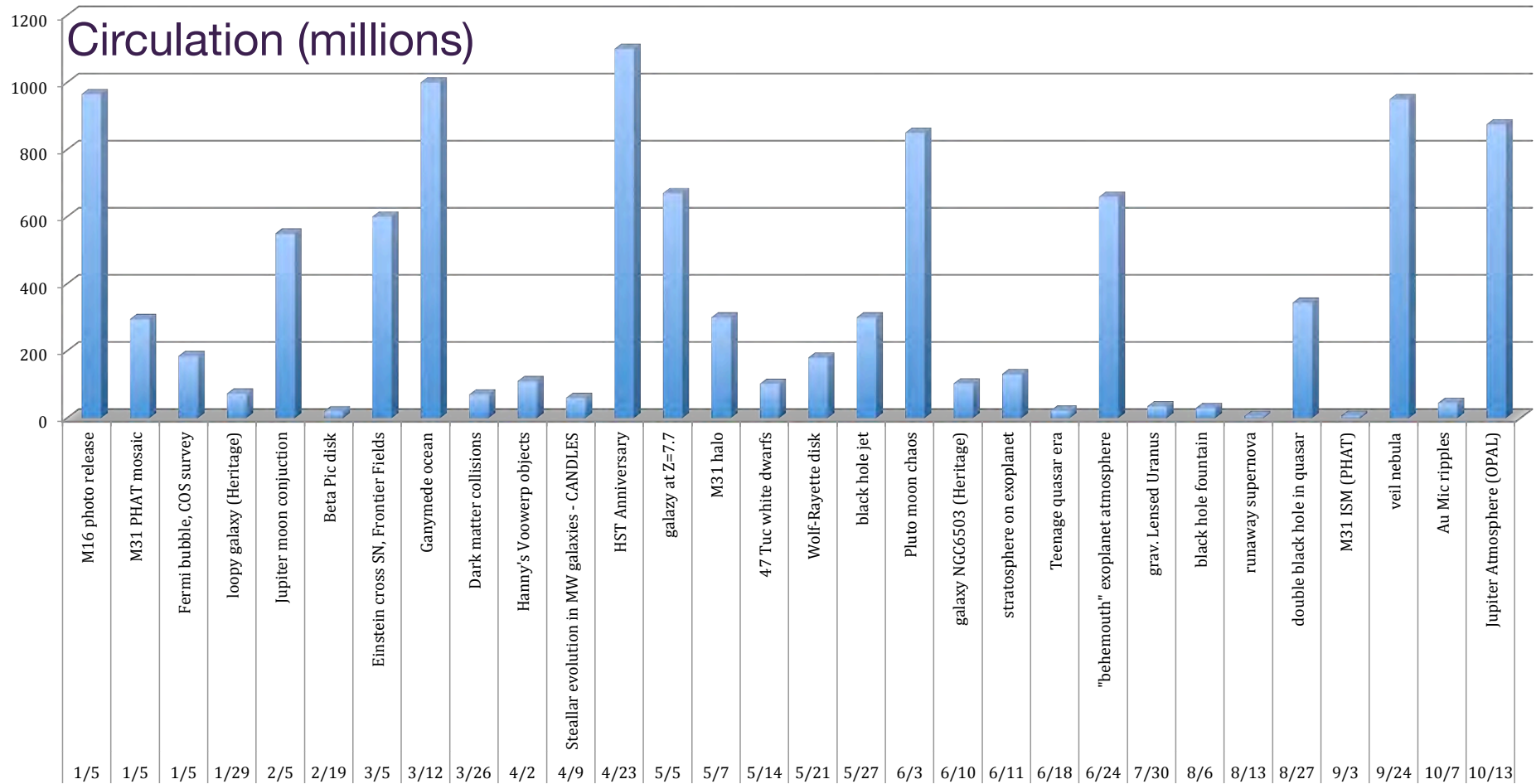


April 2015

September 2015



2015 Hubble Press Releases



Space Telescope Science Institute

A Team of Teams

Products & Services

INS Linda Smith	IT Dave Liska	OED Carl Johnson	BRC Karen Debelius	HR Sheryl Bruff	PMO (Acting) Kelli Underwood	Grants Manager Paula Sessa	Gov Rel Manager Michelle Burkett	Housing Manager Ray Beaser
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**Associate Director
Administration**
Don Hough

Priorities & Deliveries

CMO Marc Postman	ESA Antonella Nota	HST (Interim) Helmut Jenkner	JWST Massimo Stiavelli	OPO Hussein Jirdeh	SMO Neill Reid	WFIRST Roeland Van Der Marel
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**Associate Director
Science**

