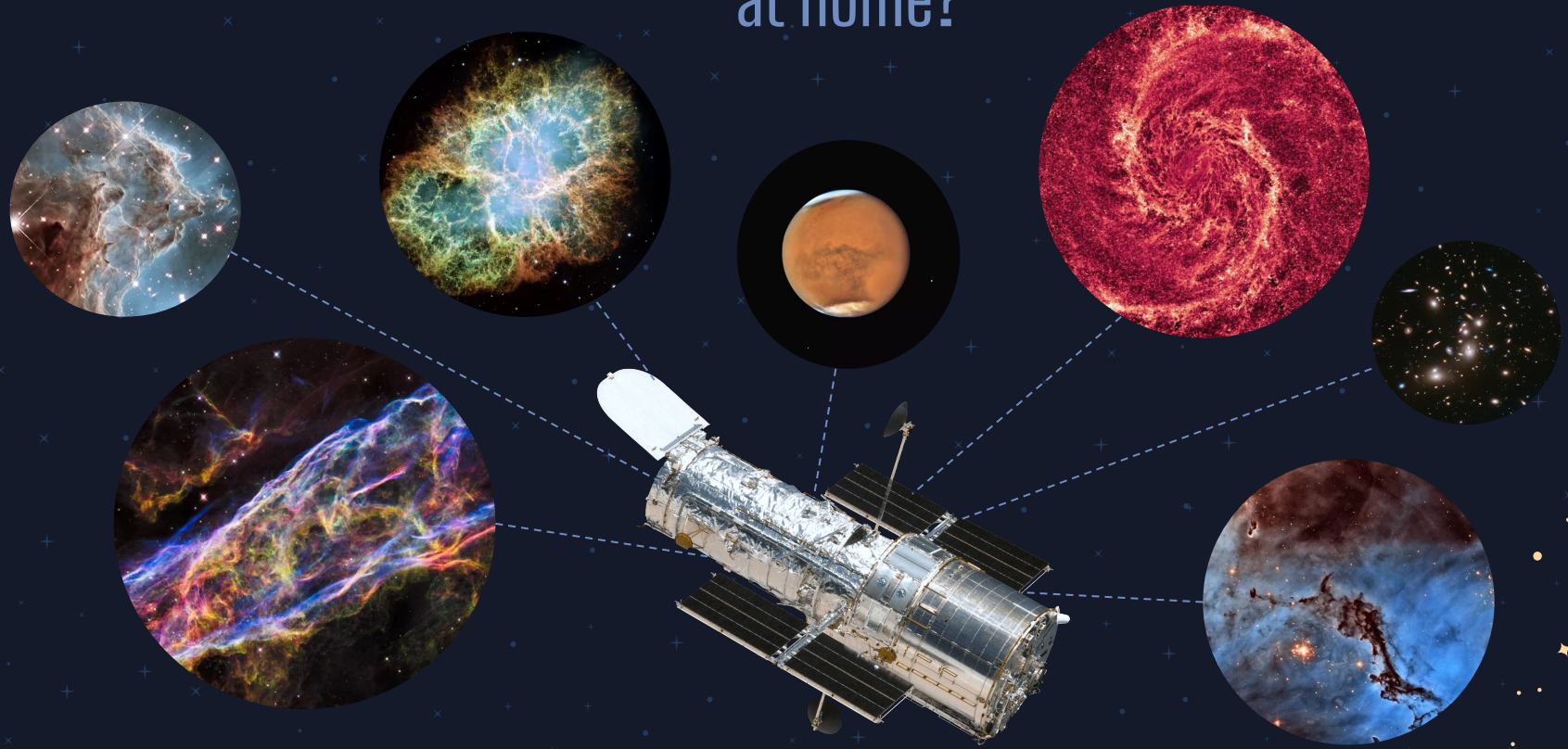
Aliens, Galaxies and the Big Bang: Introducing the James Webb Space Telescope

Natalie Williams - Astronomy in the City November 2021

But don’t we already have a perfectly good space telescope at home?

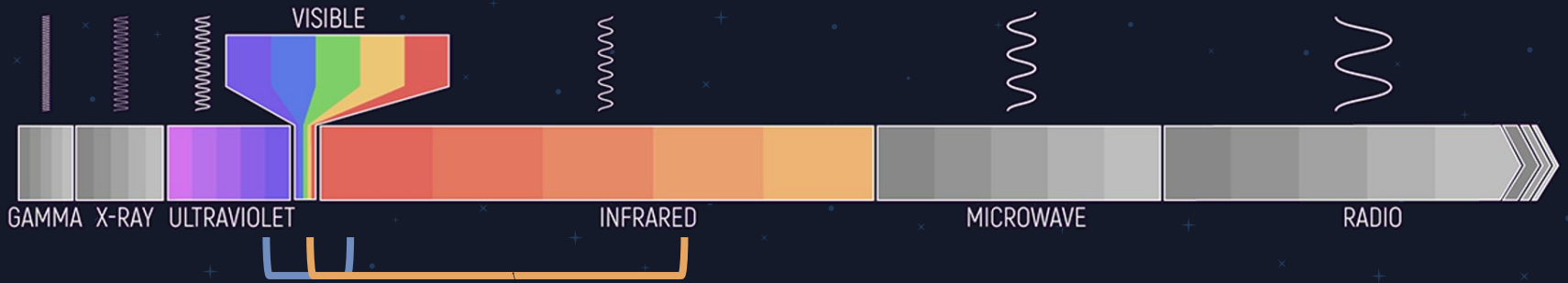


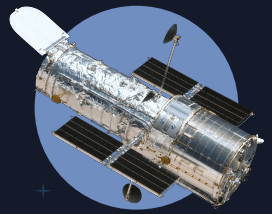
Me (5ft 3in)

