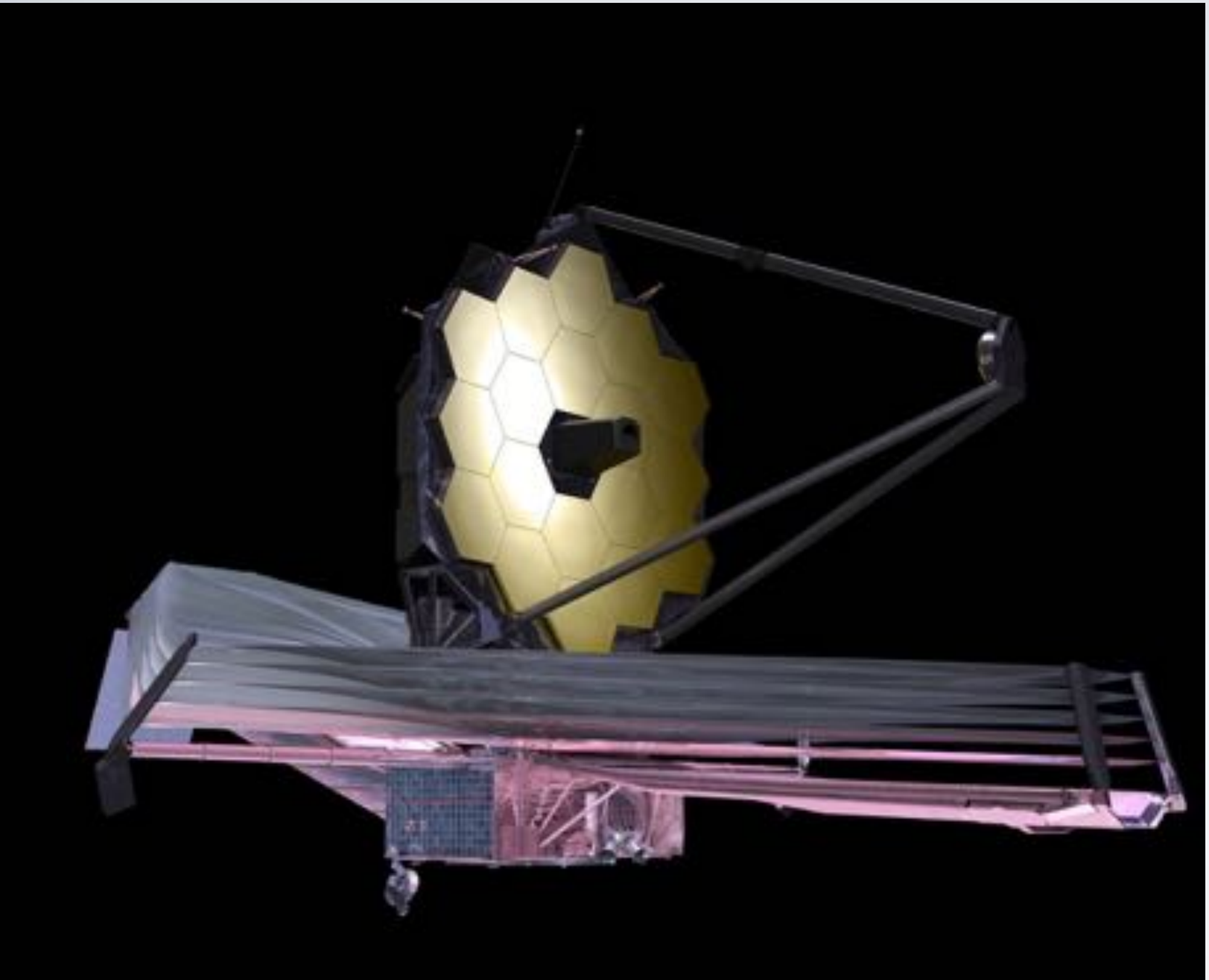
# Opportunities with the James Webb Space Telescope

Nancy A. Levenson
Space Telescope Science Institute

image credit: J.Dore

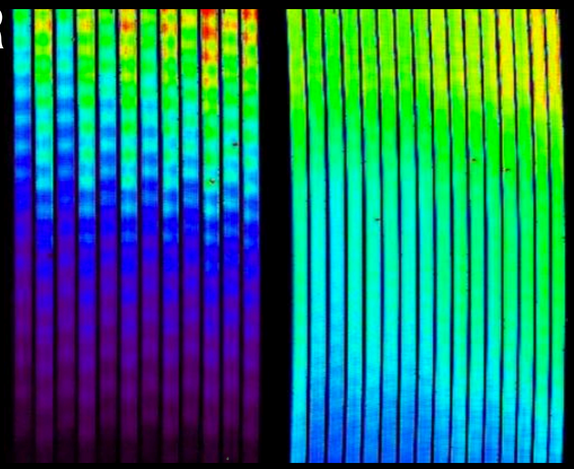
# JWST



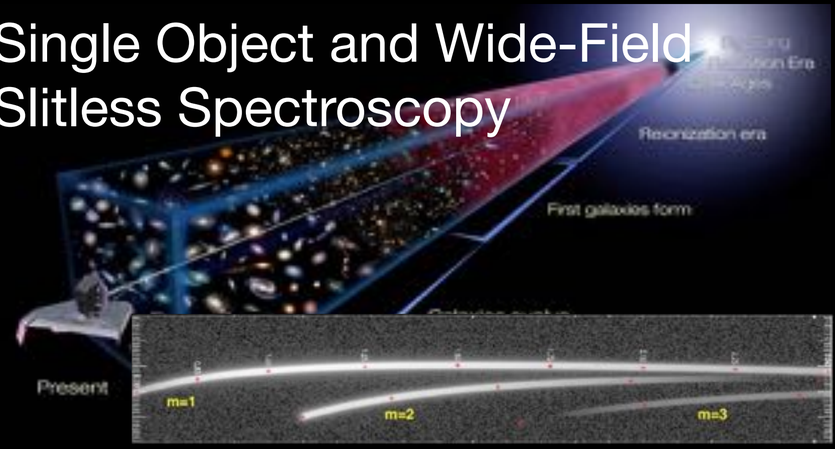
- NASA, ESA, and CSA
- 6.5m mirror
- cooled
- instruments cover near- through mid-infrared
- imaging, spectroscopy, coronagraphs, integral field units, etc.