**Interim Deputy
Director**
Jerry Kriss
Director
Ken Sembach

~650 people in FY16

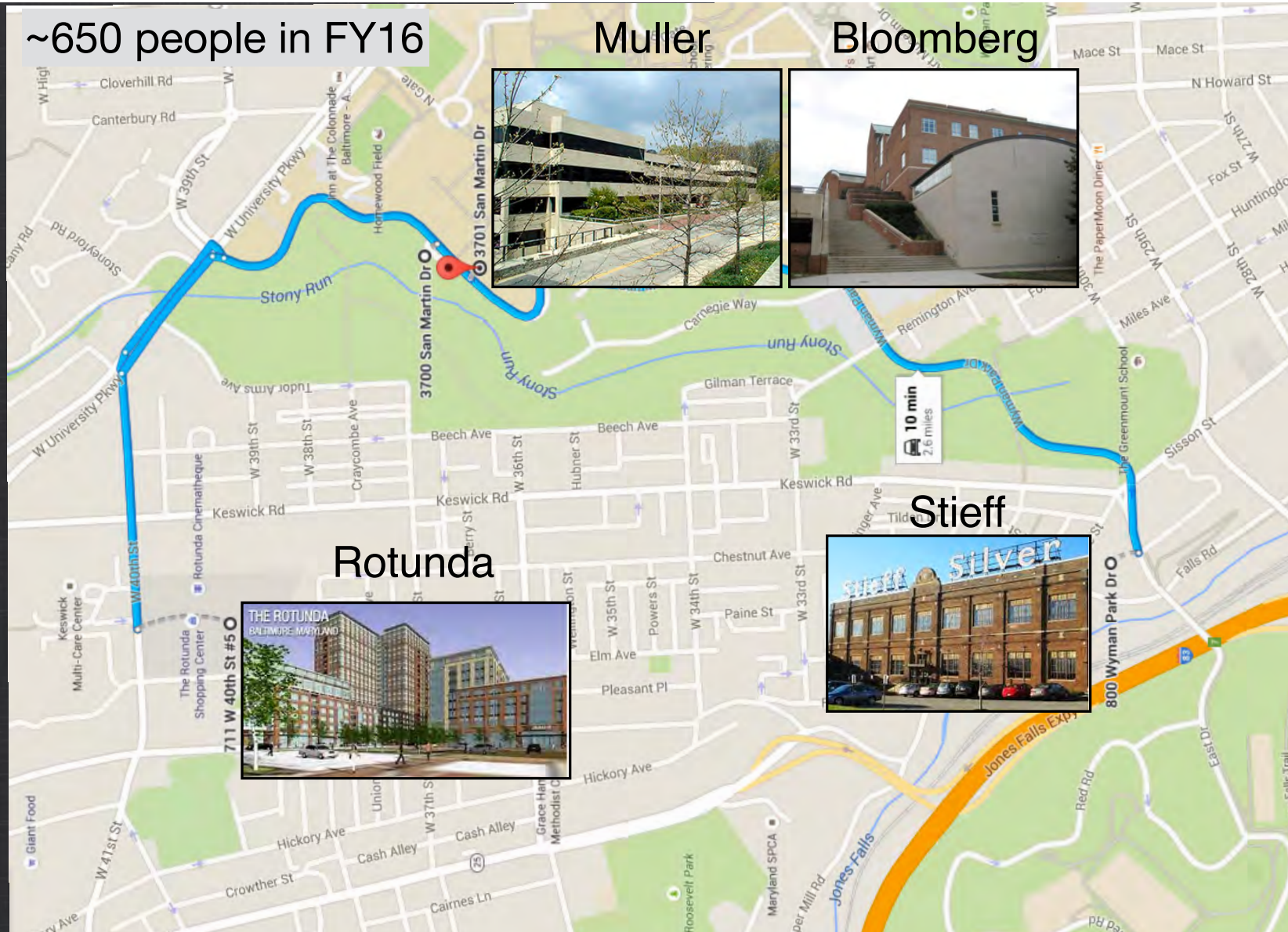
Muller

Bloomberg



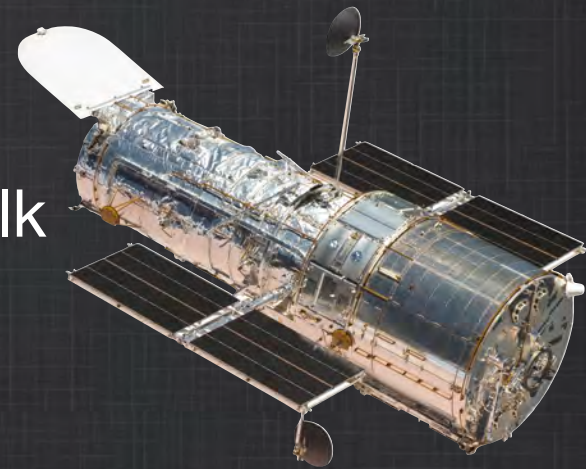
Rotunda

Stieff

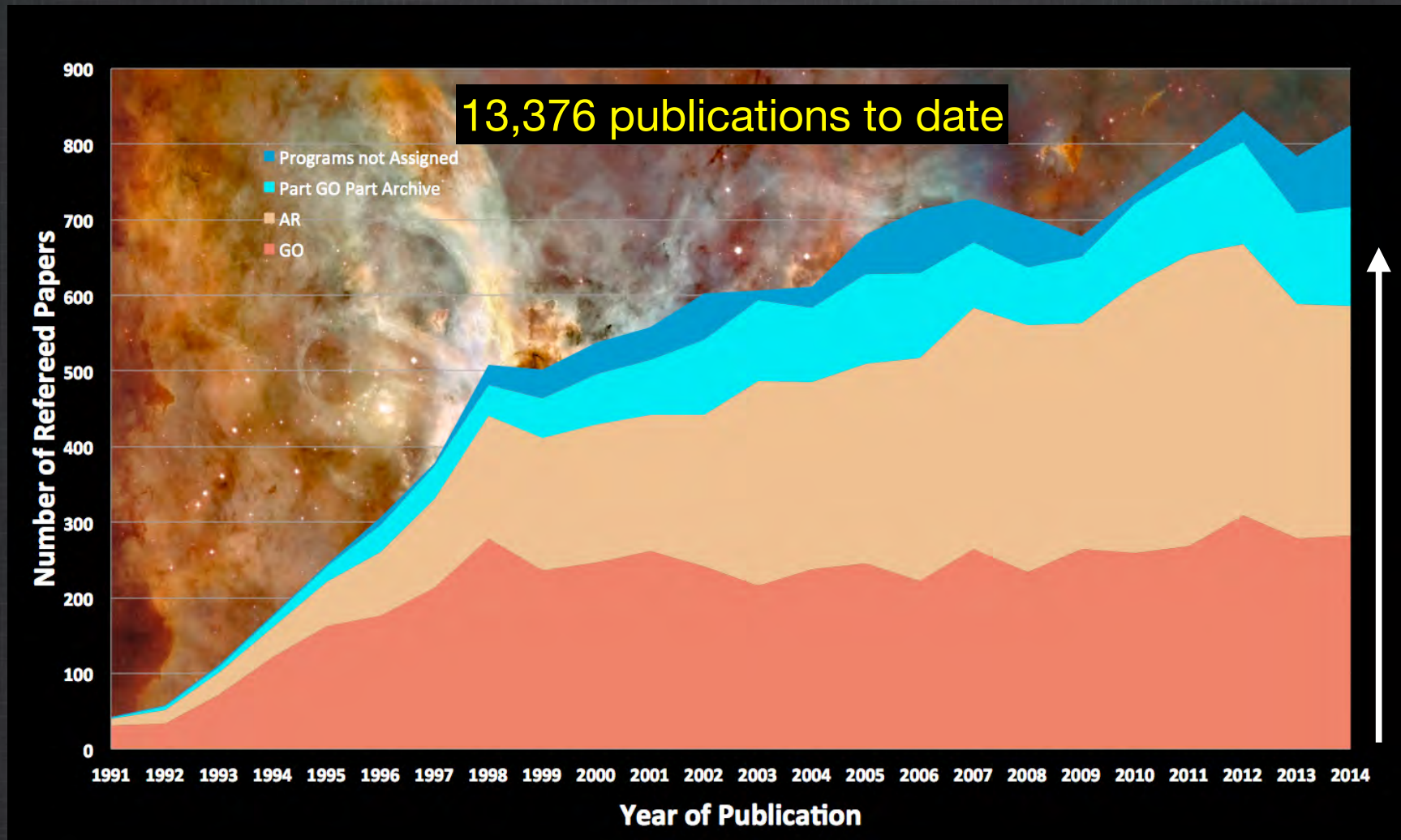


Noteworthy Hubble Items

- 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

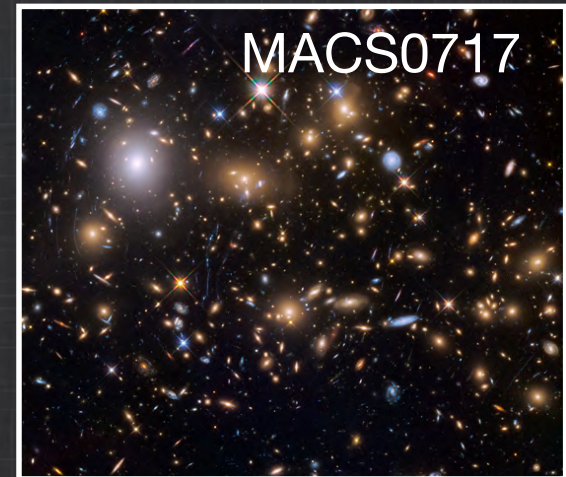
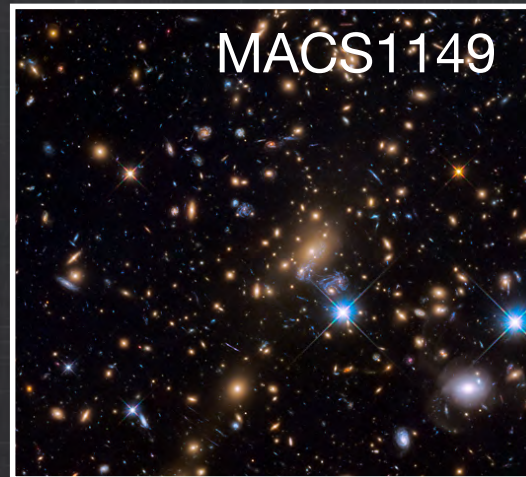
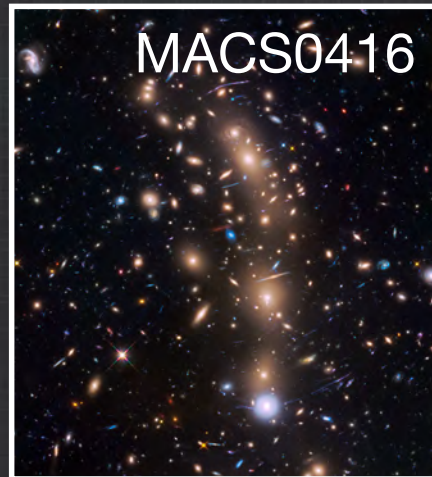


Hubble Science Productivity Remains Outstanding

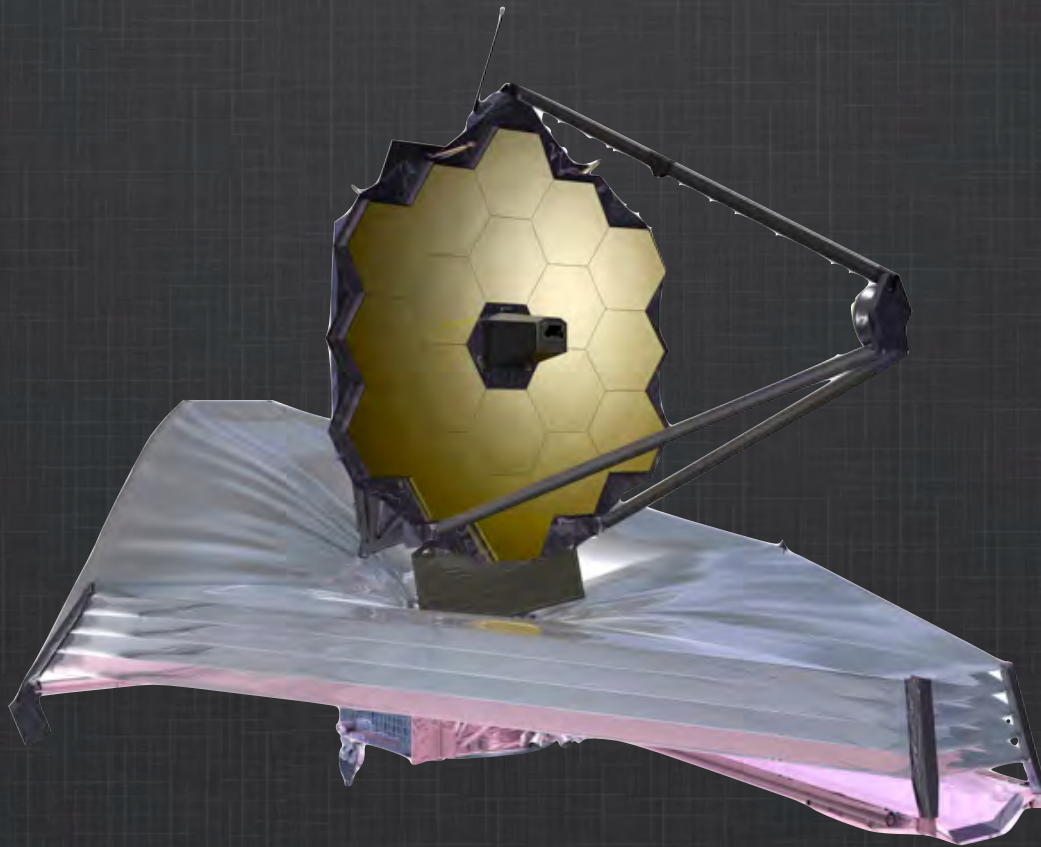


Frontier Fields

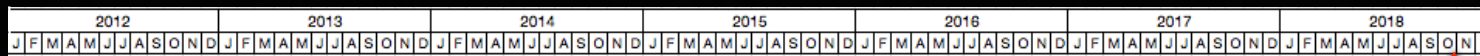
- Four clusters (+ four parallel deep fields) complete
- Continuing with final two clusters in Cycle 23
 - Abell S1063 - first epoch almost complete
 - Abell 370 - starting soon