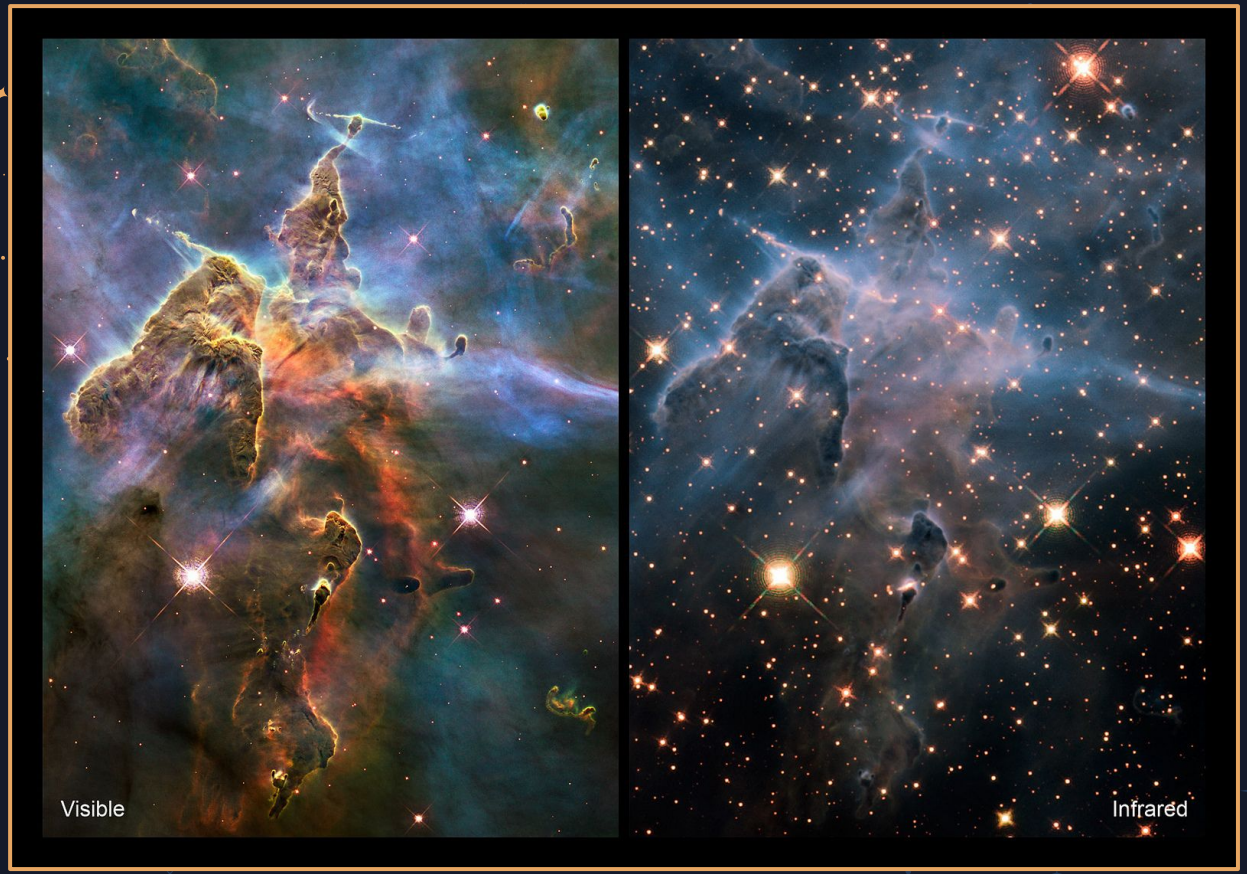
Hubble

JWST

ELECTROMAGNETIC SPECTRUM





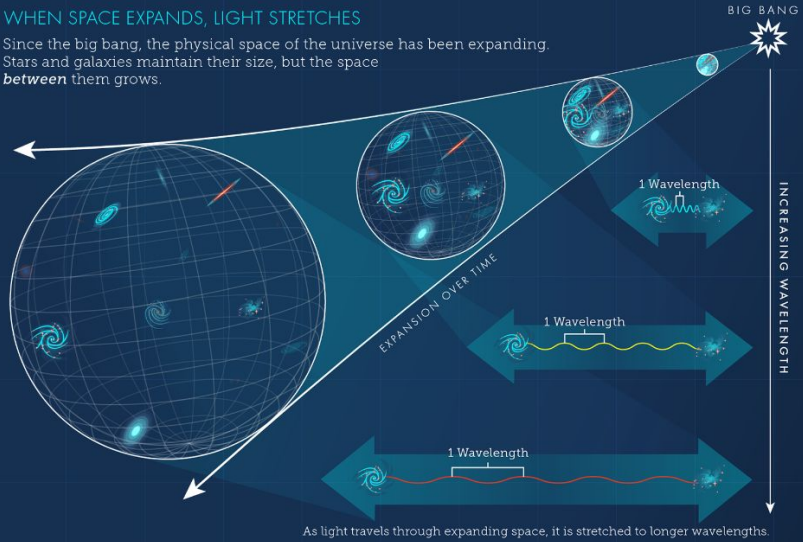

Visible
Infrared


NASA/IPAC
93.4
90
85
80
75
73.6

WHAT IS COSMOLOGICAL REDSHIFT?