Ultra Sensitive and High Resolution Imaging

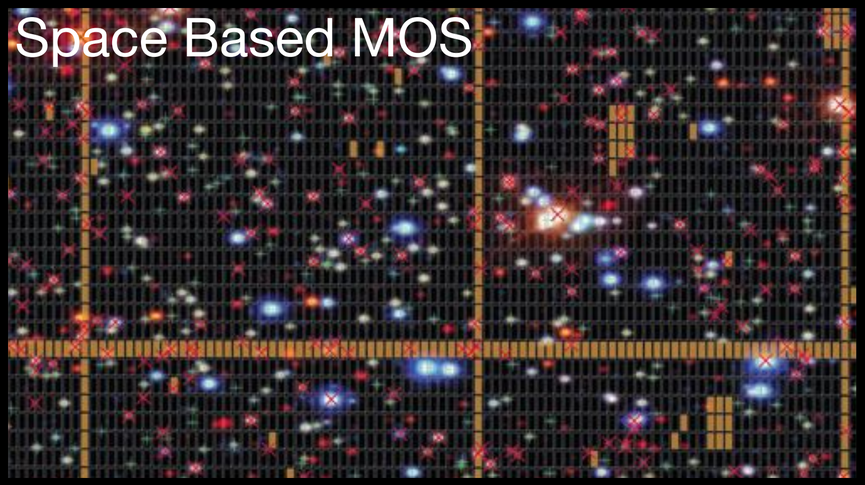
Mid IR IFUs

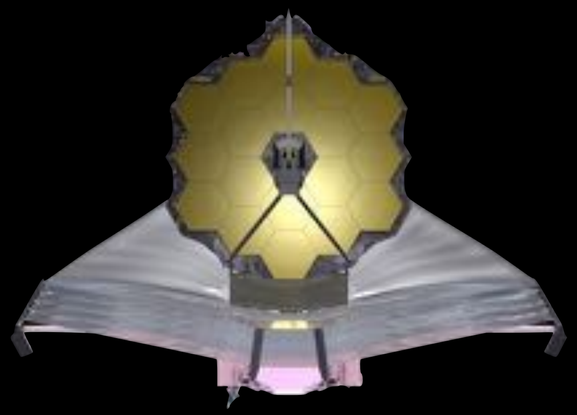


Single Object and Wide-Field Slitless Spectroscopy




Space Based MOS

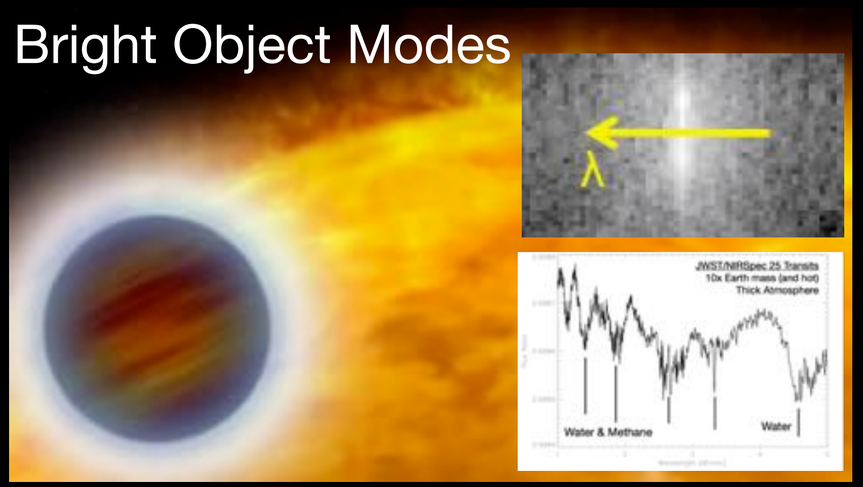




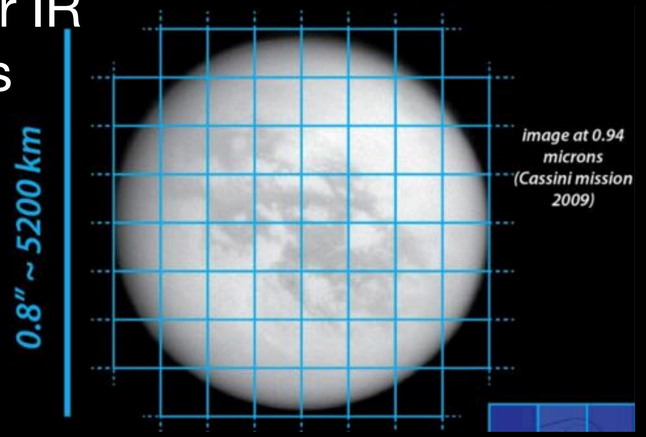
Science Capabilities

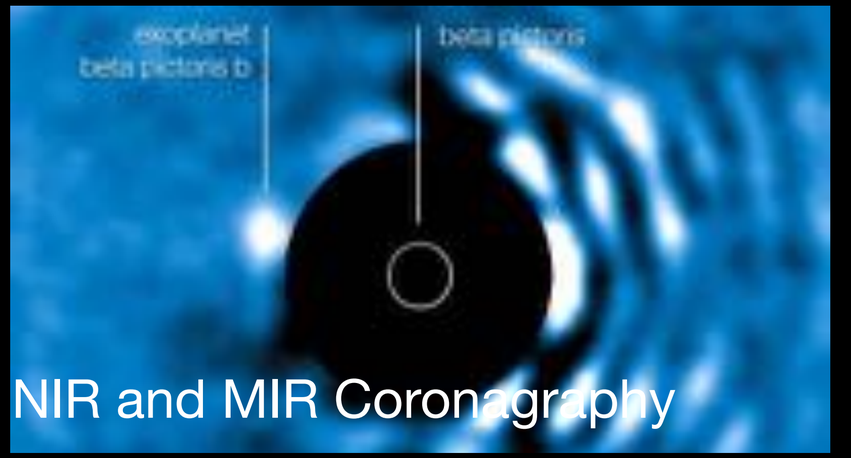
Moving Target Support

Bright Object Modes




Near IR IFUs

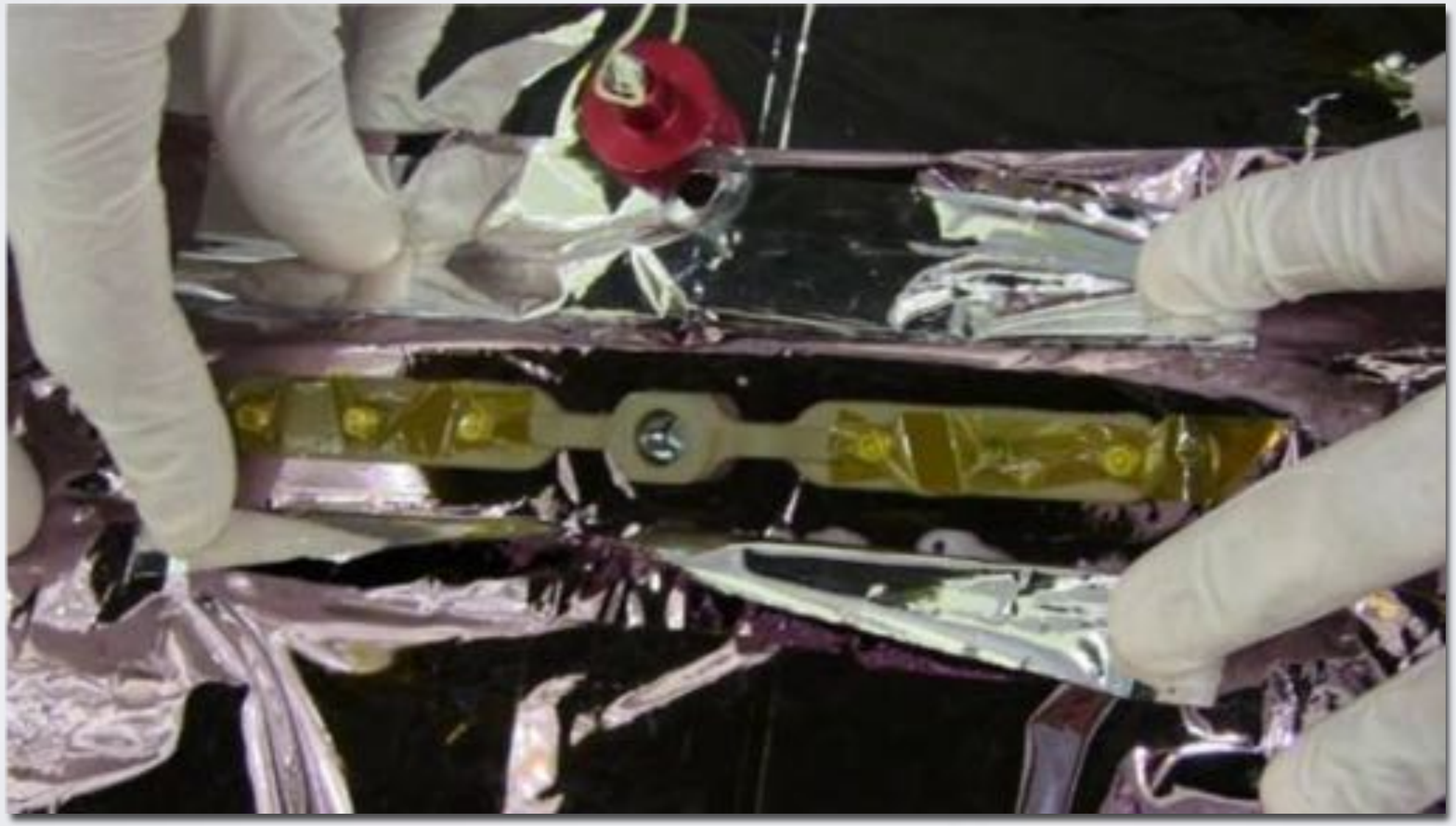