JWST



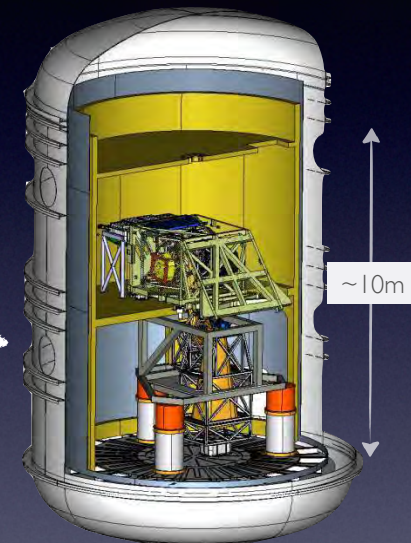
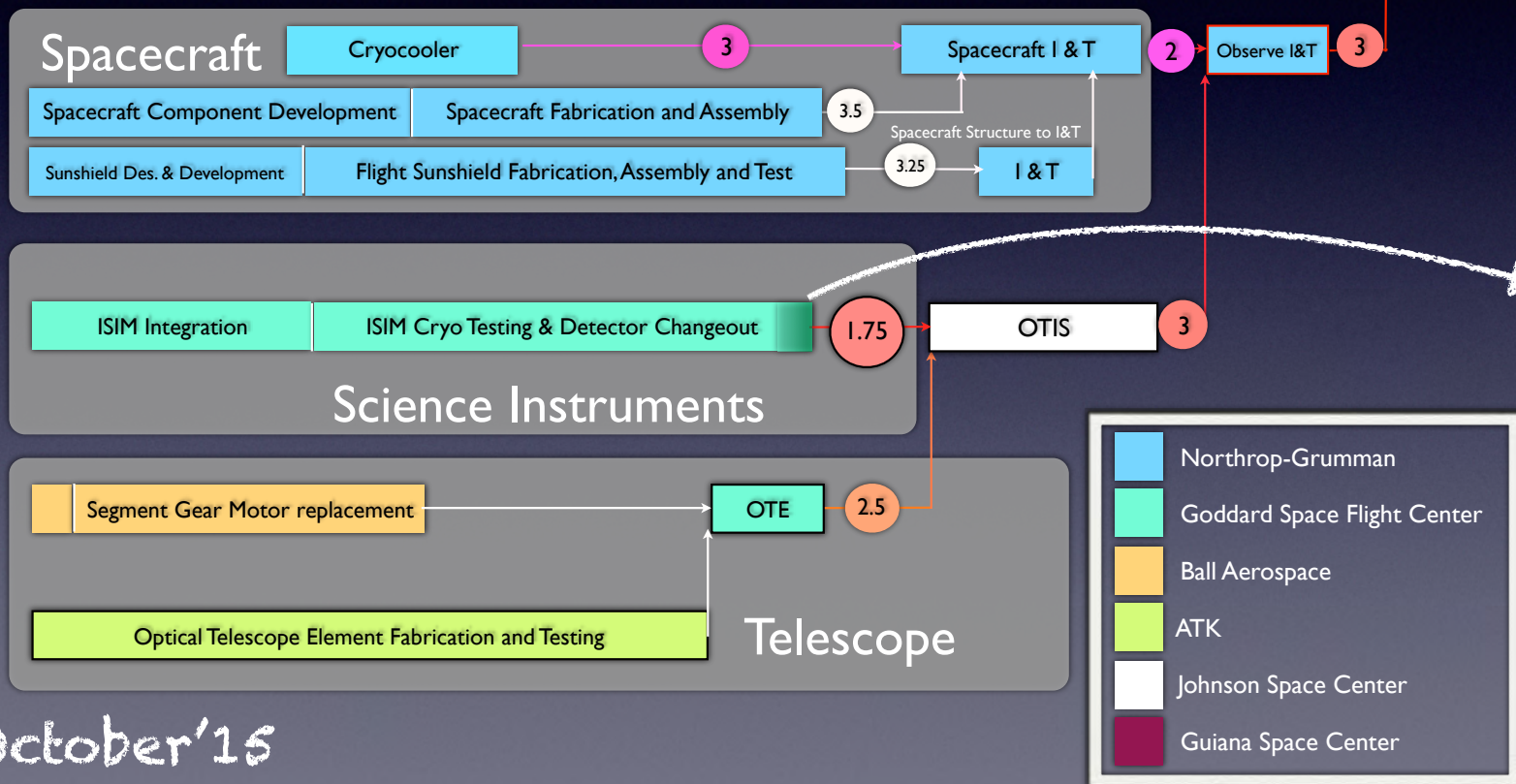
JWST schedule - 8.75 months of funded schedule reserve available



OTE = Optical Telescope Element

OTIS = Optical Telescope + ISIM

k months of critical path (mission pacing) slack

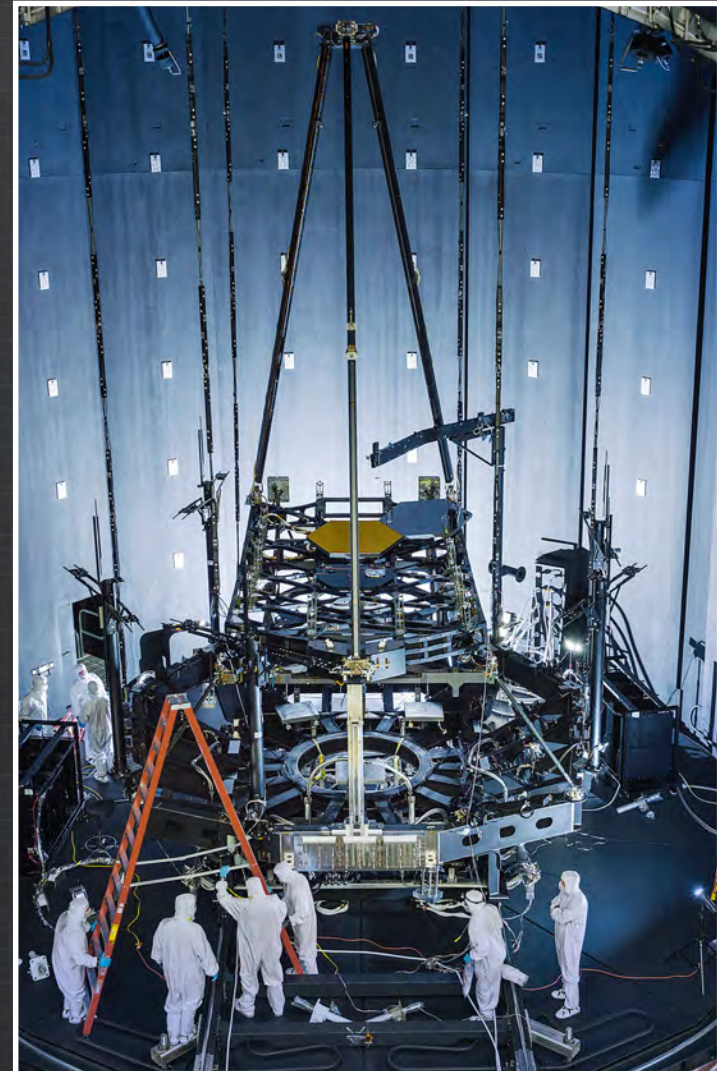
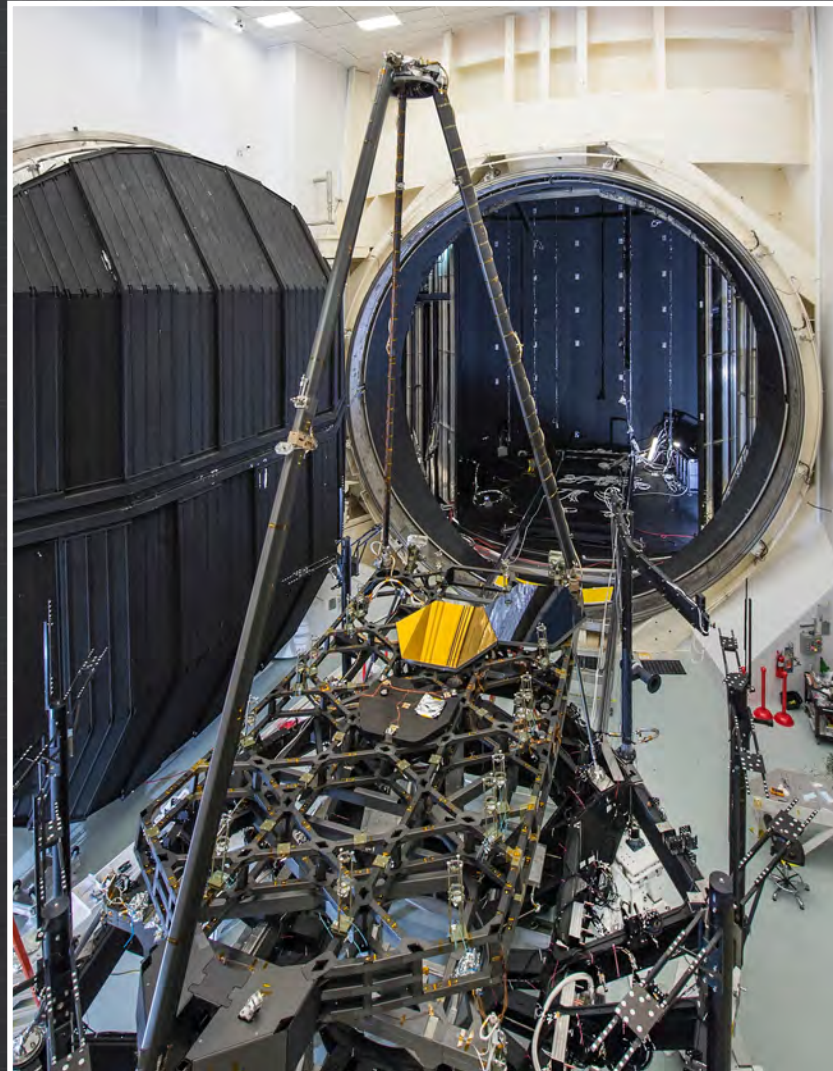


