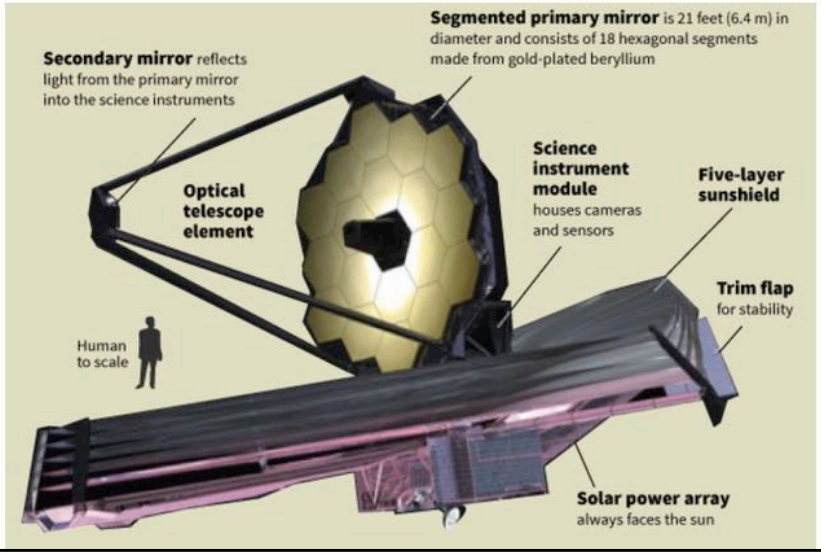
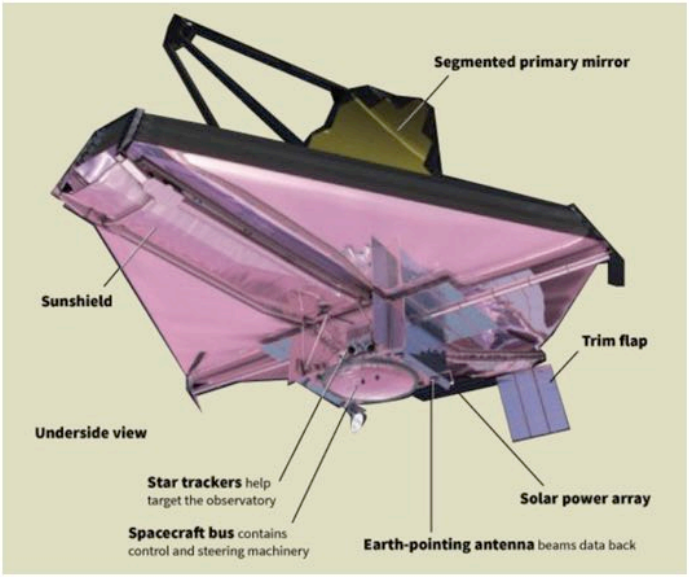
13. Future Space Missions