WHEN SPACE EXPANDS, LIGHT STRETCHES

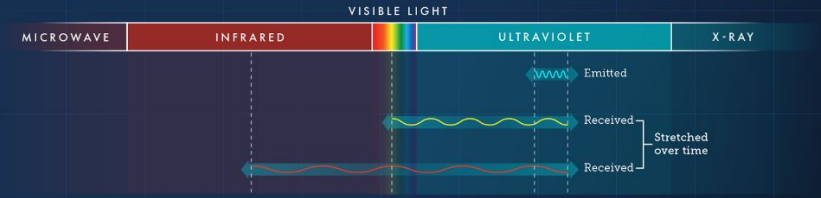
Since the big bang, the physical space of the universe has been expanding. Stars and galaxies maintain their size, but the space ***between*** them grows.



As light travels through expanding space, it is stretched to longer wavelengths.

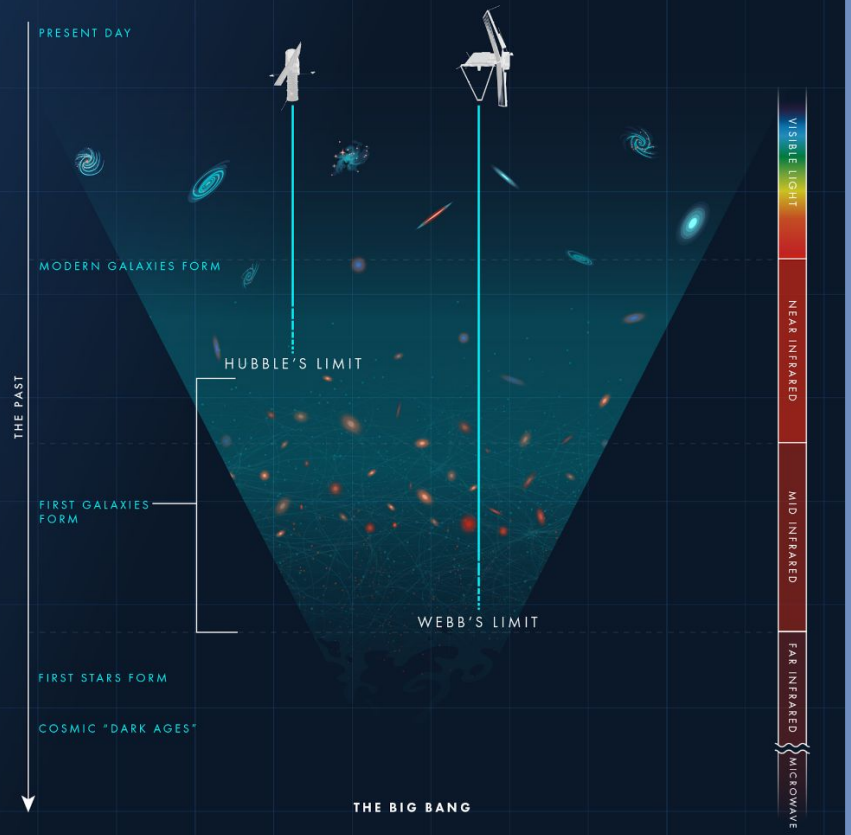
REDDER THAN RED

The longest visible wavelength is red.
Beyond red are longer wavelengths that we can't see, starting with infrared.
When light is stretched by the expansion of space, we say that it is **redshifted**—from its original wavelength to a longer, redder one.



SEEING THE PAST

Telescopes with **infrared** detectors allow us to see the ancient light of the first galaxies, which has been redshifted over space and time.