GSFC Space Environment Simulator

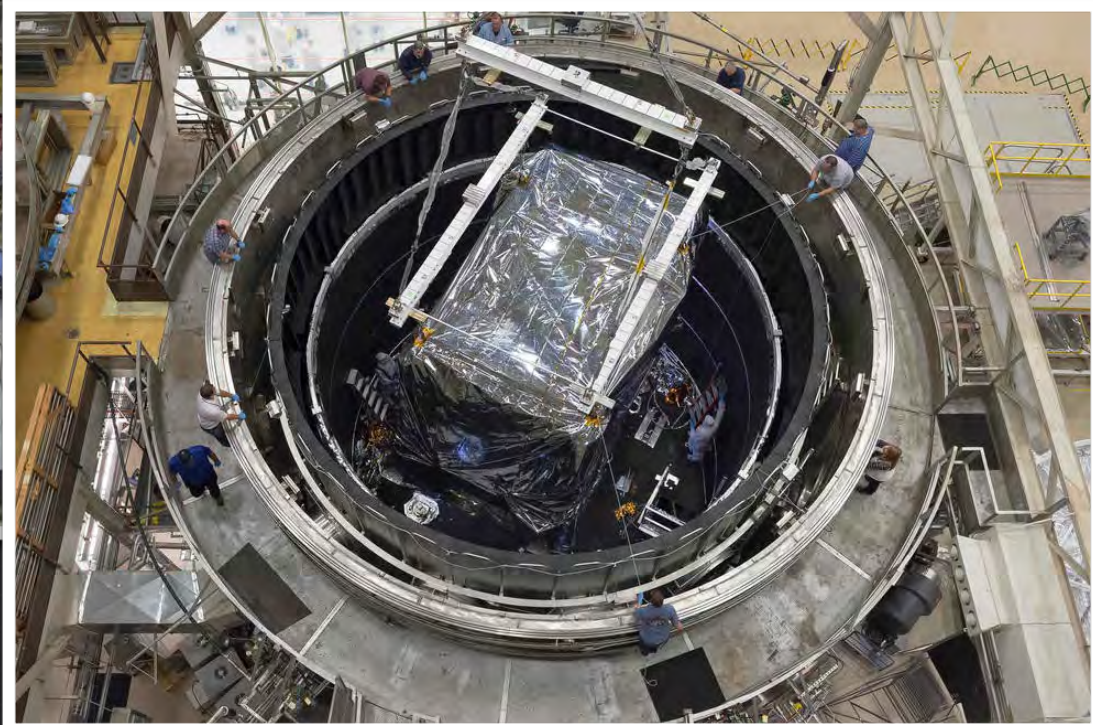
Optical Telescope Simulator (OSIM) + ISIM @ GSFC

October'15

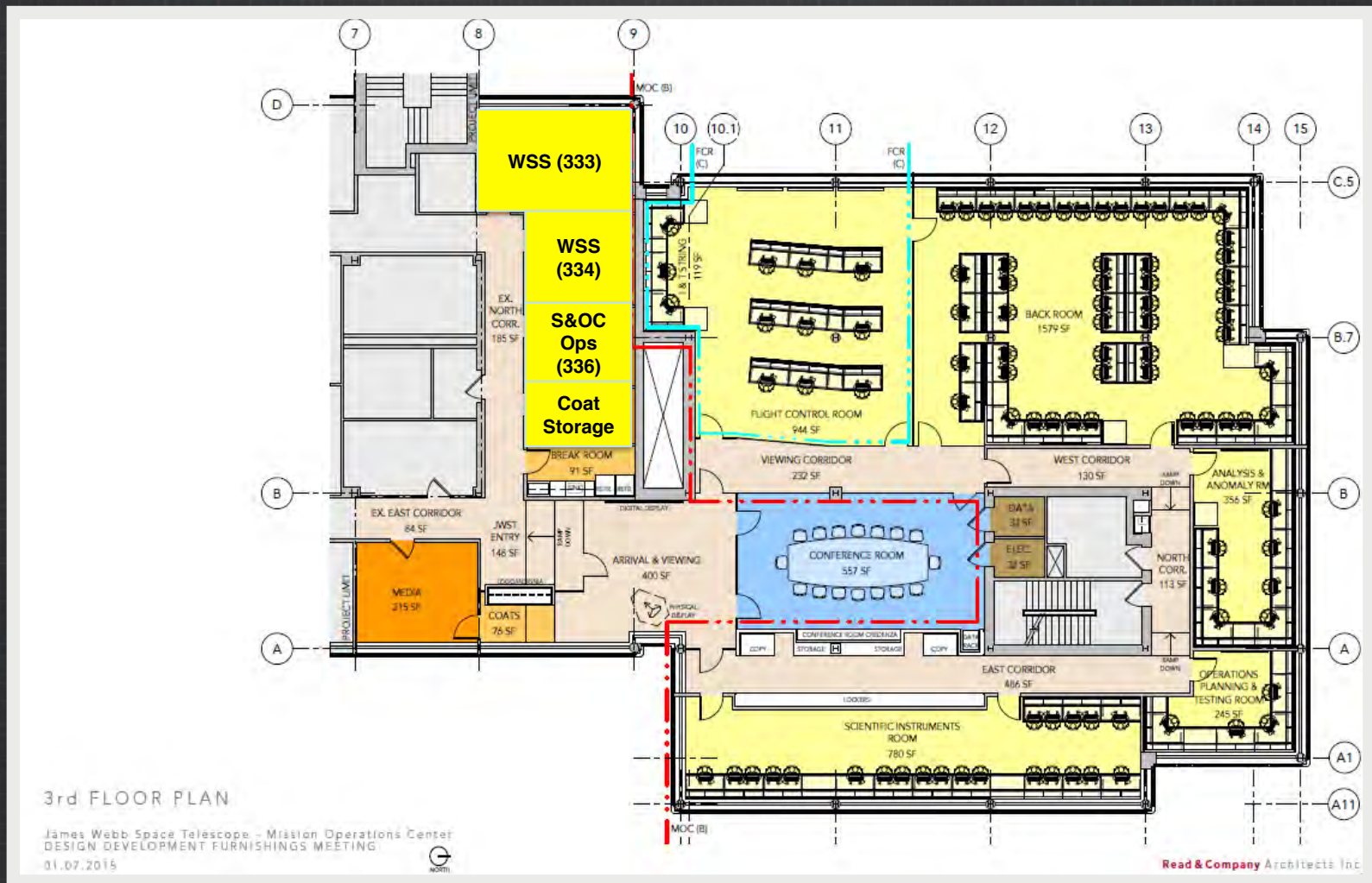
Testing of the Optical Equipment Completed at JSC