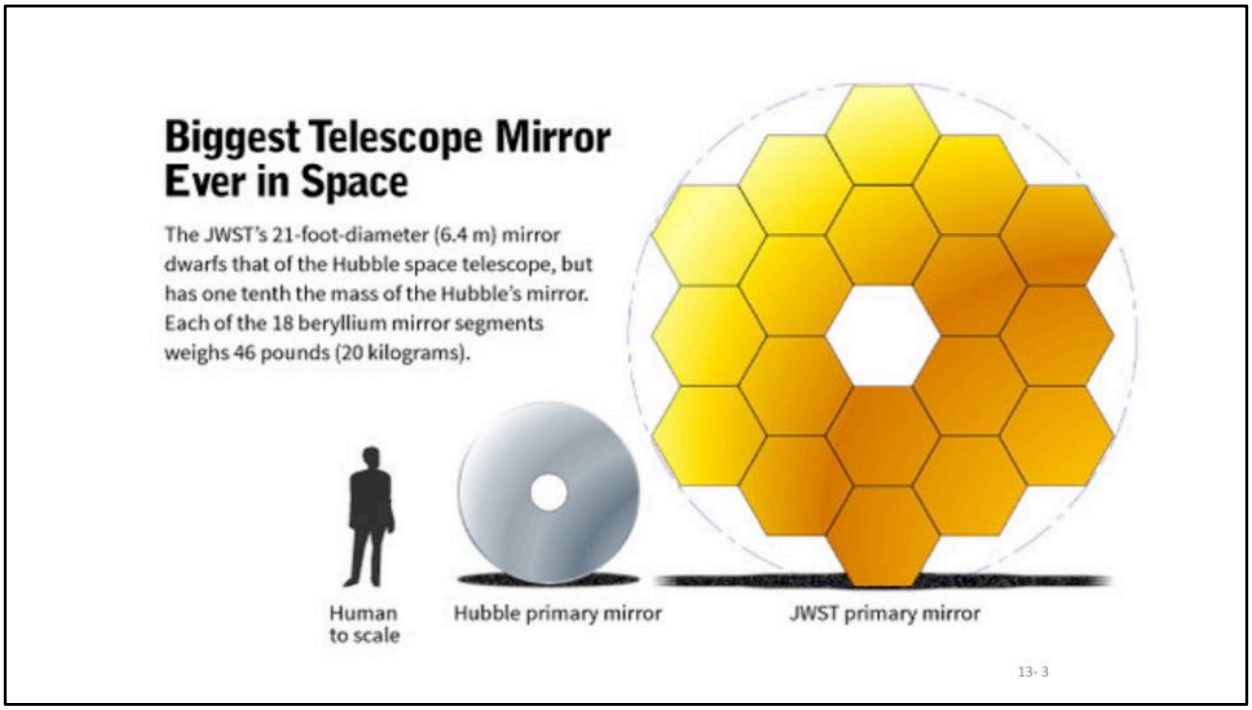
13.1 James Webb Space Telescope



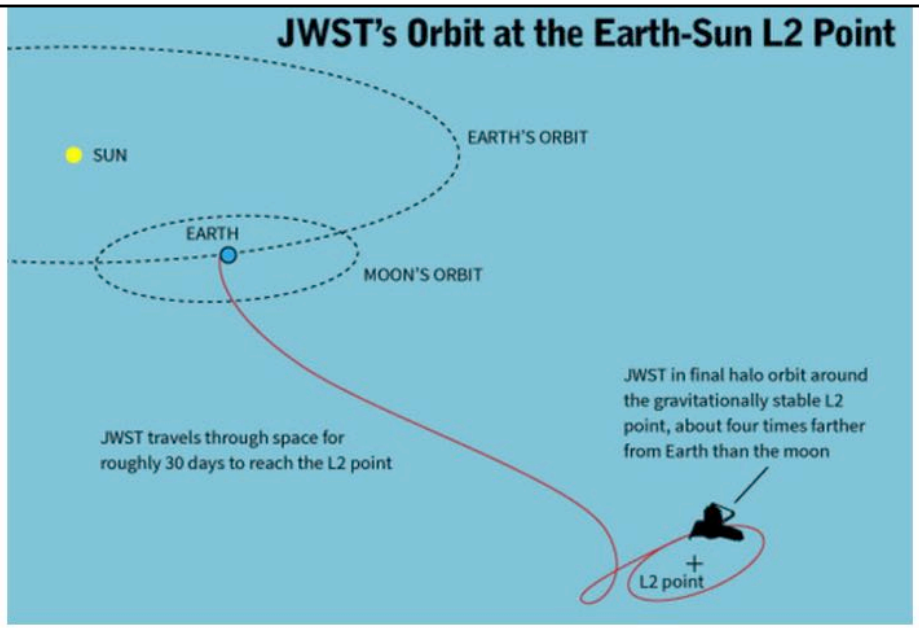
Notes:
https://www.space.com/21232-nasa-james-webb-space-telescope-infographic.html