NIRCam

Near-Infrared Camera

NIRSpec

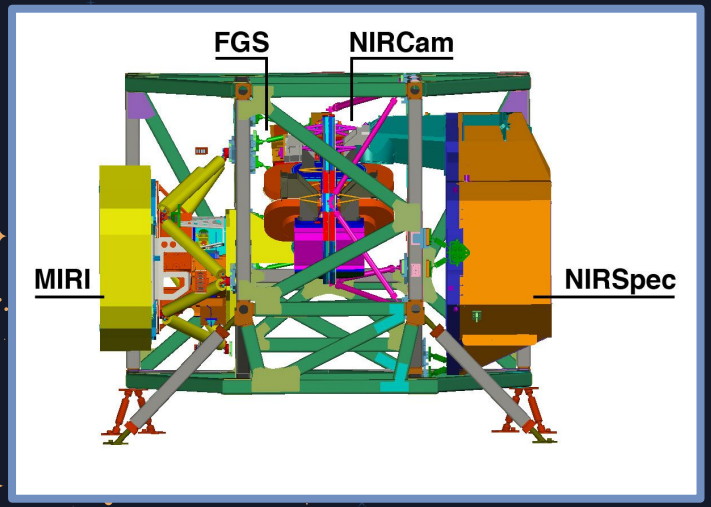
Near-Infrared Spectrograph

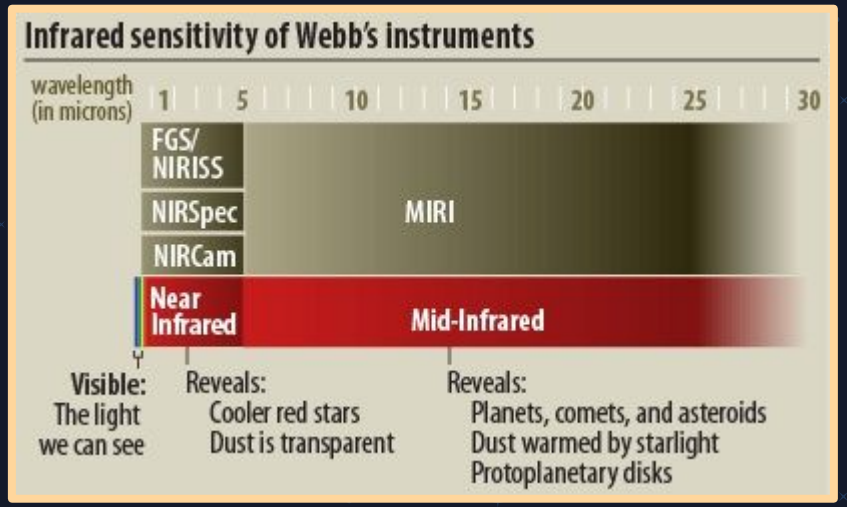
MIRI

Mid-Infrared Instrument

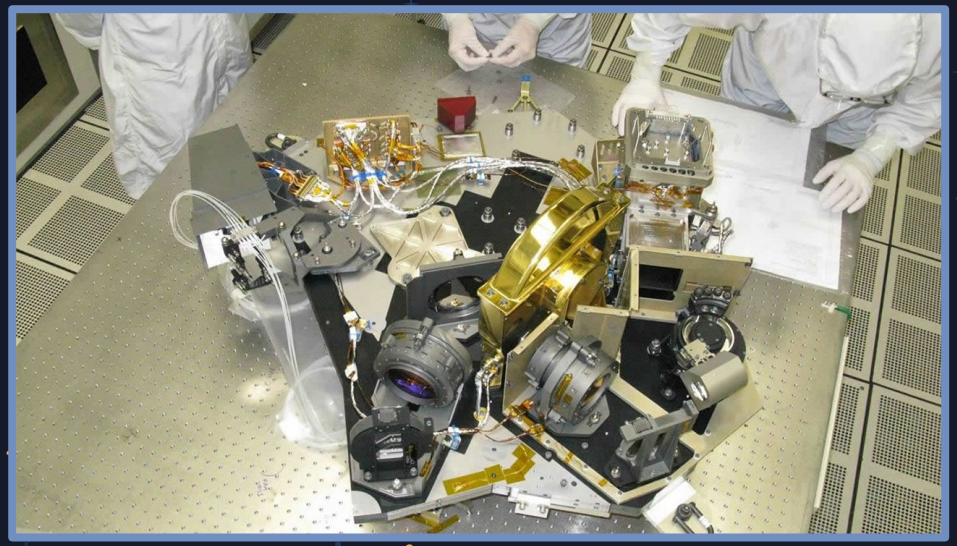
FGS/NIRISS

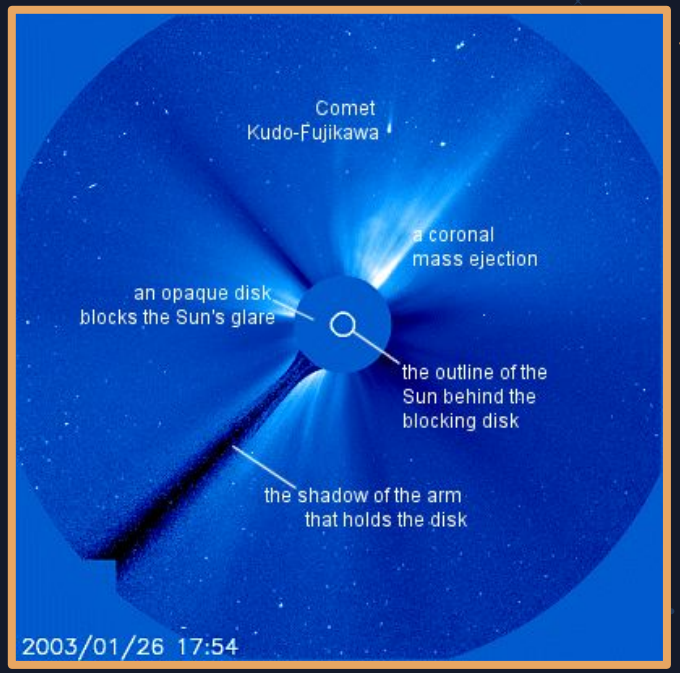
Fine Guidance Sensor/Near InfraRed Imager and Slitless Spectrograph