NIR and MIR Coronagraphy

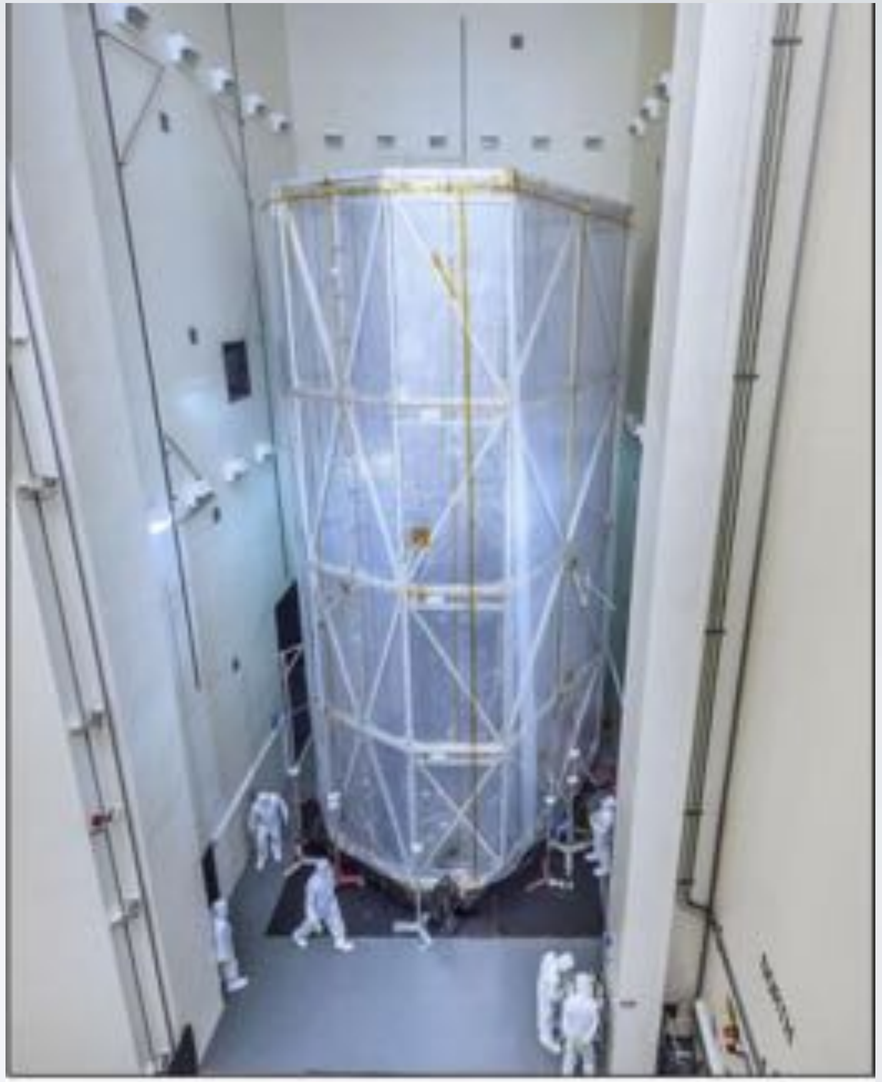
# delay and current schedule

- NASA now planning for March 2021 launch
- delay (from 2018) announced in March 2018, following independent review board
  - primarily requiring time for integration and testing
  - secondary issue of sunshield fasteners



# progress with testing

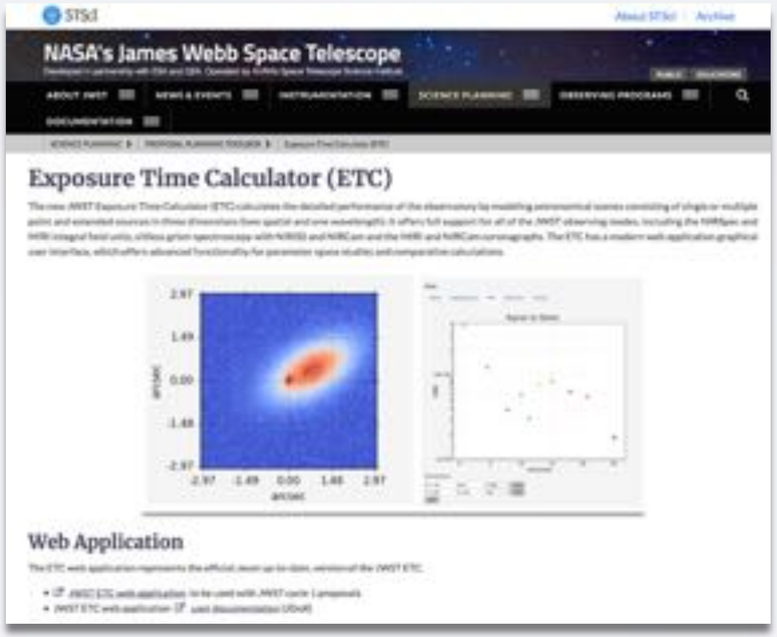
SCE en route to the LATF
Image Credit: Northrop Grumman