Notes:
https://www.space.com/21232-nasa-james-webb-space-telescope-infographic.html



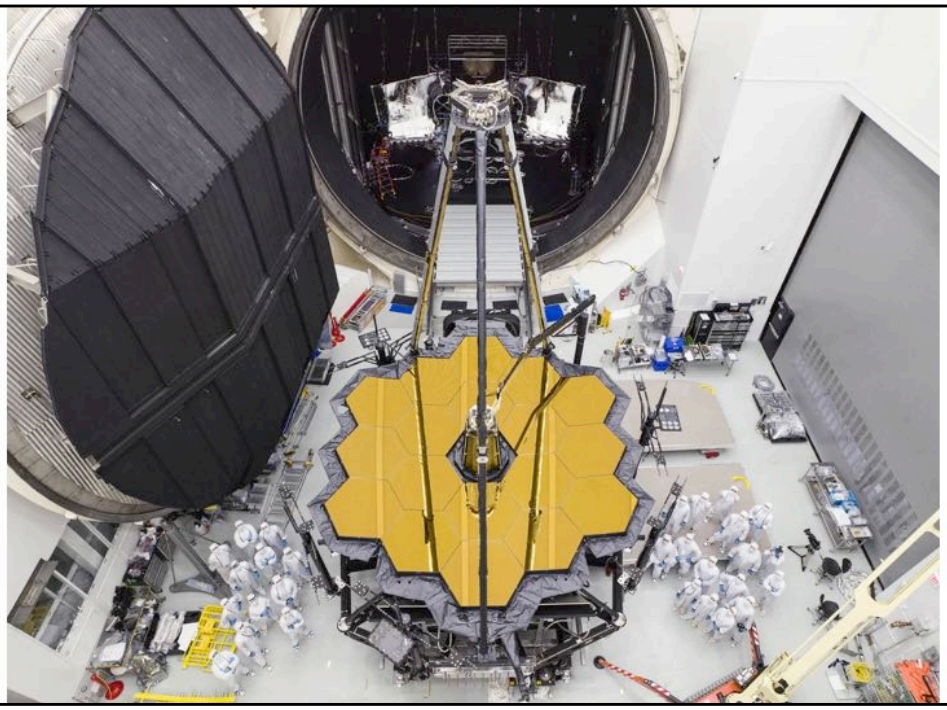
Notes:
https://www.space.com/21232-nasa-james-webb-space-telescope-infographic.html



13- 4

Notes:
https://www.space.com/21232-nasa-james-webb-space-telescope-infographic.html

tbd



Notes:
Full scale cryogenic testing in a vacuum chamber.

tbd

JWST requires a segmented deployable primary mirror

Ariane 5 ECA

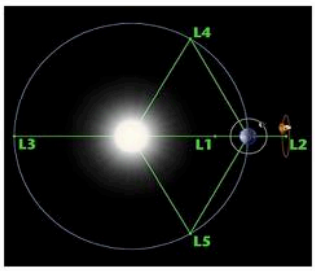
- JWST is designed to integrate with an Ariane V launch vehicle and 5 m diameter fairing
- Launch from Kourou Launch Center (French Guiana) with direct transfer to L2 point.
- Payload launched at ambient temperature with on orbit cooling to 50 K via passive thermal radiators
- JWST payload: 6330 kg

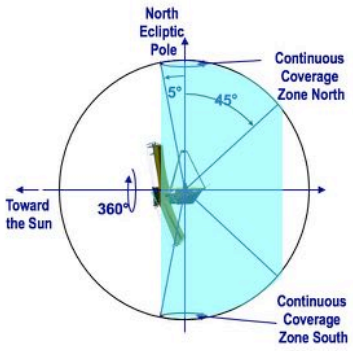
Notes:
M. Greenhouse presentation (2009)

tbd

JWST science objectives require the largest cryogenic telescope ever constructed

- An L2 point orbit was selected for JWST to enable passive cryogenic cooling
  - Station keeping thrusters are required to maintain this orbit
  - Propellant sized for 11 years (delta-v ~ 93 m/s)