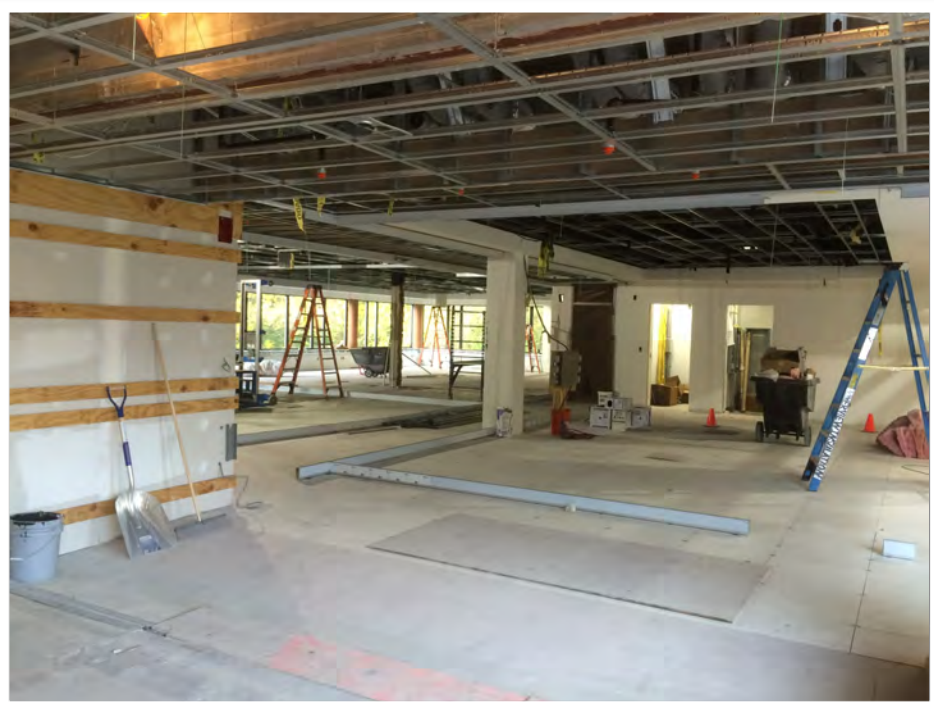
Assembling the Mirror and Testing the Instruments are Underway at GSFC