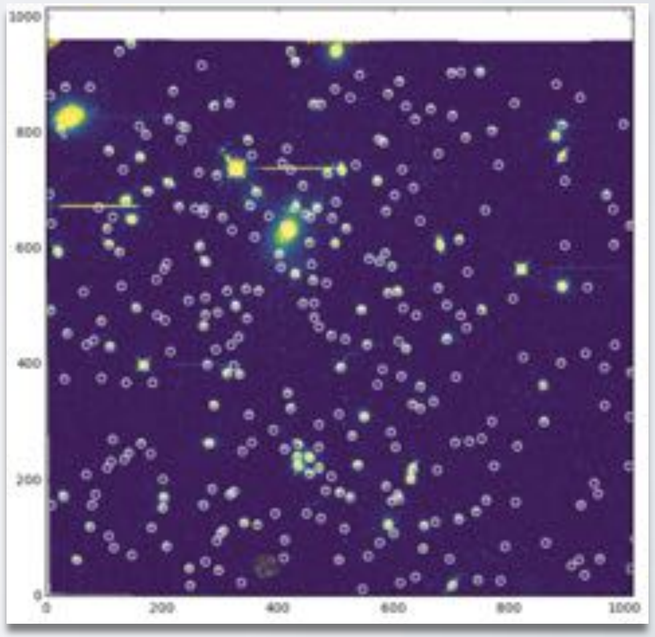


Clean tent with SCE being prepared for acoustic testing inside the Large Acoustic Test Facility (LATF)

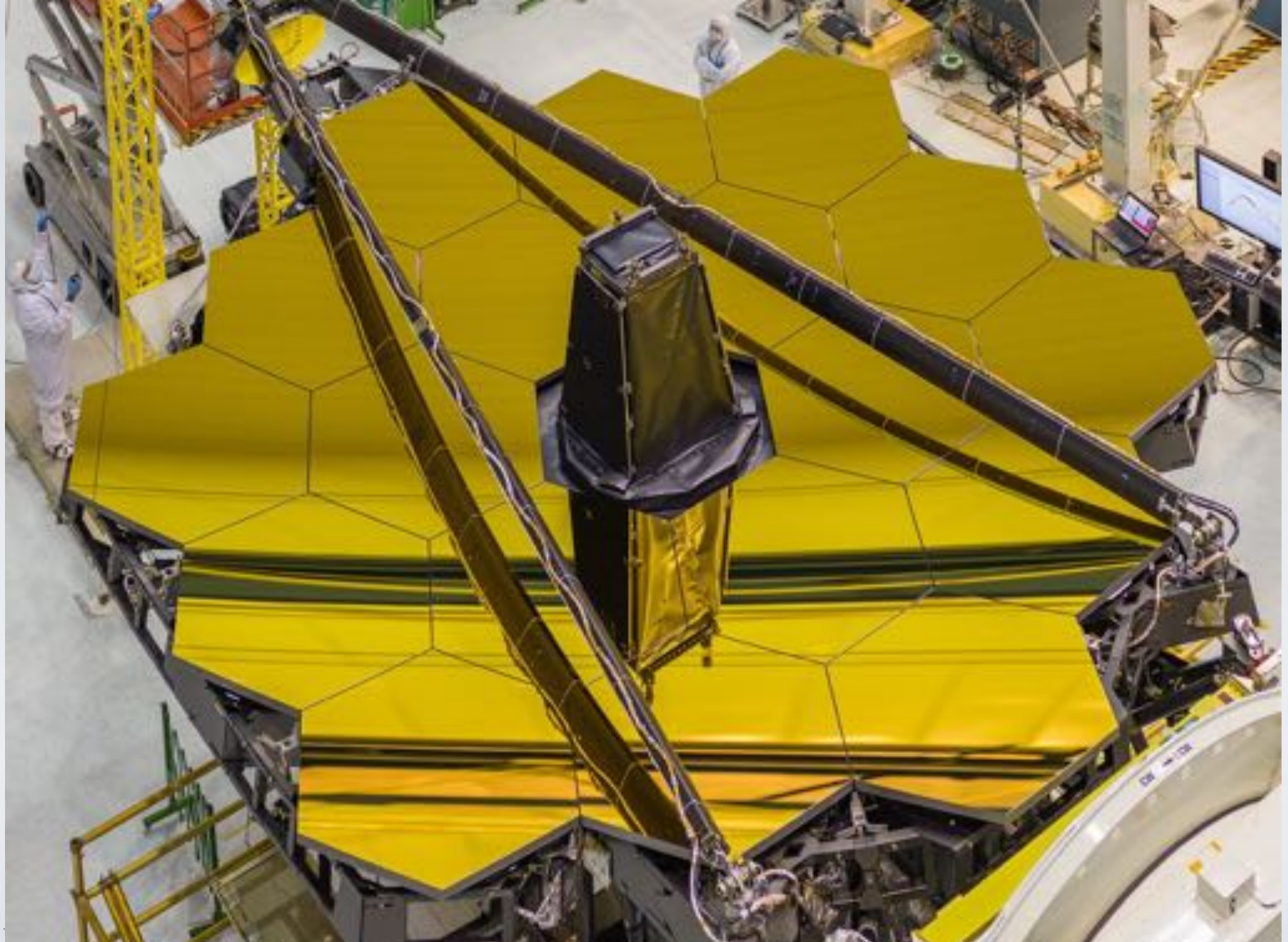
# opportunities with current schedule

- with extra time, improvements that will especially benefit users:
  - increase operational efficiency
  - tools and documentation for users will be improved
    - some options: Jupyter notebook infrastructure; "light" version of Exposure Time Calculator; cloud hosted data analysis infrastructure
  - lessons learned from original Cycle 1 process