- The JWST can observe the whole sky while remaining continuously in the shadow of its sunshield
  - Field of Regard is an annulus covering 35% of the sky
  - The whole sky is covered each year with small continuous viewing zones at the Ecliptic poles

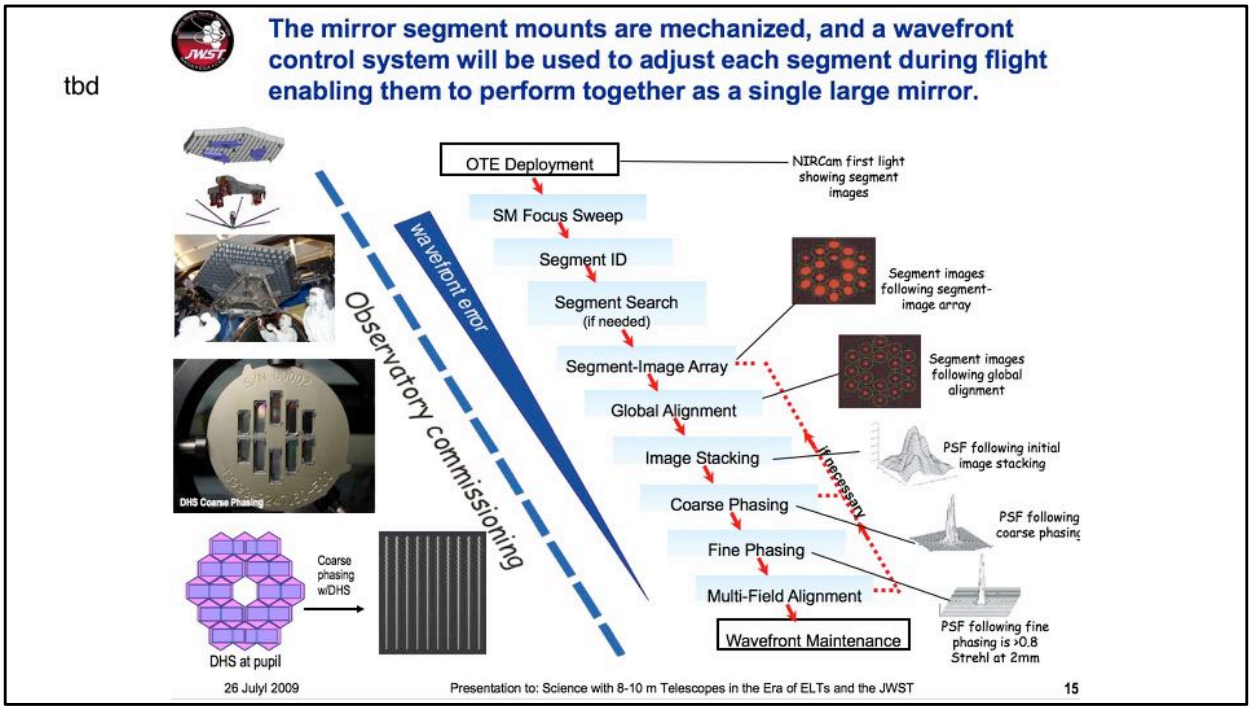
Notes:
M. Greenhouse presentation (2009)

Deployment movie:

https://www.youtube.com/watch?v=bTxLAGchWnA

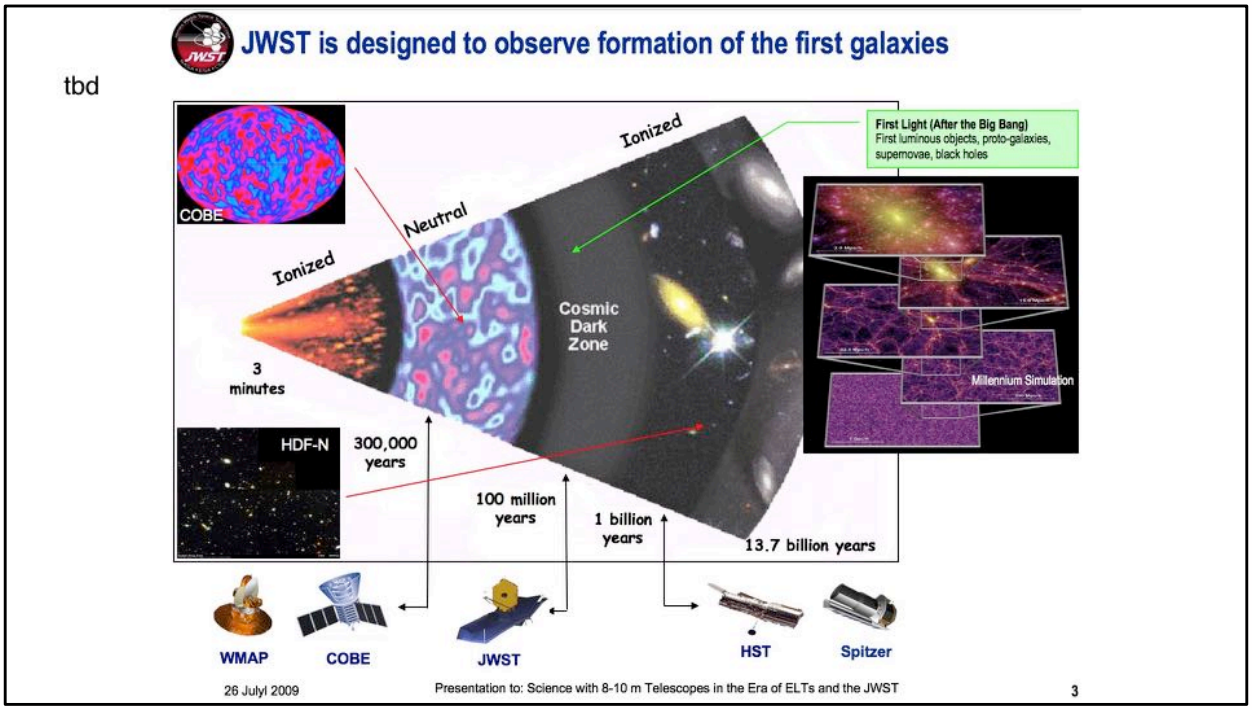
Notes:

tbd



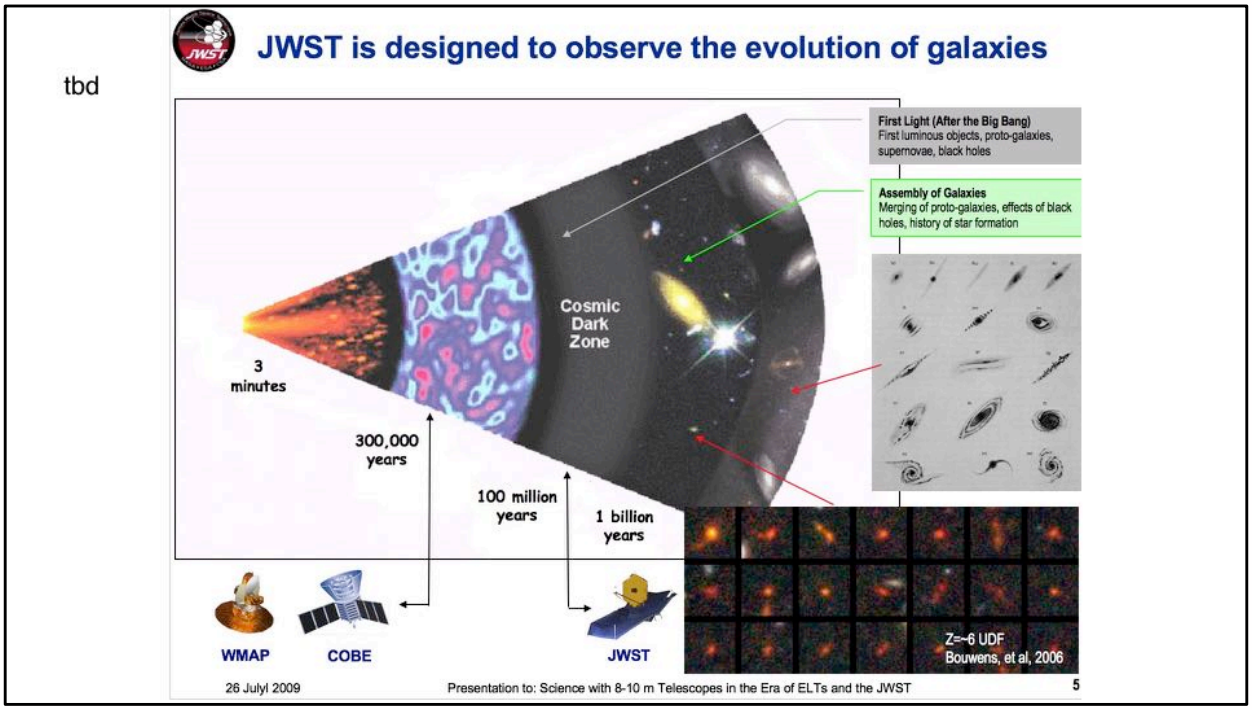
Notes:
M. Greenhouse presentation (2009)