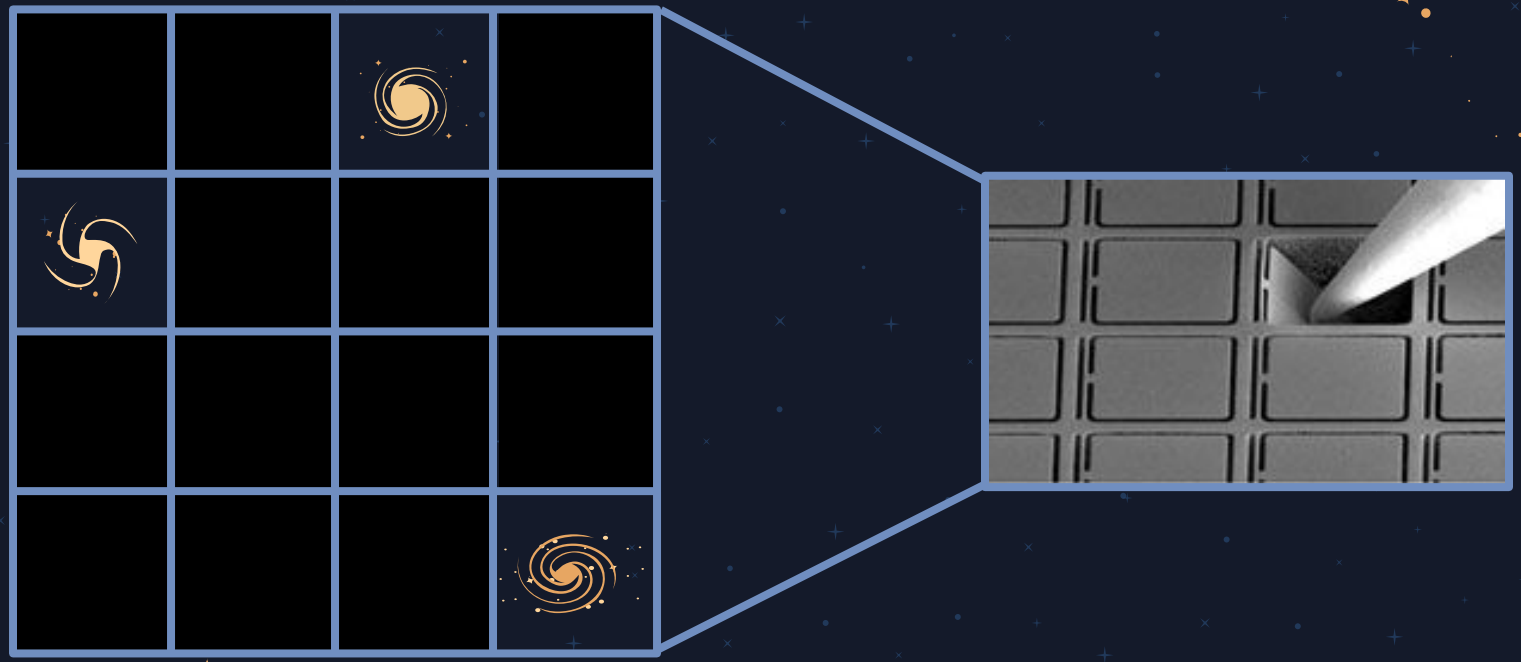


NIRCam: Near-Infrared Camera

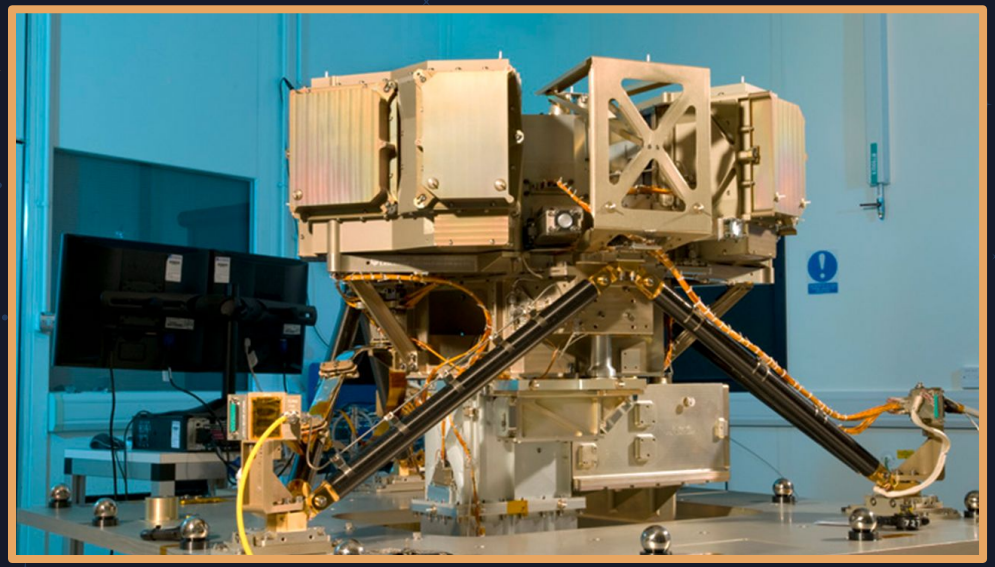




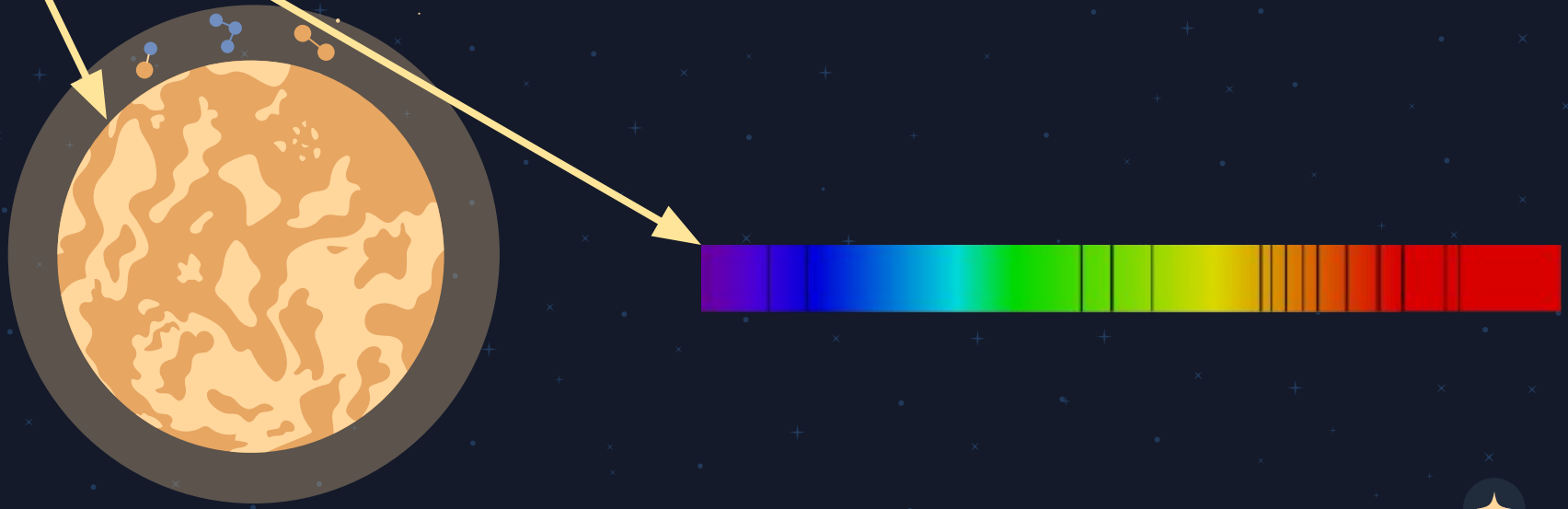
NIRSpec: Near-Infrared Spectrograph

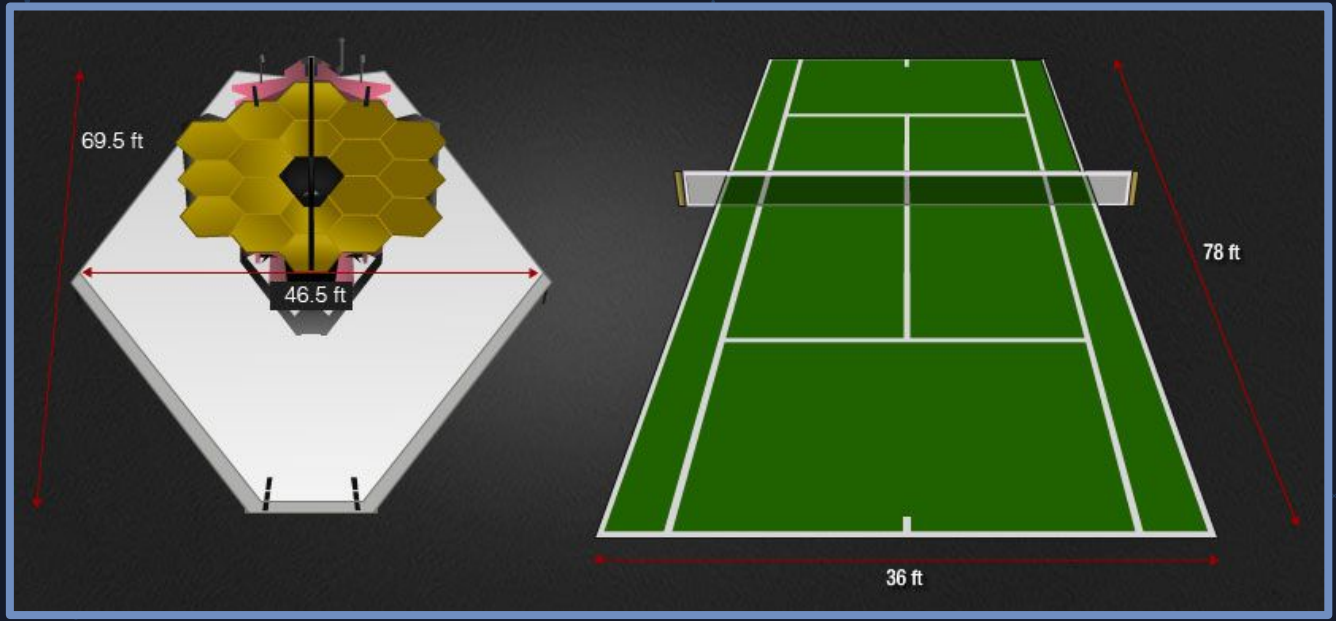


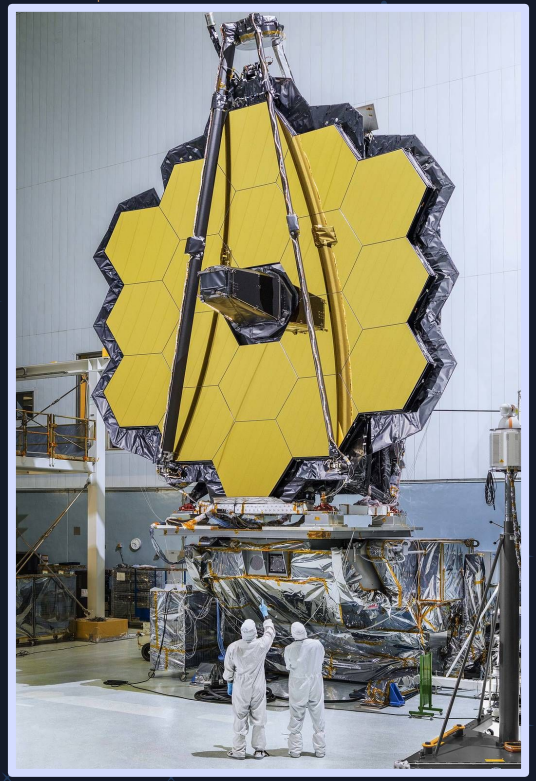
MIRI - Mid-Infrared Instrument