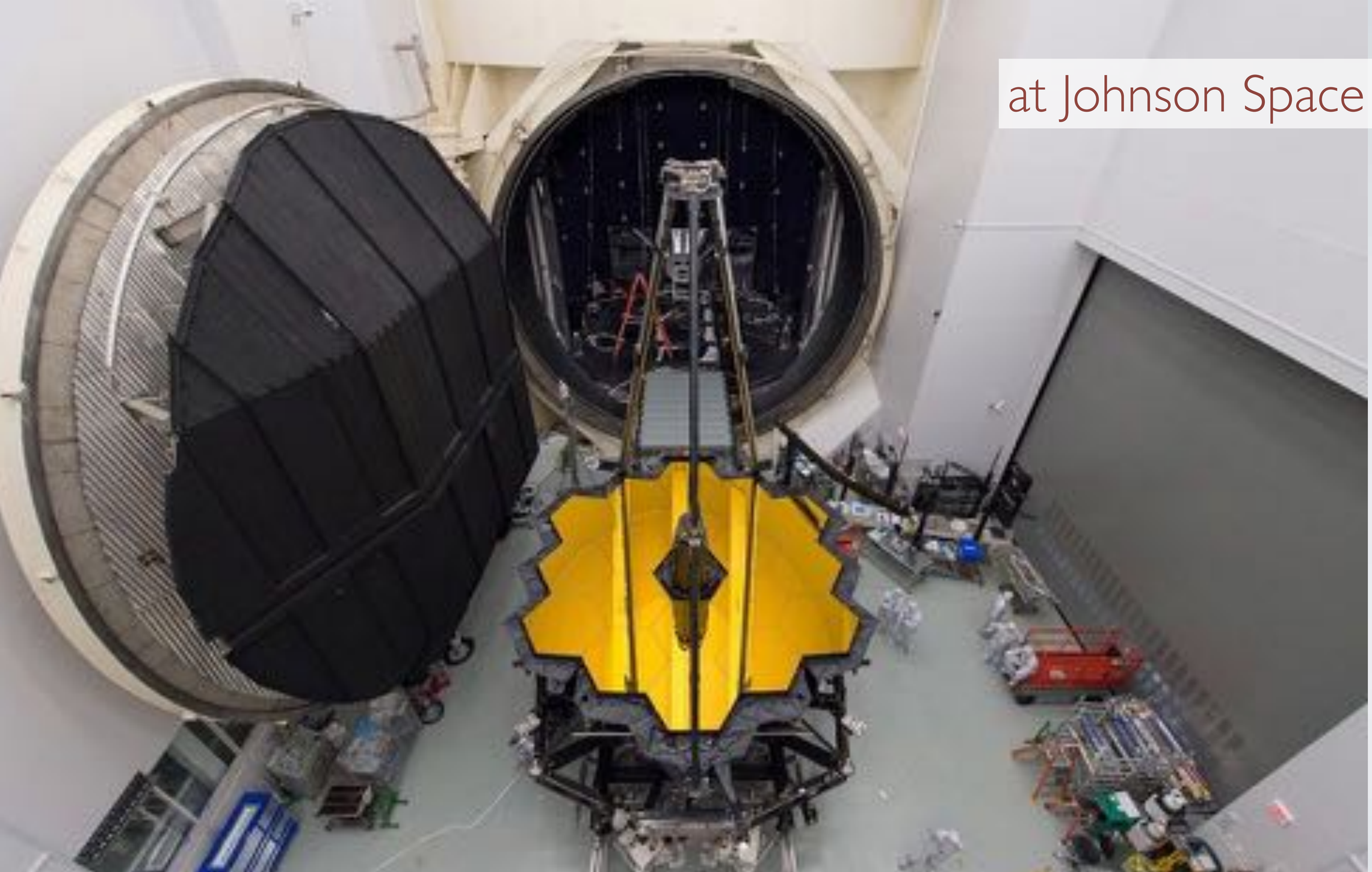



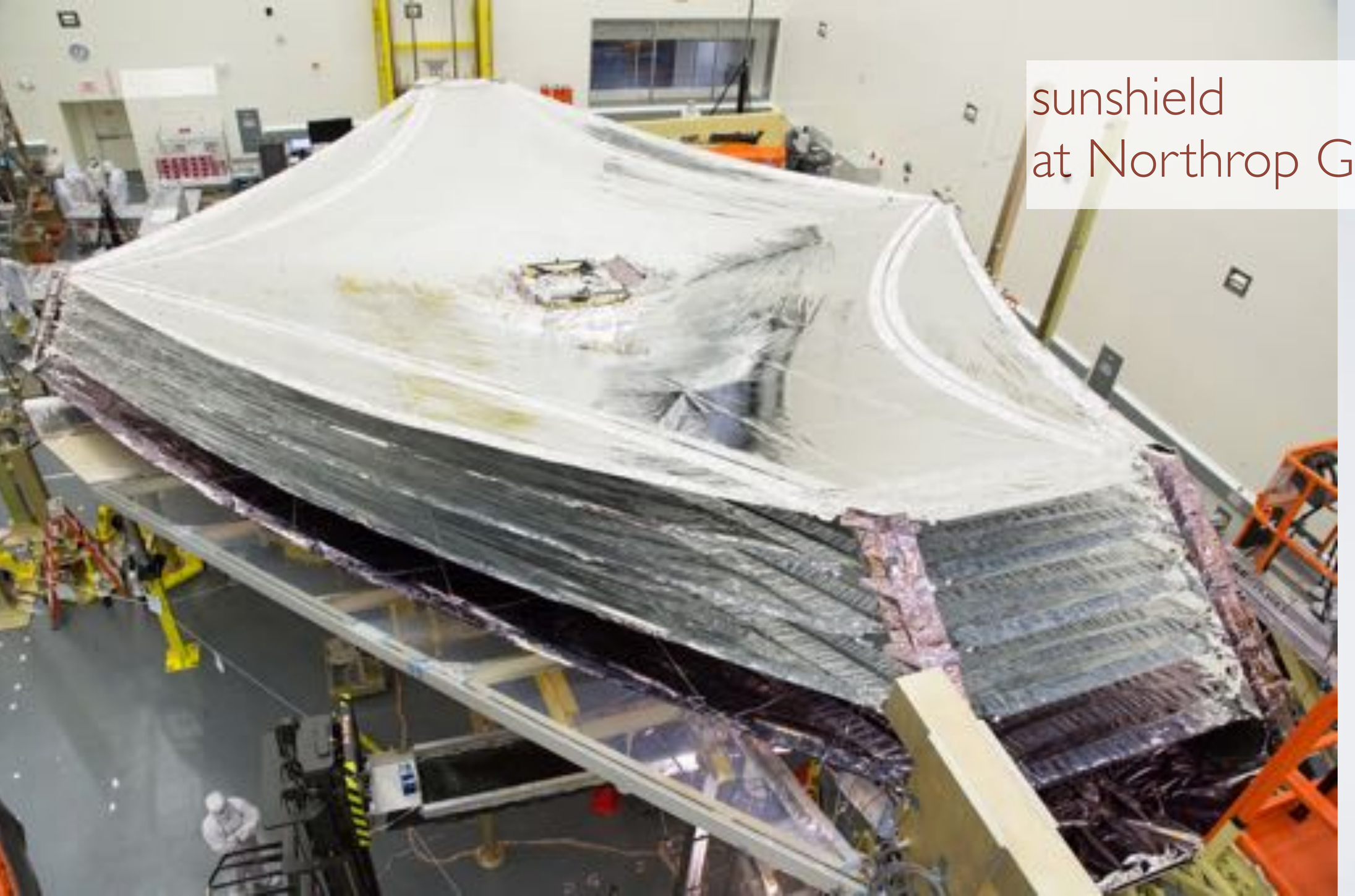
Hubble example: find all IR sources in 2 minutes