tbd

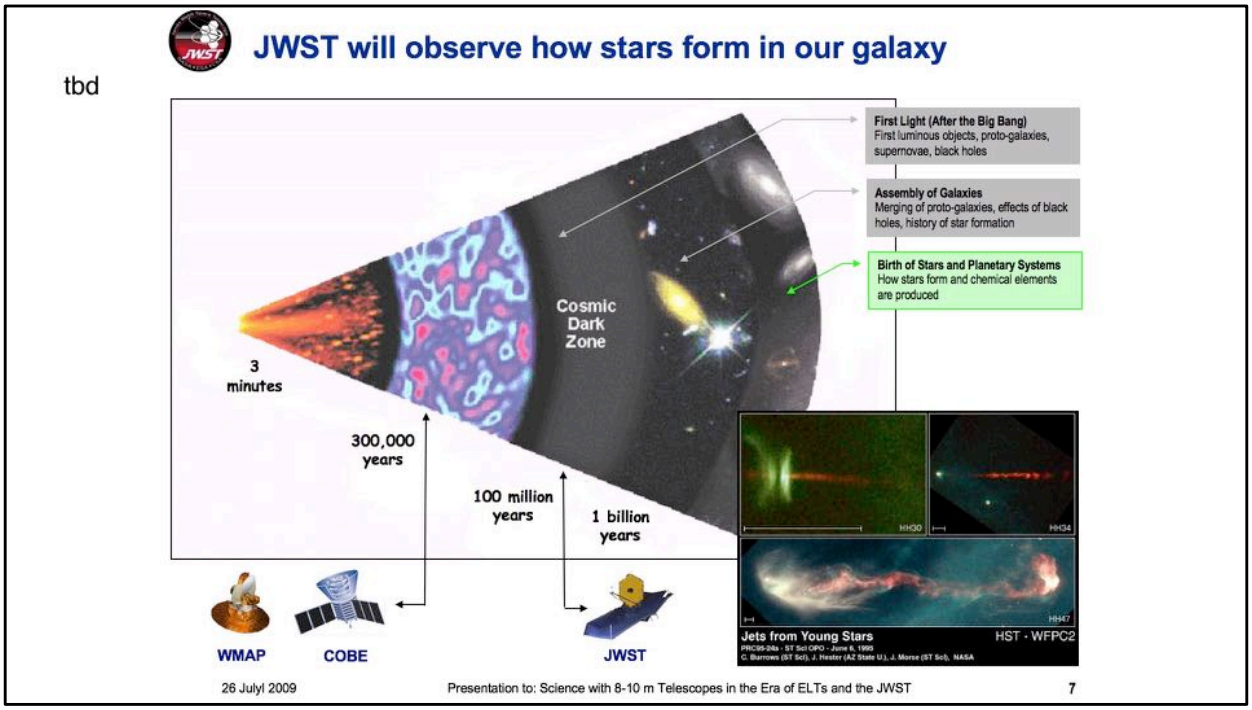


Notes:
M. Greenhouse presentation (2009)