JWST Mission Operations Center at STScI

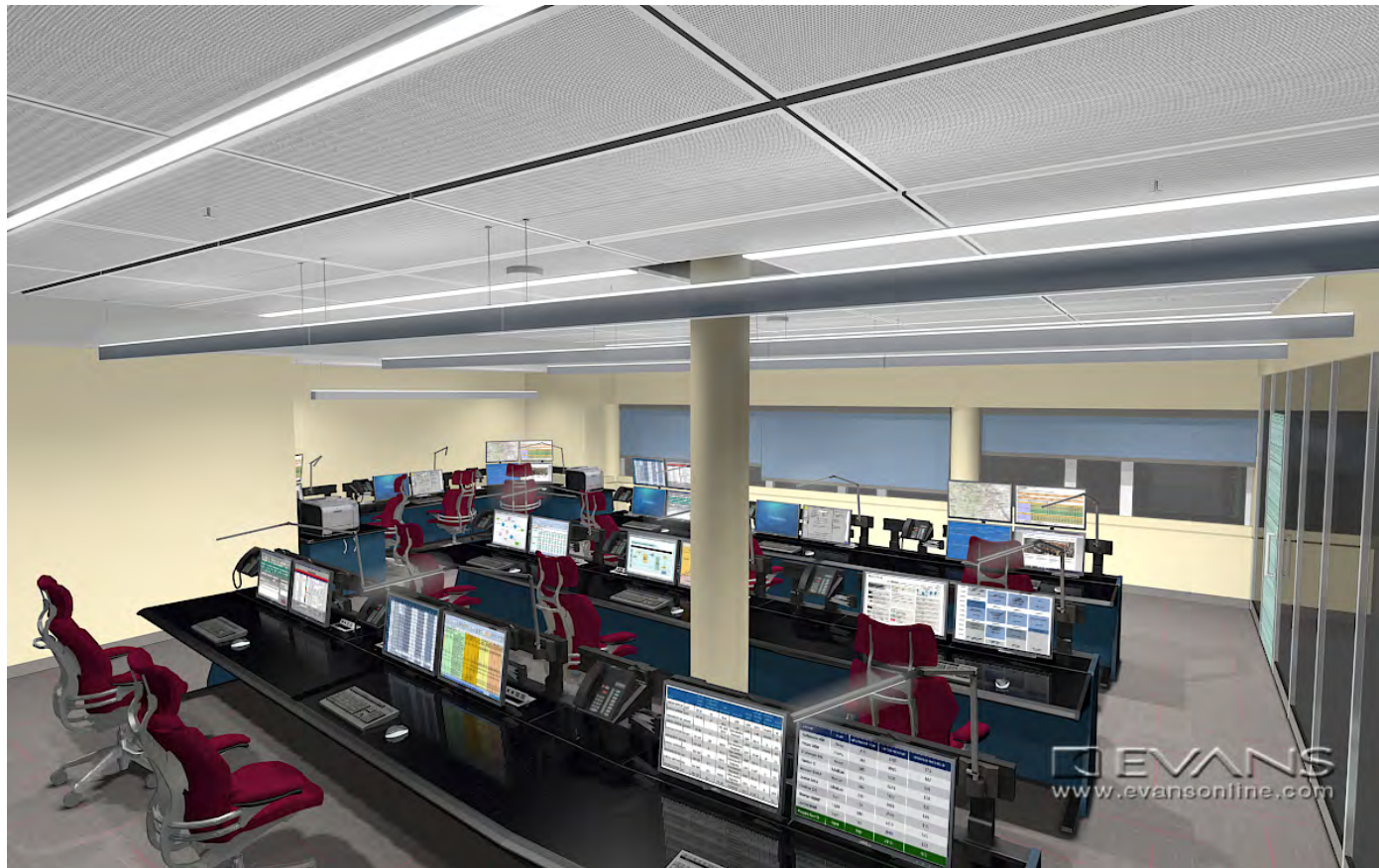


JWST Mission Operations Center at STScI



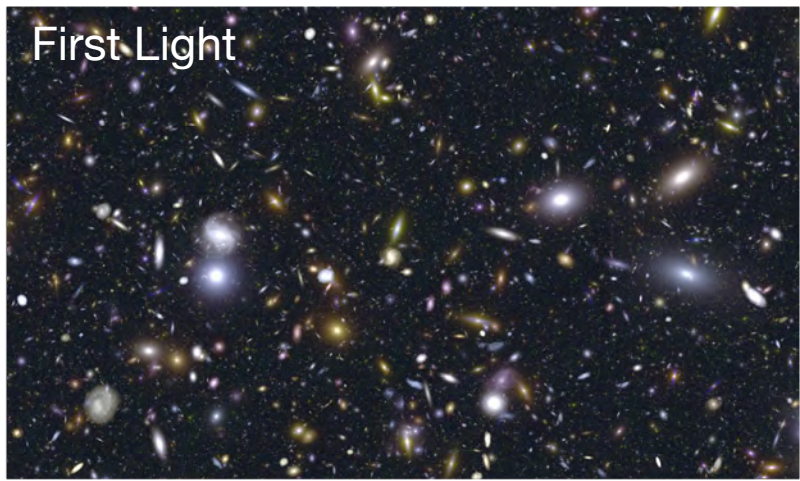


Flight Control Room

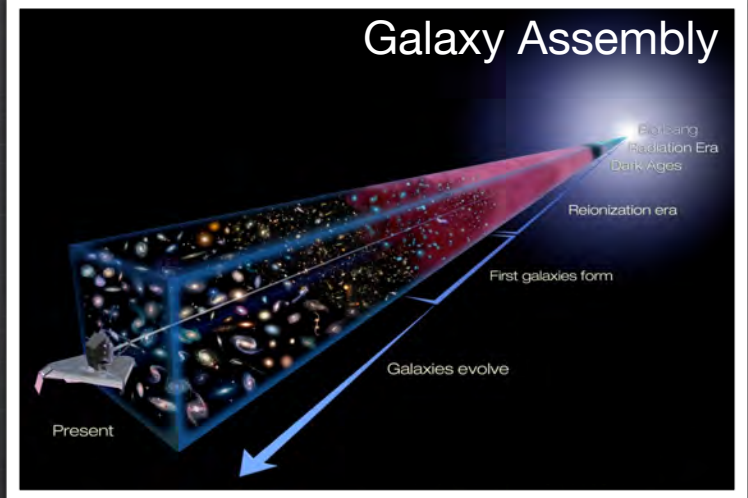


JWST Science Themes

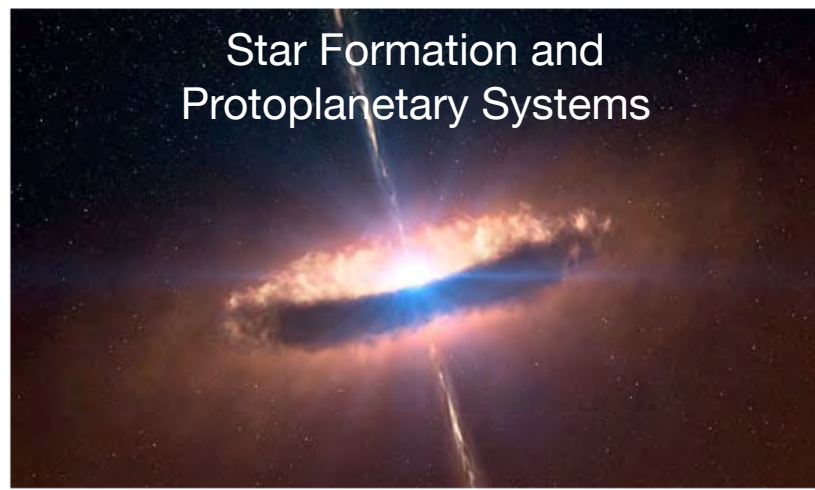
First Light



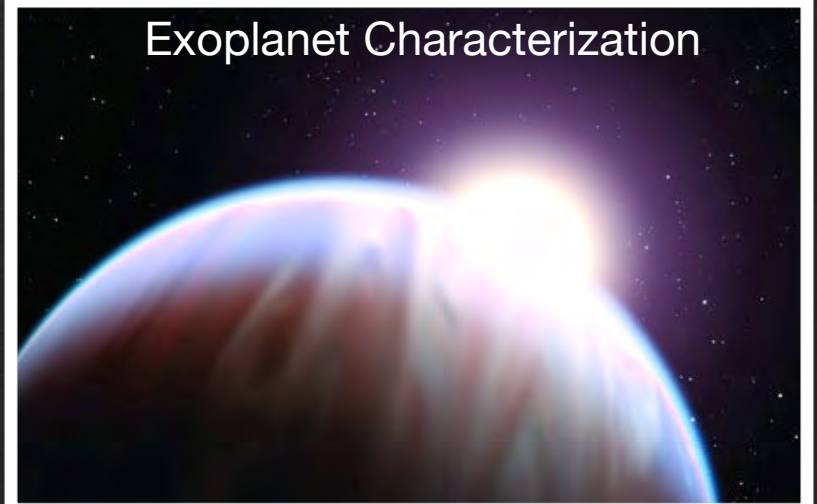
Galaxy Assembly



Star Formation and
Protoplanetary Systems



Exoplanet Characterization



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

Formation of Super
Star Clusters

Direct Imaging of
Exoplanets

Galaxy Assembly with
Gravitational Lensing

Planet Formation

Solid Icy Material in
Star Forming Regions

Organic Material in the
Circumstellar Media

Galaxy
Assembly and Physics of
Galaxy Formation

Mid-IR
Spectroscopy of the
Epoch of Galaxy
Assembly

Star Forming Galaxies
from $z = 4$ to 10

High Redshift Galaxy
Clusters

Debris Disks

Core Collapse
Supernovae and Ejecta

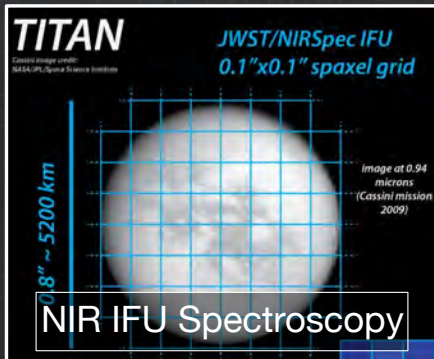
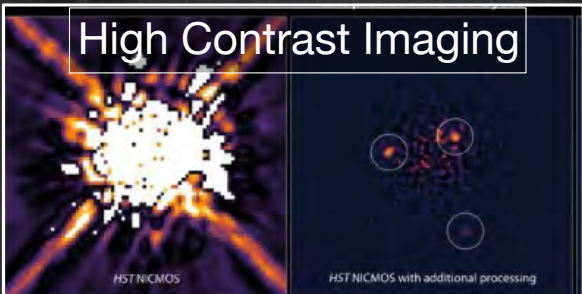
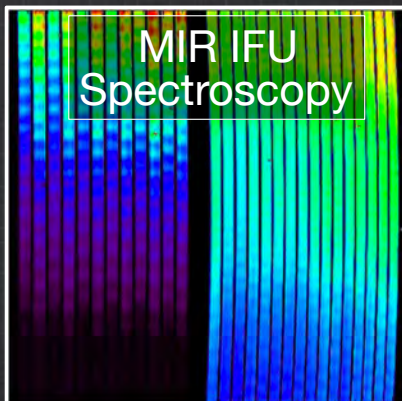
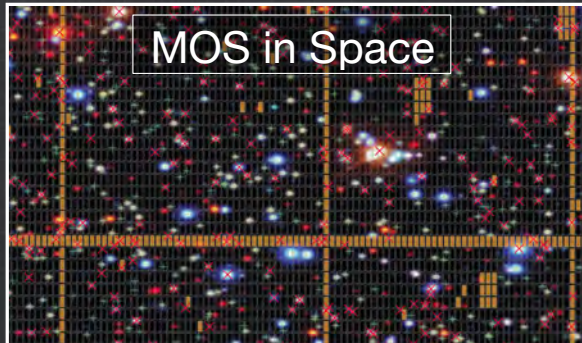
Conference in ... (2015)

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.

Exposure Time Calculator Authentication anon_101 Help ▼

Available Workbooks

#	Name	Load	Description	Options
1006	New Workbook	[Load]	An Empty Workbook	[Copy] [Remove] [Sharing]
1007	Imaging workbook	[Load]	Imaging observations of a 1 microJy flat spectrum source.	[Copy] [Remove] [Sharing]
1008	High-resolution spectroscopy workbook	[Load]	High-resolution spectroscopy observations of a 1 mJy flat spectrum source.	[Copy] [Remove] [Sharing]
1009	Medium-resolution spectroscopy workbook	[Load]	Medium-resolution spectroscopy observations of a 1 mJy flat spectrum source.	[Copy] [Remove] [Sharing]
1010	Multiple extended source workbook	[Load]	Multiple extended sources observed in imaging and spectroscopy.	[Copy] [Remove] [Sharing]
1011	Sample NIRSpec MSA Calculations	[Load]	Sample of NIRSpec MSA calculations showing the effects of shutter location, source location within the shutter, and the impact of multiple sources within a scene.	[Copy] [Remove] [Sharing]
1012	Example Source Flux Distributions	[Load]	Example imaging calculations for each of the supported source geometries: point, flat, 2D gaussian, and seric	[Copy] [Remove] [Sharing]
1013	Sample Coronagraphy Calculations	[Load]	Coronagraphy calculations using three faint sources, one central star, and one reference source	[Copy] [Remove] [Sharing]
1014	Sample NIRISS WFSS Calculations	[Load]	Sample NIRISS WFSS Calculations	[Copy] [Remove] [Sharing]

[Create New Workbook](#) [Get a Copy of the Sample Workbooks](#)

Exposure Time Calculator Authentication Edit View Scene Library ▼ session log = trans.wssw1.5 Help ▼

Sample NIRISS WFSS Calculations

Calculations Scenes and Sources Uploaded Spectra

MIRI	NIRCam	NIRISS	NIRSpec	ID	Plot	Mode	Scene	(μ)	SNR	Δ	\times
				5	<input checked="" type="checkbox"/>	niriss wfss	1	4252.00	5.75	<input checked="" type="checkbox"/>	<input type="checkbox"/>
				4	<input checked="" type="checkbox"/>	niriss wfss	1	4252.00	9.72	<input checked="" type="checkbox"/>	<input type="checkbox"/>
				3	<input checked="" type="checkbox"/>	niriss wfss	1	4252.00	8.82	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
				2	<input checked="" type="checkbox"/>	niriss wfss	1	4252.00	11.45	<input checked="" type="checkbox"/>	<input type="checkbox"/>
				1	<input type="checkbox"/>	niriss imaging	1	1063.00	22.27	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Scene Backgrounds Instrument Setup Strategy Detector Setup

Scene for this calculation: 1

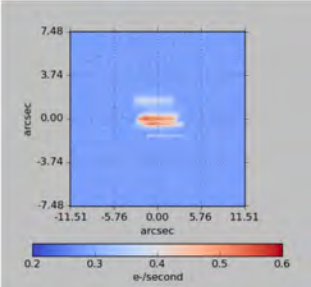
Sources in that scene: 1: Galaxy 1

Spectral energy distribution: ☐ Uploaded File ☒ Select ☐ Flat Continuum ☐ No Continuum

[Reset](#) [Calculate](#)