# instruments



# at Johnson Space Center



# sunshield
# at Northrop Grumman

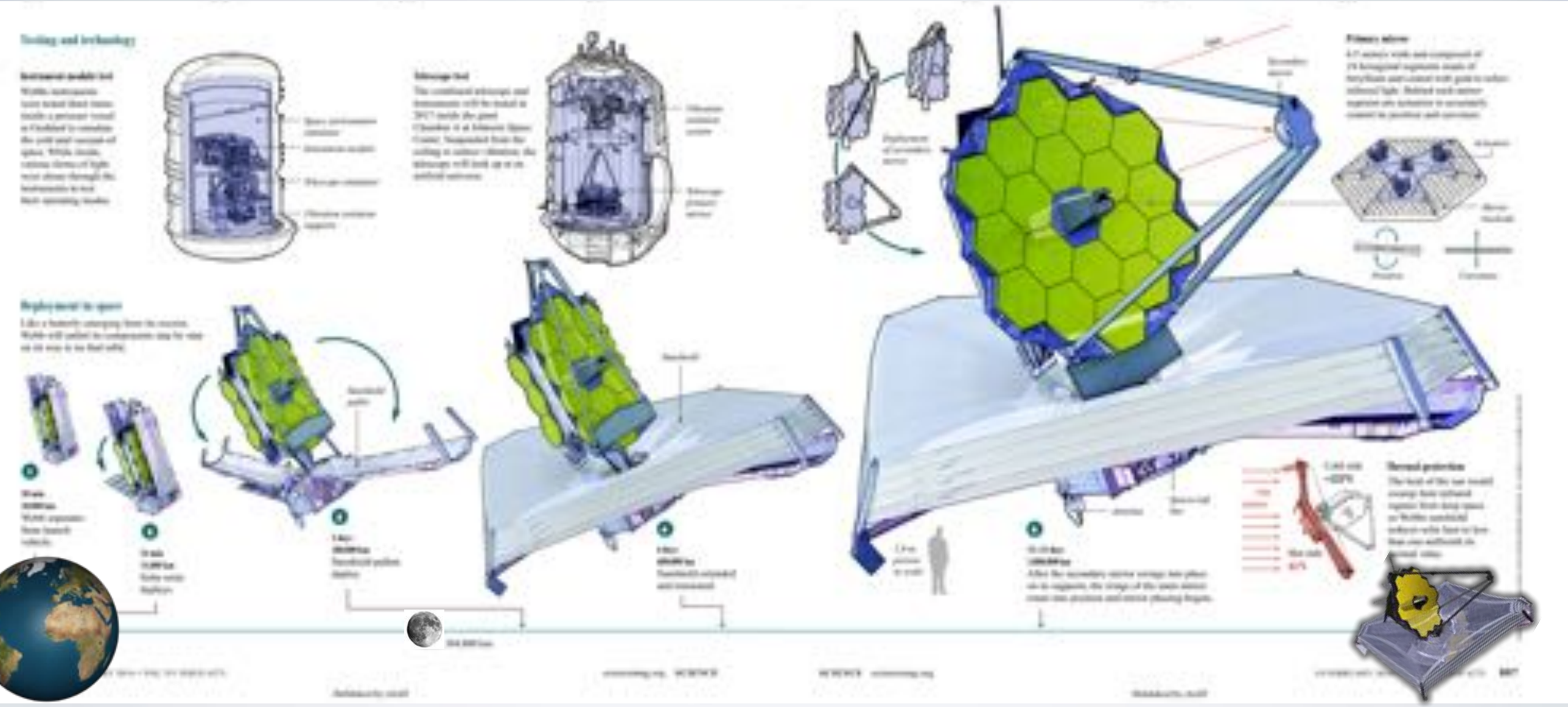
# spacecraft bus at Northrop Grumman

telescope and sunshield
at Northrop Grumman

# October 2018

# JWST's journey

# deployment



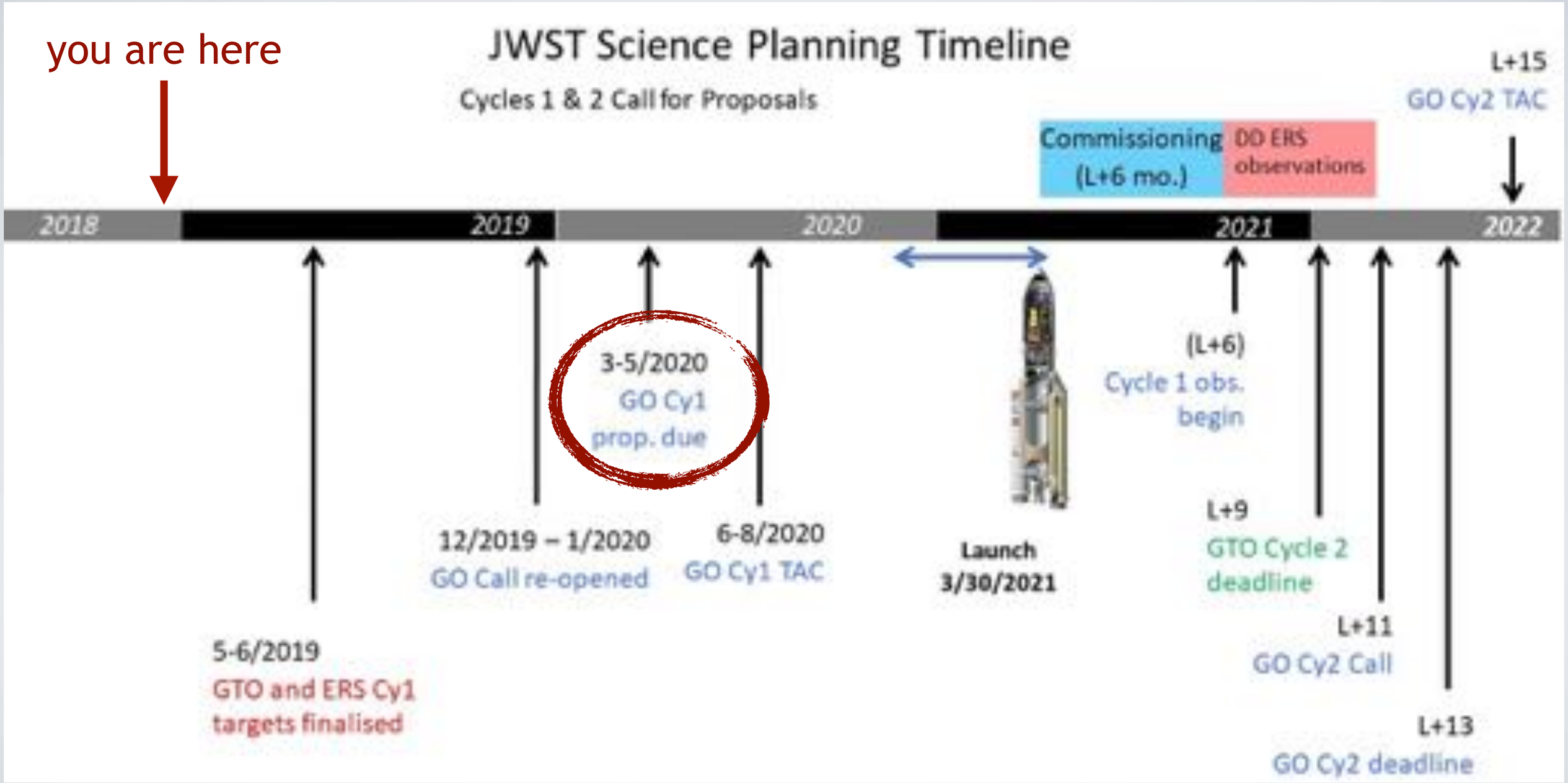
# JWST Commissioning Phase (6 months)

**Phase I - Commission the Spacecraft (30 days)**
Launch and mid-course corrections
Deployment of solar arrays, sunshield, mirrors
Subsystem checkouts
NIR instrument cooldown modifications

**Phase III - Commissioning the Science (60 days)**
Each instrument is independently focused, calibrated, and characterized
Science instruments participate in observatory level tests (thermal slew, stray light, mechanism disturbance, moving target)
Begin ERO, DD-ERS, Cycle 1 science and calibration programs