tbd



Notes:
M. Greenhouse presentation (2009)



Notes:
M. Greenhouse presentation (2009)

Instruments working at 0.6-5 μm:

Near-Infrared Camera (NIRCam)
Imaging
Coronagraphic imaging
Wide field slitless spectroscopy
Grism spectroscopy

Near-Infrared Spectrograph (NIRSPEC)
Multi-object spectroscopy with the micro-shutter assembly
3-D imaging spectroscopy with the integral field unit
High contrast single object spectroscopy with the fixed slits

Near-InfraRed Imager and Slitless Spectrograph (NIRISS)
Wide-field slitless spectroscopy
Aperture masking interferometry Imaging

Instrument working at 5-29 μm:

Mid-Infrared Instrument (MIRI)
Imaging
Low resolution spectroscopy
Medium resolution integral field unit spectroscopy
Coronagraphy

https://jwst.stsci.edu/science

Notes: https://jwst.stsci.edu/science

13.2 Euclid

The Euclid spacecraft is being built by the European Space Agency andwill have a launch mass of around 2100 kg. It will be about 4.5 m talland 3.1 m in diameter with 1.2 m entrance aperture.

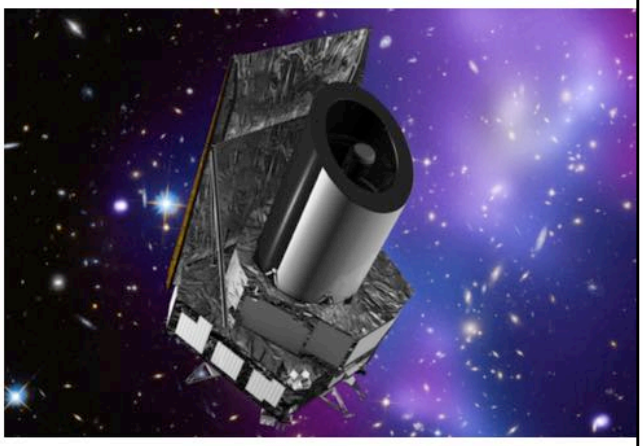
Launch planned for 2021 with a lifetime of 6 years at L2.

Scientific Goals

- Investigate the nature and properties of dark matter by mapping the 3-dimensional dark matter distribution in the Universe

- Test the validity of general relativity on cosmic scales by measuring the acceleration of the universe at different ages of the Universe

- Refine the initial conditions at the beginning of our Universe, which seed the formation of the cosmic structures we see today.



Notes:
http://sci.esa.int/euclid/45403-mission-status/

13.3 WFIRST - Wide-Field Infrared Survey Telescope

Aperture is 2.4 m observatory with wide field imaging capability. Currently in the concept phase. Funding uncertain.