Images

2D SNR Detector Saturation



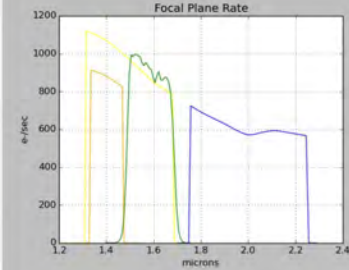
arcsec

arcsec

e-/second

Plots

Target Focal Plane Rate SNR SNR (time) Contrast



e-/sec

microns

Reports

Report Warnings

Time (s): 4252.00

Reference Wavelength (microns): 1.48

SNR: 8.82

Flux (e-/s): 0.33

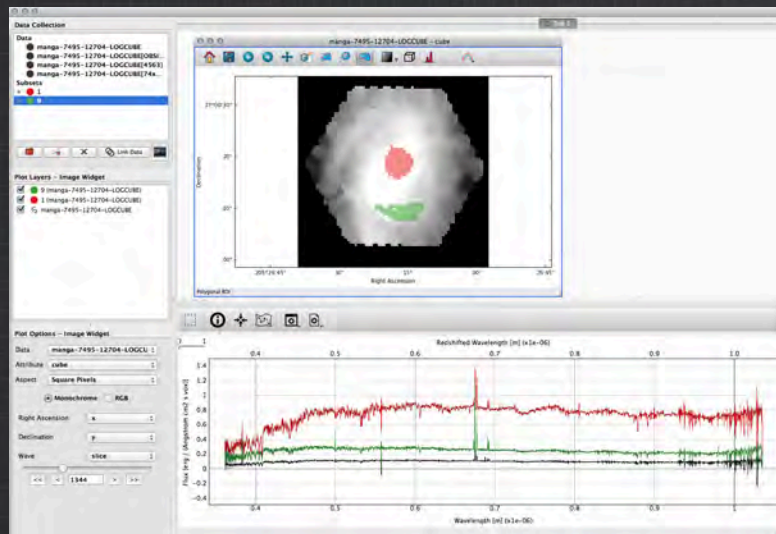
Total Flux (e-/s): 6.6e-9

JWST User Tools: Data Analysis

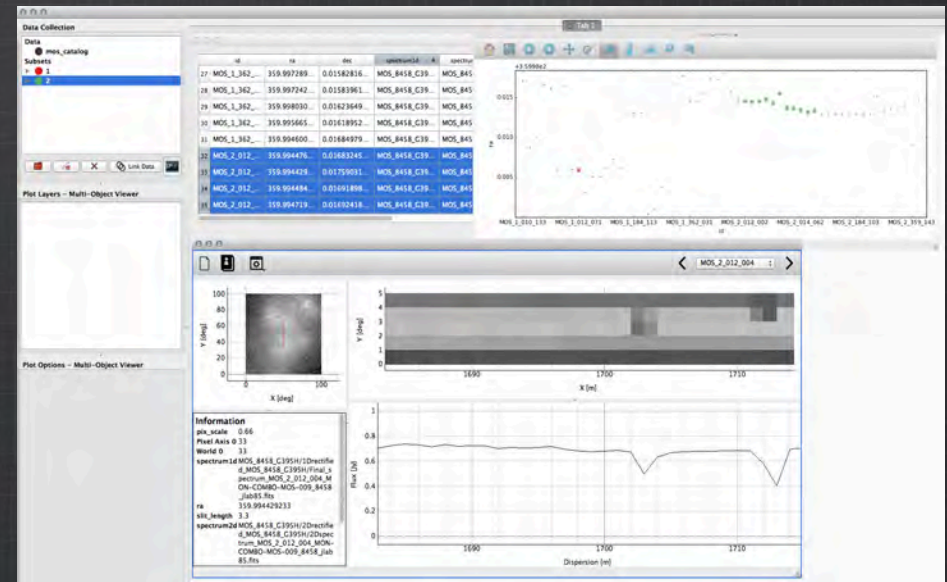
Data analysis tools include

- 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.

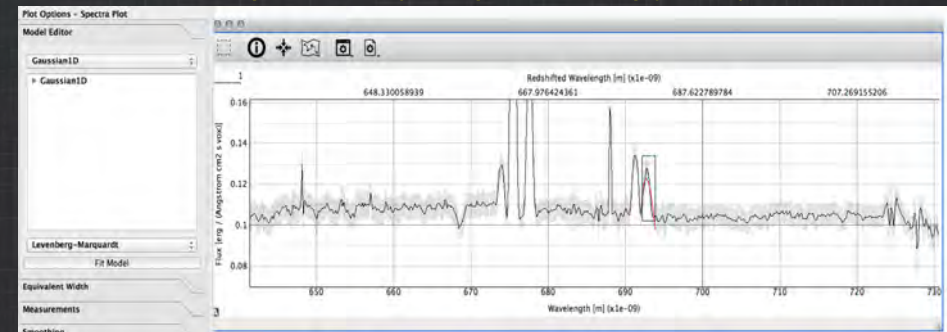
ST Cube (Cube tool)



Multi-object spectroscopy tool



SpecView (1D spectroscopy tool)

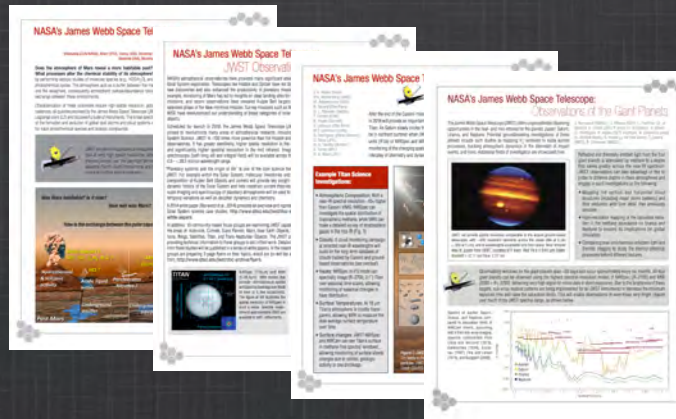


Getting the Community Ready for JWST

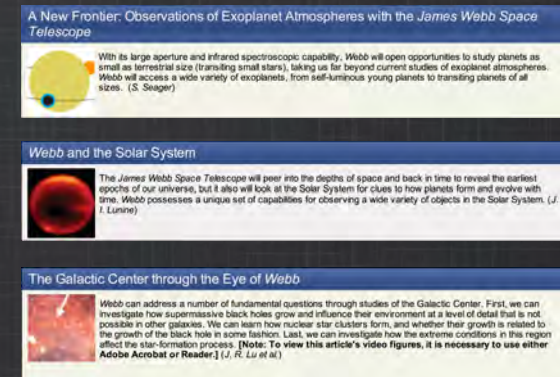
AAS, DPS, SPIE, IAU meetings
(Town Halls, Science Session, User Training, Interactive Demos, Booth, etc.)



Topical Fliers
(Community led one page science programs)



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



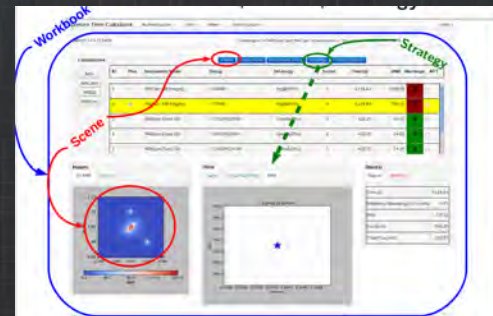
Building a New "Science Oriented" JWST Website



Strategic JWST Threads on Science-Oriented Social Media Streams



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



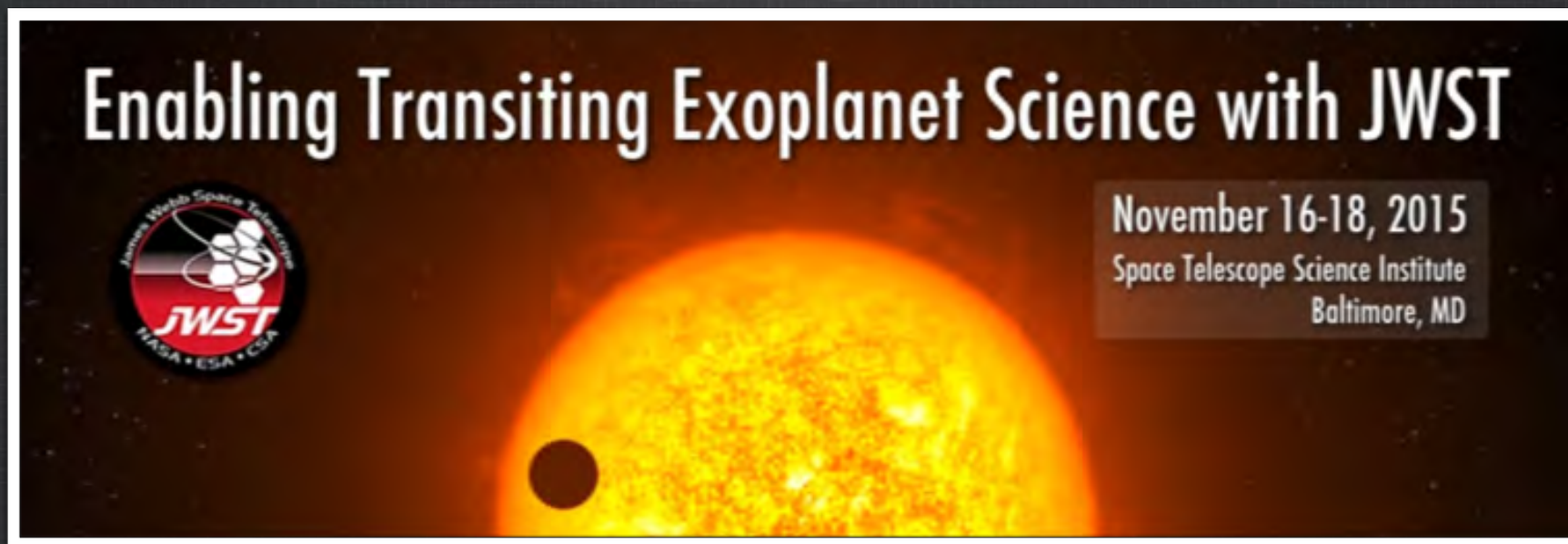
Annual Data Analysis and Training Workshops