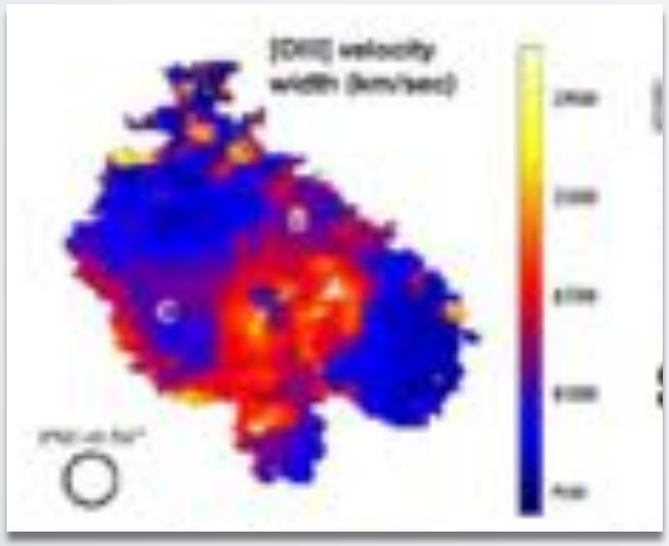
**Phase II - Commissioning the Telescope (90 days)**
Fine phasing of Optical Telescope Element (OTE) with NIRCam & Fine Guidance Sensors
NIR instruments are activated and checked out
MIRI cooldown via the cryocooler
All science instruments used to align and optimize OTE

# science timeline

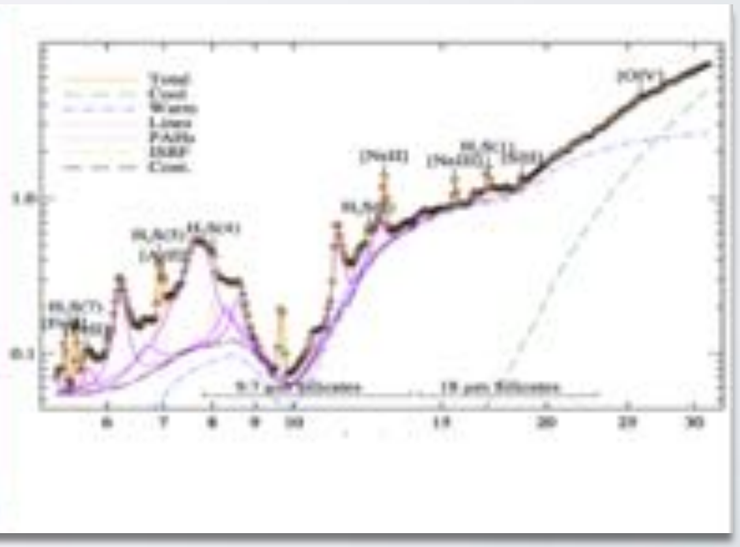


# Director's Discretionary Early Release Science (DD-ERS)

- 13 approved programs across all science areas, using most key instrument modes
- selected programs have 253 investigators + 456 additional collaborators
- ~500 hours observing time
- observations soon after commissioning (mostly within 3–5 months)
- no exclusive access (proprietary period)
  - eligible for archival research in Cycle 1
- science teams will deliver science-enabling products, beyond raw data
  - e.g., software for analysis, reduced data, leading workshops







# resources: observer website


jwst.stsci.edu

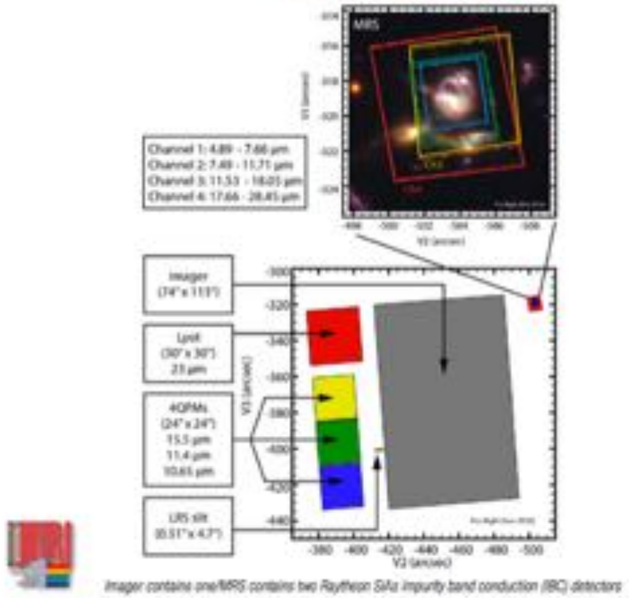
# resources: pocket guide


## Mid-Infrared Instrument (MIRI)

**Observing Modes**

| Observing Mode | Wavelength Coverage (um) | Field of View/Slit Size (arcsec) | Pixel Scale (arcsec/pixel) | Comment |
|---|---|---|---|---|
| Imaging | 5-28 | 74 x 113 | 0.11 | Subarrays Available |
| 4QPM Coronagraphic Imaging | 10.65, 11.4, 15.5 | 24 x 24 | 0.11 | |
| Lyot Coronagraphic Imaging | 23 | 30 x 30 | 0.11 | |
| Low Resolution Spectroscopy (LRS) | 5-12 | 0.51 x 4.7 (slit) | 0.11 | Single Object Slitless Mode Available |
| Medium Resolution Spectroscopy (MRS) | 4.9-28.8 | 3.9 to 7.7 (IFU) | 0.196 - 0.273 | |

### Field of View




*Imager contains one MRS contains two Raytheon SiAs impurity band conduction (IBC) detectors*

## Near Infrared Spectrograph (NIRSpec)

**Observing Modes**

| Observing Mode | Wavelength Coverage (um) | Field of View/ Slit Size (arcsec) | Pixel Scale (arcsec/pixel) |
|---|---|---|---|
| Multi-Object Spectroscopy | See figure below | 0.2 x 0.46 (individual shutter) | 0.1 |
| IFU Spectroscopy | | 3.0 x 3.0 | 0.1 |
| Fixed Slit Spectroscopy | | 0.2 x 3.2, 0.4 x 3.65, 1.6 x 1.6 | 0.1 |
| Bright Object Time Series | | 1.6 x 1.6 | 0.1 |