FGS/NIRISS: Fine Guidance Sensor/Near-Infrared and Slitless Spectrograph




69.5 ft
46.5 ft
78 ft
36 ft



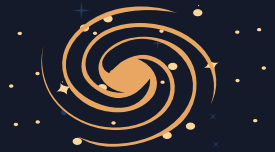
JWST Main Science Goals

The Early Universe

Looking back to the first galaxies formed after the Big Bang

Galaxies Over Time

Looking at galaxies near and far to see how they evolve

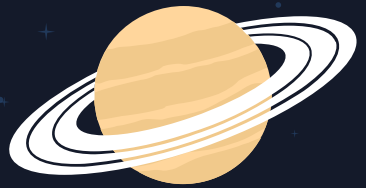


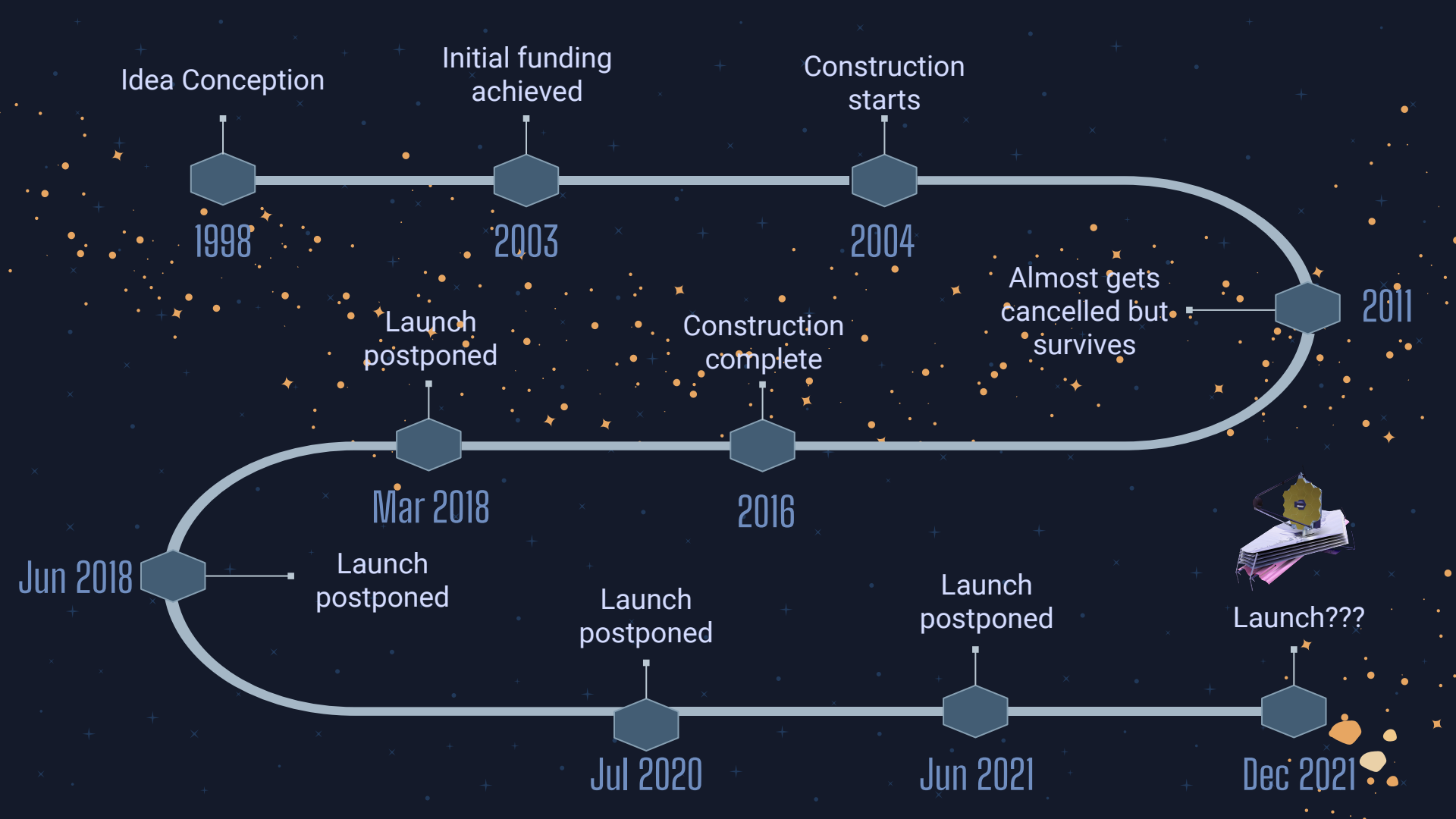
Star Lifecycles

Looking through the dust to study the lives of stars and their planets

Other Worlds

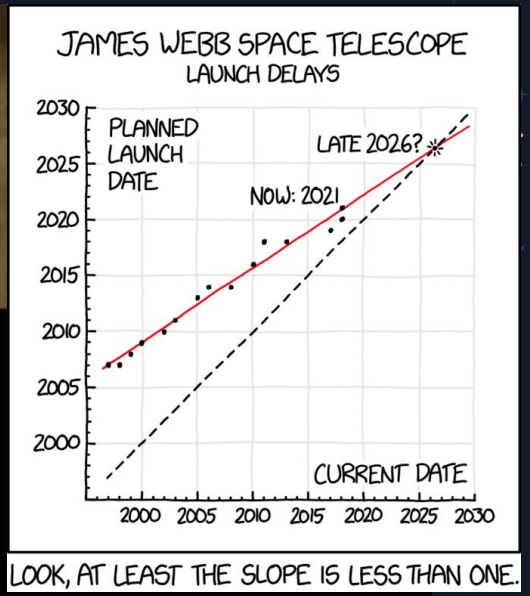
Looking for signs of life in exoplanet atmospheres