***Direct Community Engagement Initiative (2016 - 2018)**

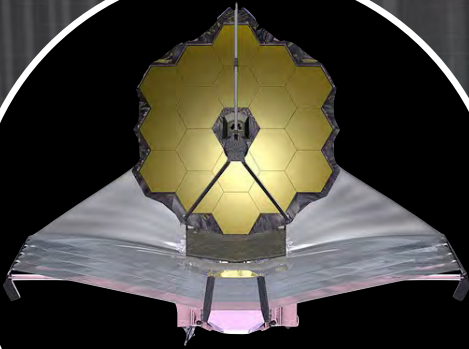
JWST Project Science at STScI will give JWST focused colloquia at most large US institutions that make up our user community

Coming Up



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

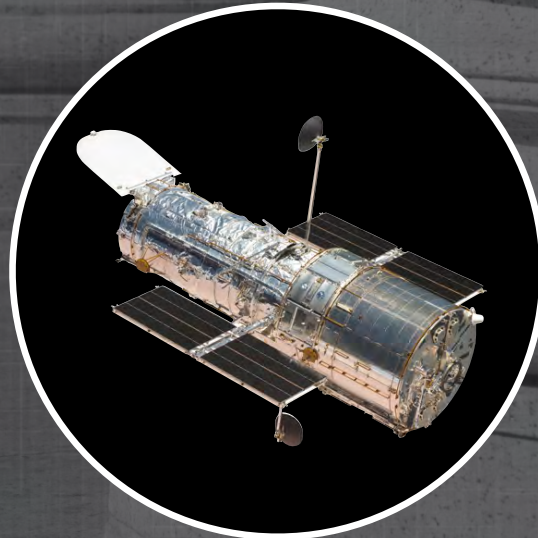
The Astrophysics Frontier JWST + WFIRST



100x More Power



100x Wider Area



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



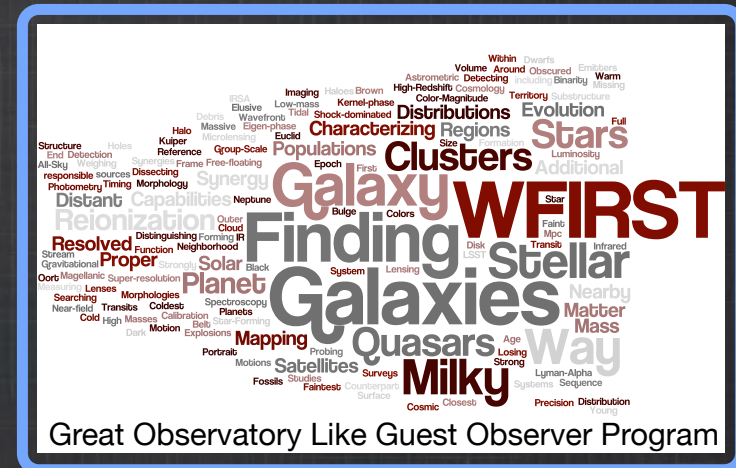
A Snapshot of WFIRST Science



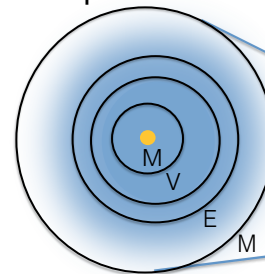
Direct Space-Based Imaging and Characterization of Nearby Exoplanets



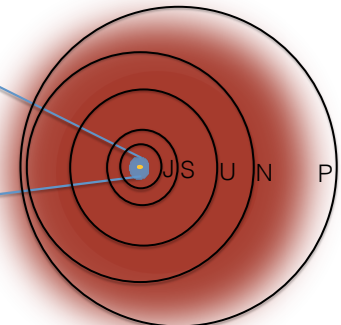
2700 Supernovae Across Cosmic Time (Distance Ladder)



Kepler Search

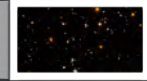


WFIRST Search



2800 planets outside of Kepler's Search Volume

Hubble - a spectacular start



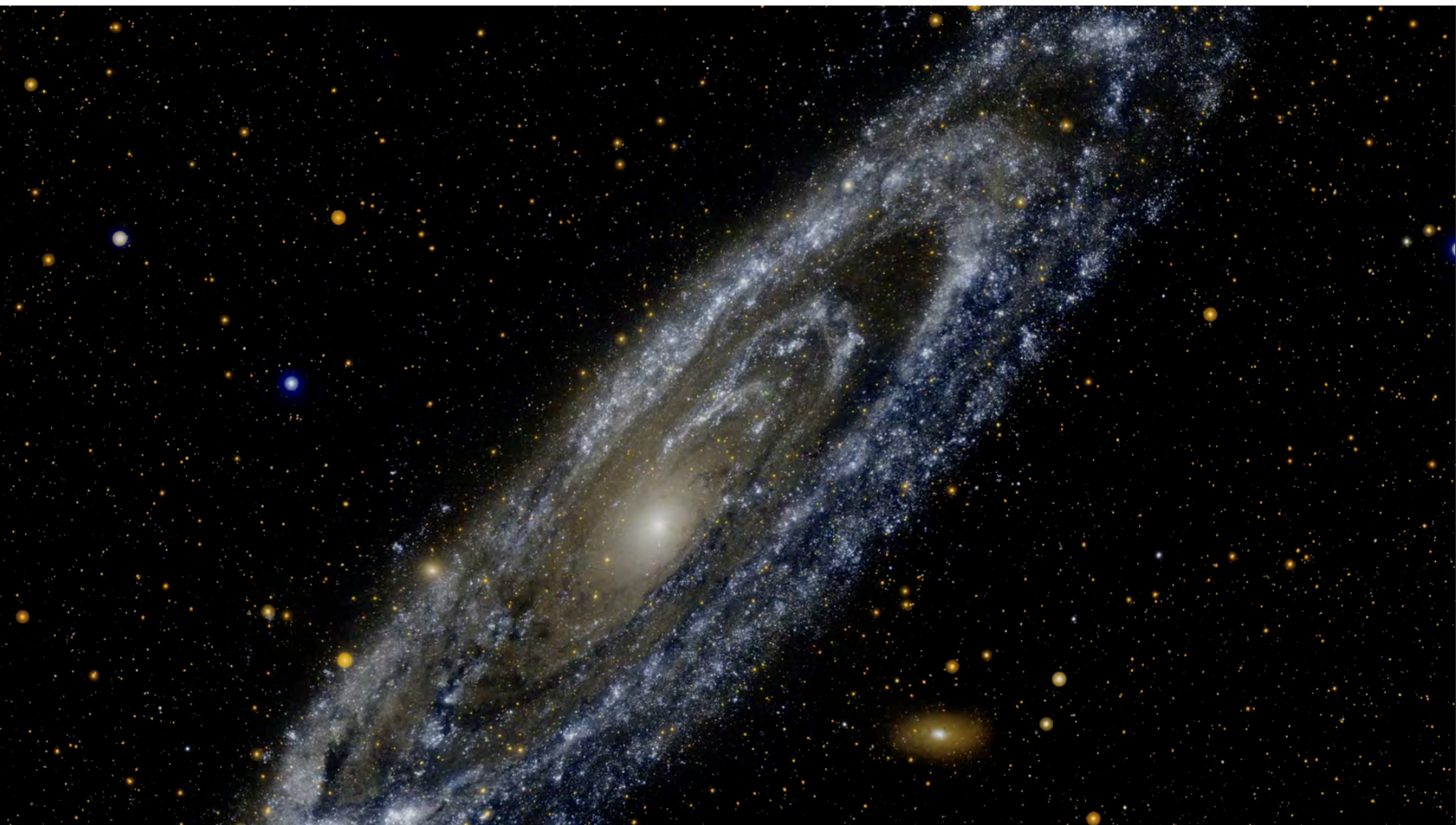
The Hubble Ultra Deep Field
seeing the Universe, 10,000 galaxies at a time

WFIRST - Hubble X 100



Hubble's Field

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



The Cycle Begins Again...

From Cosmic Birth to Living Earths

A Visionary Space Telescope for UV-Optical-NearIR Astronomy