### Wavelength Coverage

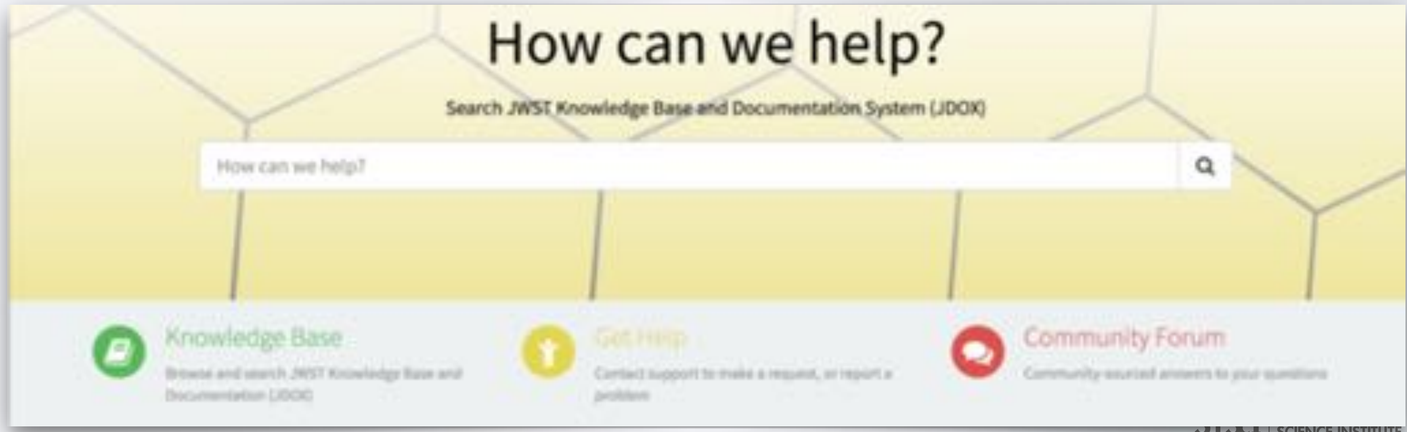

### Field of View


*Two Teledyne HgCdTe H2RG detectors*

# resources: documentation and helpdesk


jwst-docs.stsci.edu

jwsthelp.stsci.edu

# resources: observer website news and events

Youtube:
JWST Observer
Channel

Twitter:
@JWSTObserver

Facebook:
JWST Observer

## News


### WebbVR Available for Free Download

News Feature • November 29, 2018

Download WebbVR, a virtual reality experience of the James Webb Space Telescope.


### JWST Observer Events at the 233rd Meeting of the AAS

News Feature • November 21, 2018

STScI will update the community and provide JWST-related resources at the 233rd meeting of the American Astronomical Society in Seattle, WA.

### JWST ETC Version 1.3 Has Been Released

News Feature • November 13, 2018

ETC Version 1.3 includes usability enhanc

### The JWST Cycle 1 GO

## Upcoming Events


### American Astronomical Society 233rd Meeting

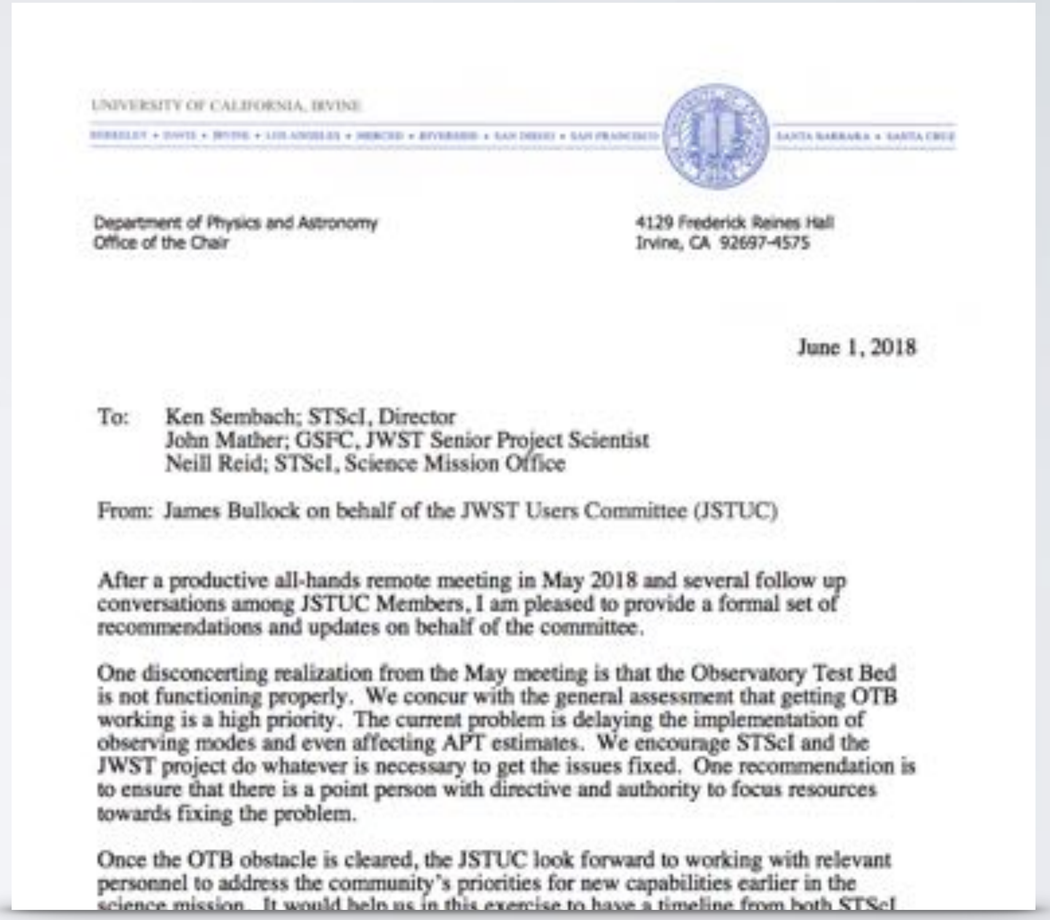
Science Meeting • January 6 - 10, 2019 • Seattle, WA

The 233rd American Astronomical Society (AAS) meeting in Seattle, WA will include a variety of events designed to update and prepare the astronomical community for JWST science. JWST Town Hall Tuesday, January 8 7:30 PM-8:30 PM The James Webb Space Telescope (JWST) will soon become the most powerful space telescope available to astronomical observers, serving a broad range of high priority science...

jwst.stsci.edu

# resources: JWST Users Committee (JSTUC)

chair: James Bullock,
University of California Irvine



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Department of Physics and Astronomy
Office of the Chair

4129 Frederick Reines Hall
Irvine, CA 92697-4575

June 1, 2018

To: Ken Sembach; STScI, Director
John Mather; GSFC, JWST Senior Project Scientist
Neill Reid; STScI, Science Mission Office

From: James Bullock on behalf of the JWST Users Committee (JSTUC)

After a productive all-hands remote meeting in May 2018 and several follow up conversations among JSTUC Members, I am pleased to provide a formal set of recommendations and updates on behalf of the committee.

One disconcerting realization from the May meeting is that the Observatory Test Bed is not functioning properly. We concur with the general assessment that getting OTB working is a high priority. The current problem is delaying the implementation of observing modes and even affecting APT estimates. We encourage STScI and the JWST project do whatever is necessary to get the issues fixed. One recommendation is to ensure that there is a point person with directive and authority to focus resources towards fixing the problem.

Once the OTB obstacle is cleared, the JSTUC look forward to working with relevant personnel to address the community's priorities for new capabilities earlier in the science mission. It would help us in this exercise to have a timeline from both STScI

jwst.stsci.edu/science-planning/user-committees

# resources: outreach

webbtelescope.org

webbtelescope.org

## Join Webb on a journey of discovery

# summary

- March 30, 2021: JWST launch
- ~April 2020: Cycle 1 proposals due
- ~January 2020: Cycle 1 call for proposals
- Start planning early!
  Complex instruments and modes

jwst.stsci.edu

jwst-docs.stsci.edu

jwsthelp.stsci.edu

webbtelescope.org