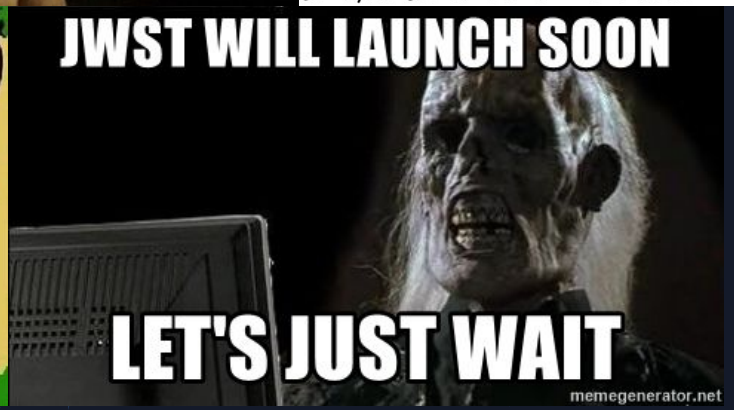

Idea Conception
1998
Initial funding achieved
2003
Construction starts
2004
Almost gets cancelled but survives
2011
Launch postponed
Mar 2018
Construction complete
2016
Jun 2018
Launch postponed
Launch postponed
Jul 2020
Launch postponed
Jun 2021
Launch???
Dec 2021

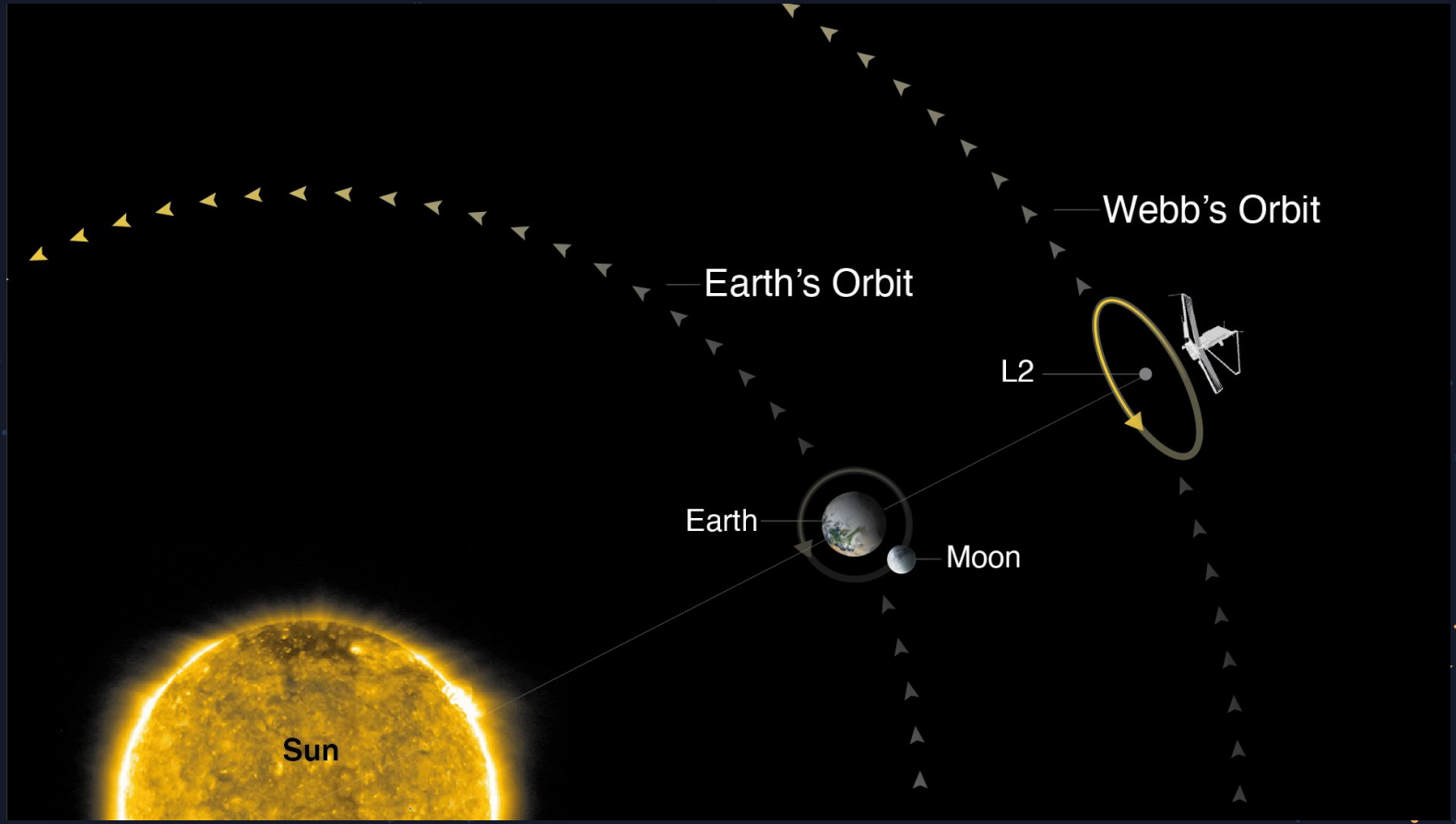

⚠TRADE OFFER⚠
i receive:
$10 billion
you receive:
Absolutely nothing
James Webb Space Telescope


WHAT DO WE SAY ABOUT THE LAUNCH OF JWST?
NOT TODAY...


JAMES WEBB SPACE TELESCOPE
LAUNCH DELAYS
PLANNED LAUNCH DATE
LATE 2026?
NOW: 2021
CURRENT DATE
2030
2025
2020
2015
2010
2005
2000
2000 2005 2010 2015 2020 2025 2030
LOOK, AT LEAST THE SLOPE IS LESS THAN ONE.


DO ALL FAIRY TALES BEGIN WITH 'ONCE UPON A TIME?'
NO, MANY OF THEM BEGIN, 'WHEN JWST LAUNCHES….'


JWST WILL LAUNCH SOON
LET'S JUST WAIT
memegenerator.net


Webb's Orbit
Earth's Orbit
L2
Earth
Moon
Sun


JLG LIFT

Good Luck JWST!

12:20pm 18th December
Watch on NASA TV, the NASA app and www.nasa.gov