Dark Energy

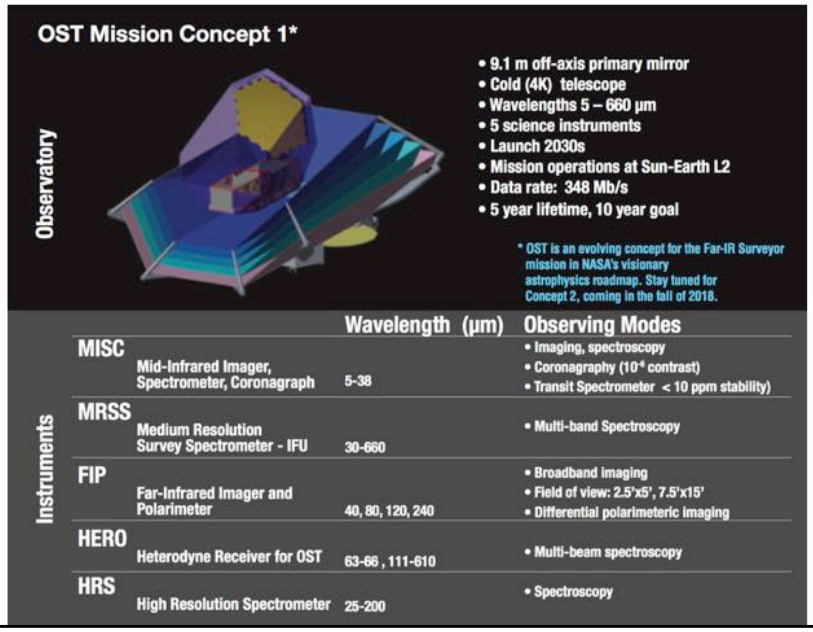
WFIRST will answer basic questions about dark energy: Is cosmic acceleration caused by a new energy component or by the breakdown of General Relativity on cosmological scales?

Exoplanets

Completing a census of Exoplanets to help answer new questions about the potential for life in the universe: How common are solar systems like our own? What kinds of planets exist? WFIRST uses gravitational lensing to find exoplanets down to a mass only a few times that of the Moon.

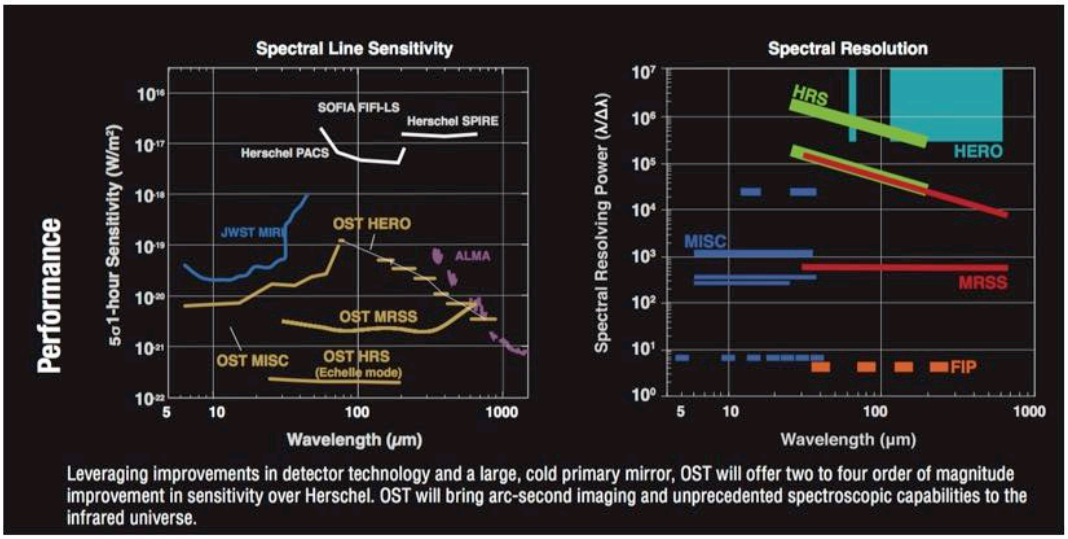
Notes:
https://wfirst.gsfc.nasa.gov/index.html

13.4 Origins Space Telescope



Notes:
https://asd.gsfc.nasa.gov/firs/flyer/OST_Flyer_Dec2017.pdf

Origins Space Telescope



Leveraging improvements in detector technology and a large, cold primary mirror, OST will offer two to four order of magnitude improvement in sensitivity over Herschel. OST will bring arc-second imaging and unprecedented spectroscopic capabilities to the infrared universe.

Notes: