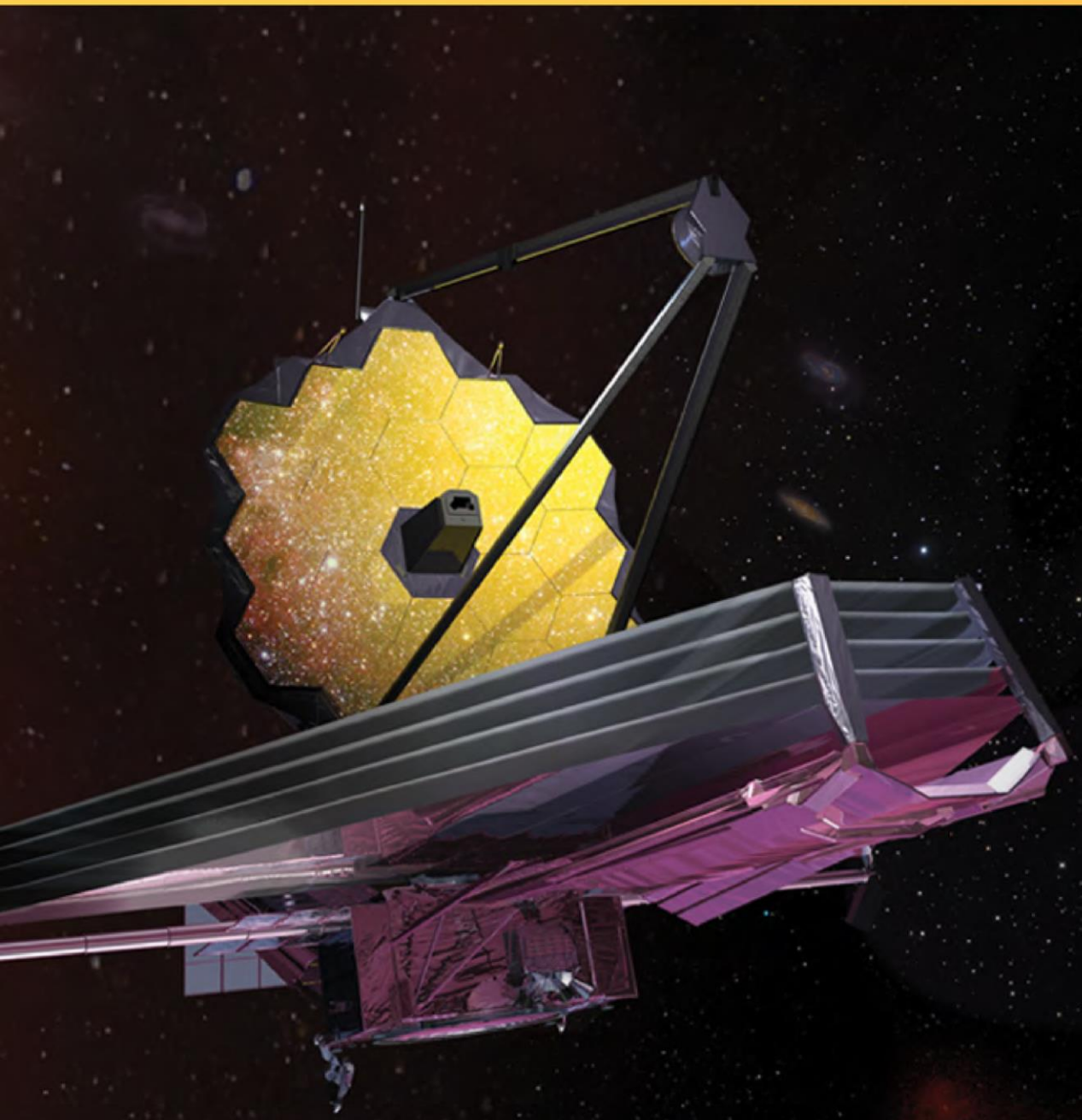


National Aeronautics and
Space Administration

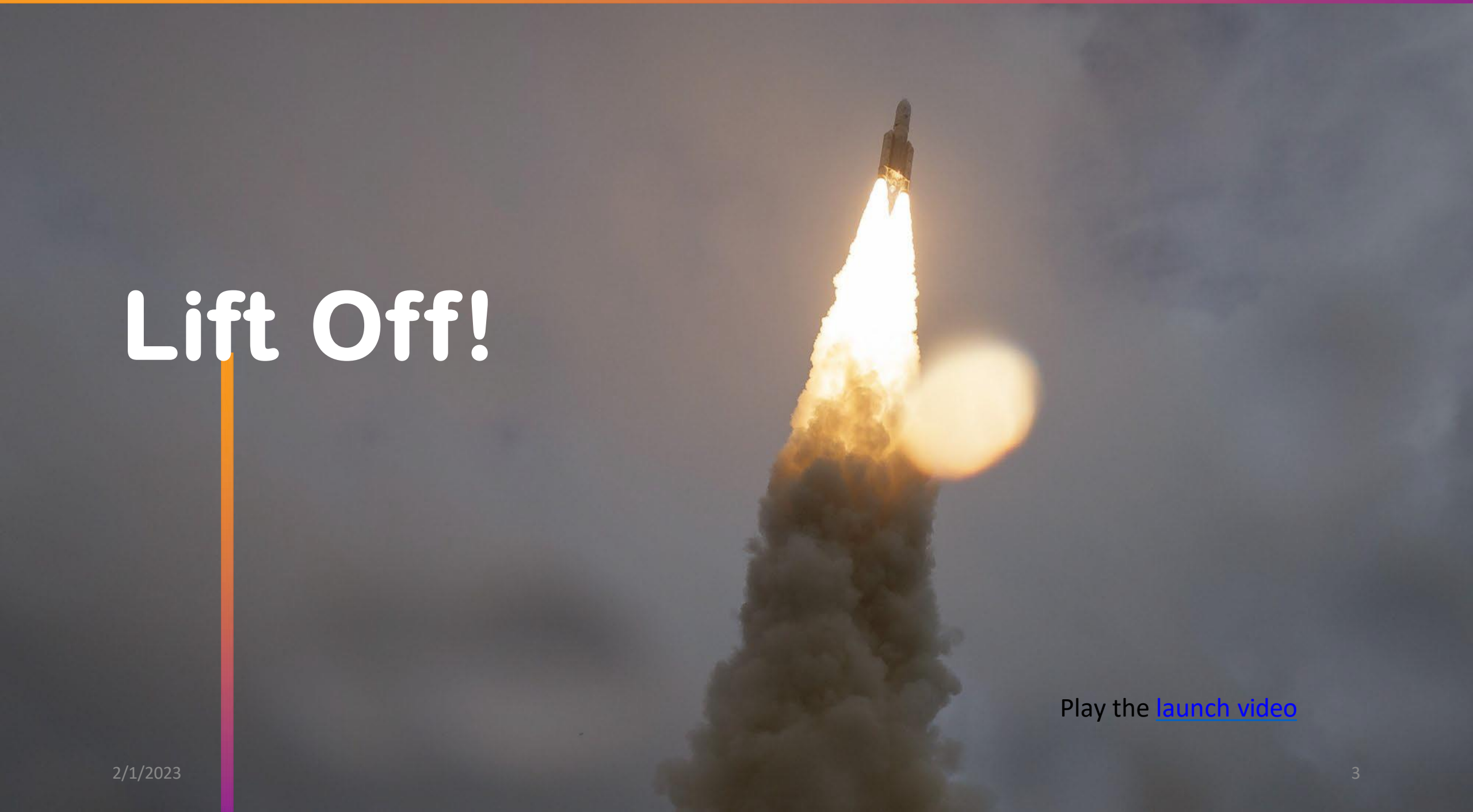
# JWST's First Look at the Universe

**Louis Barbier,**
**NASA Associate Chief Scientist**

# Contents


- Lift Off! Webb's Journey Begins
- Why Study Infrared Light?
- Exploring the Universe with Webb!
- Webb's Exciting Discoveries

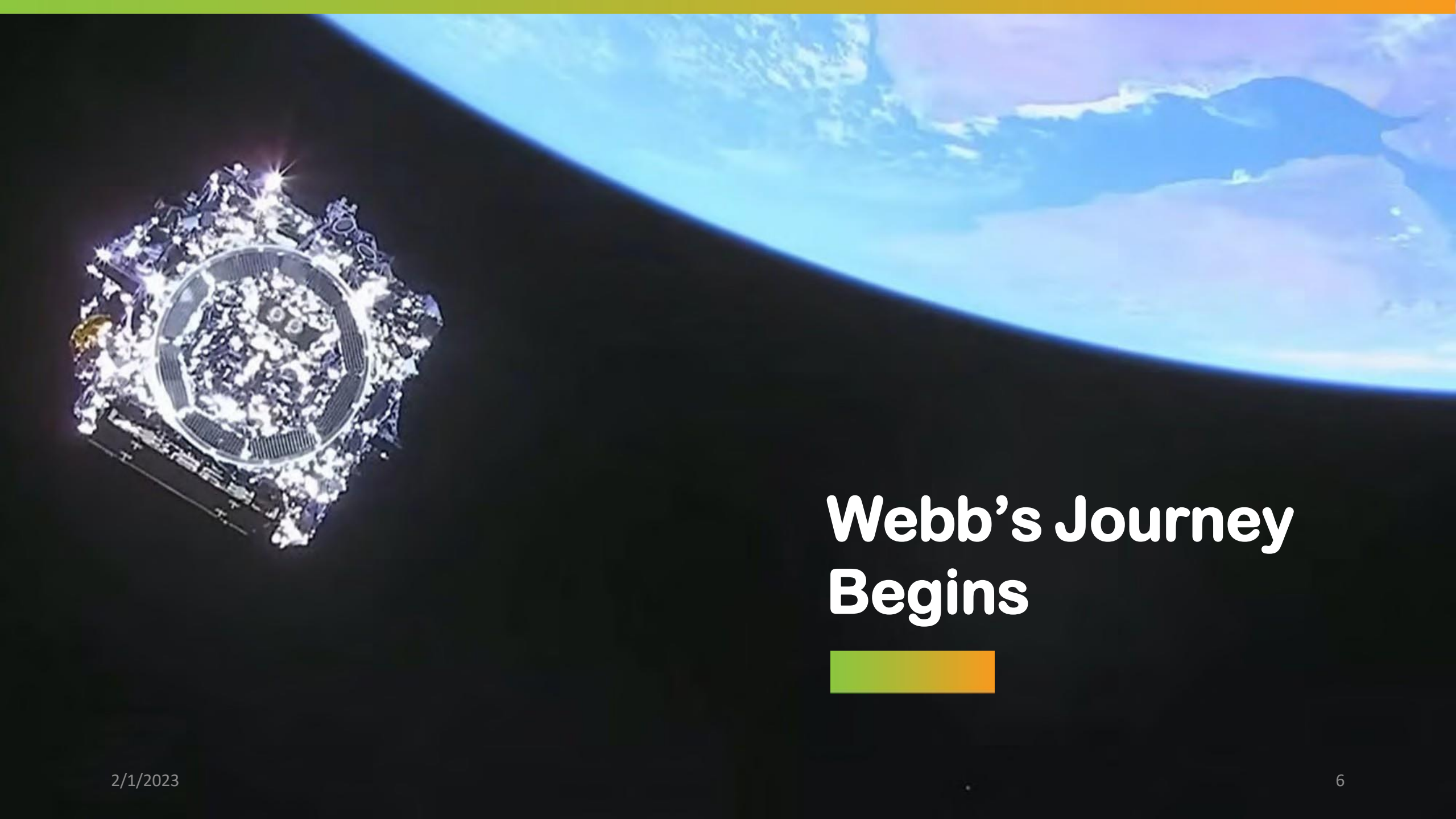
# Lift Off!



Play the launch video

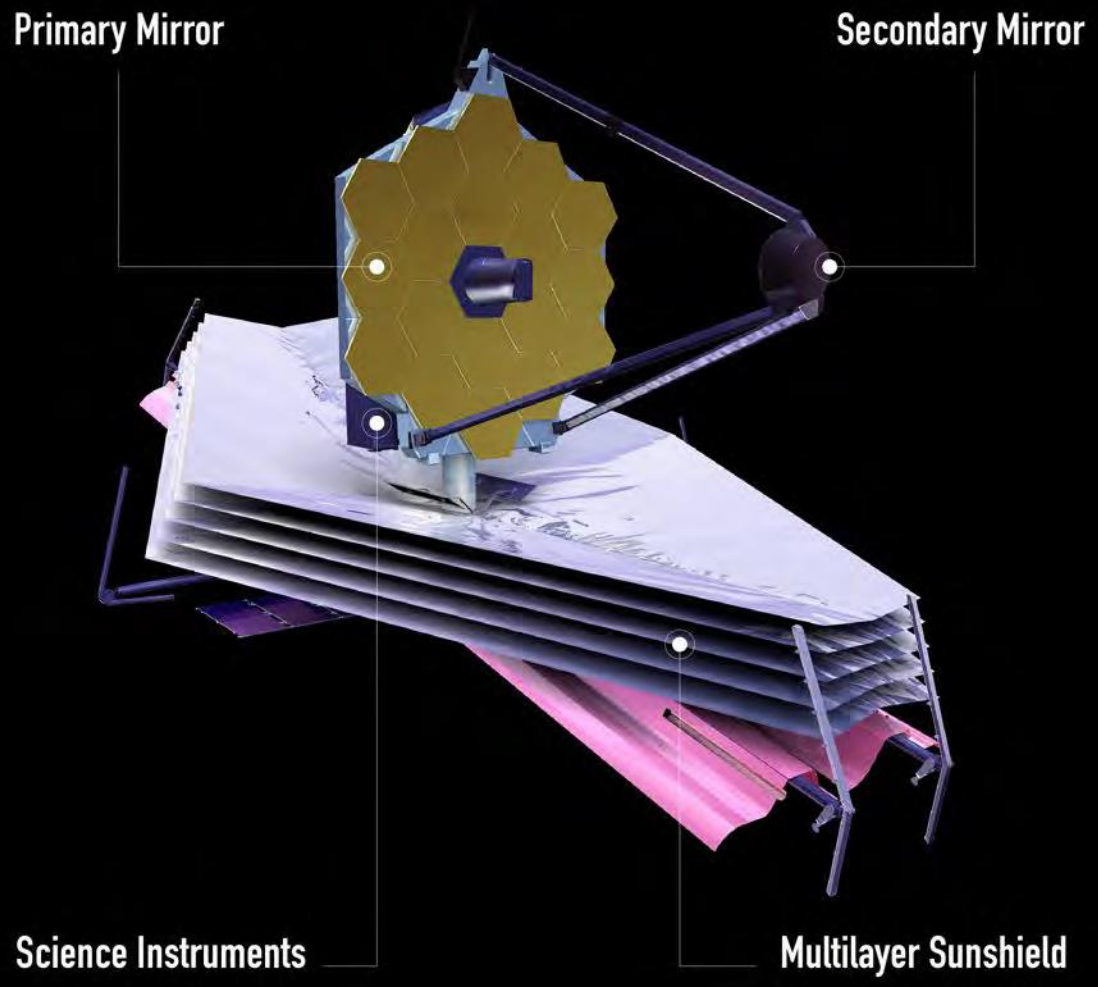
# JWST Deployment video

https://www.youtube.com/watch?v=RzGLKQ7_KZQ

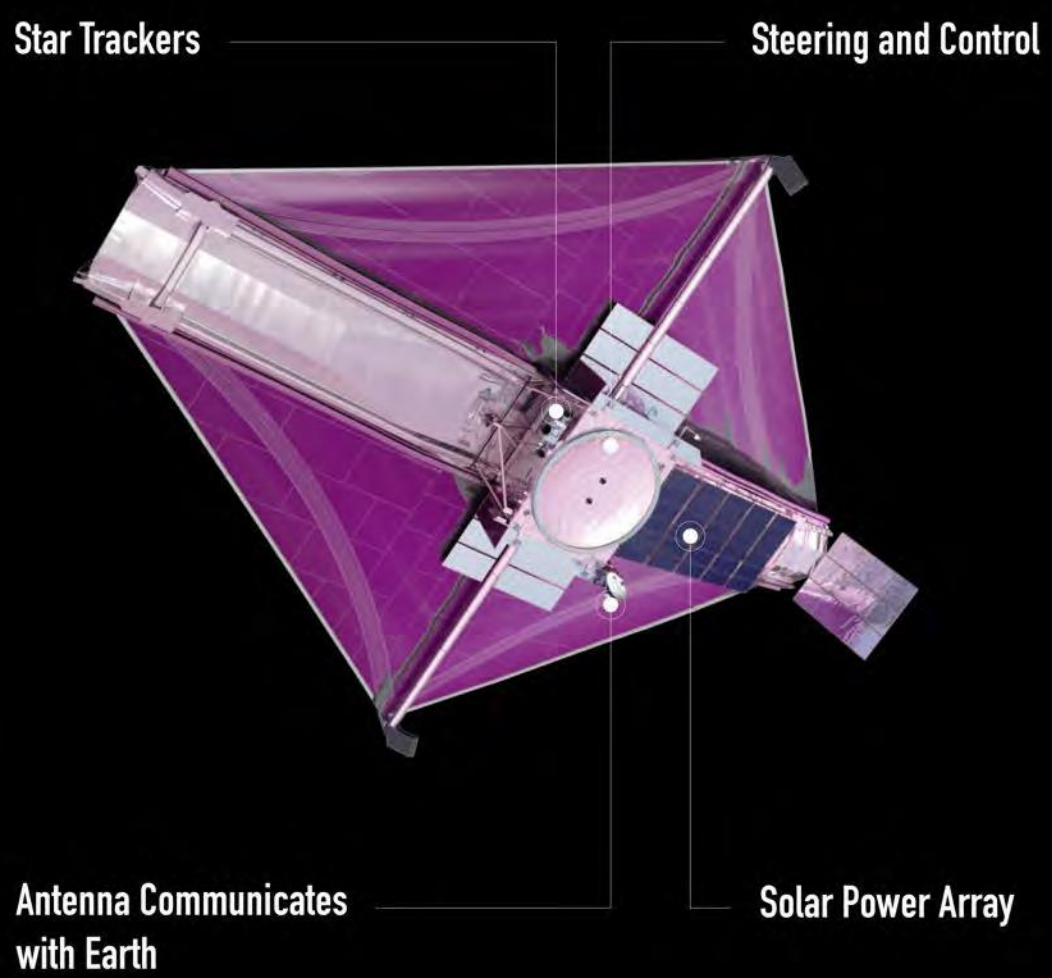


# Webb’s Journey Begins

# Observing Side

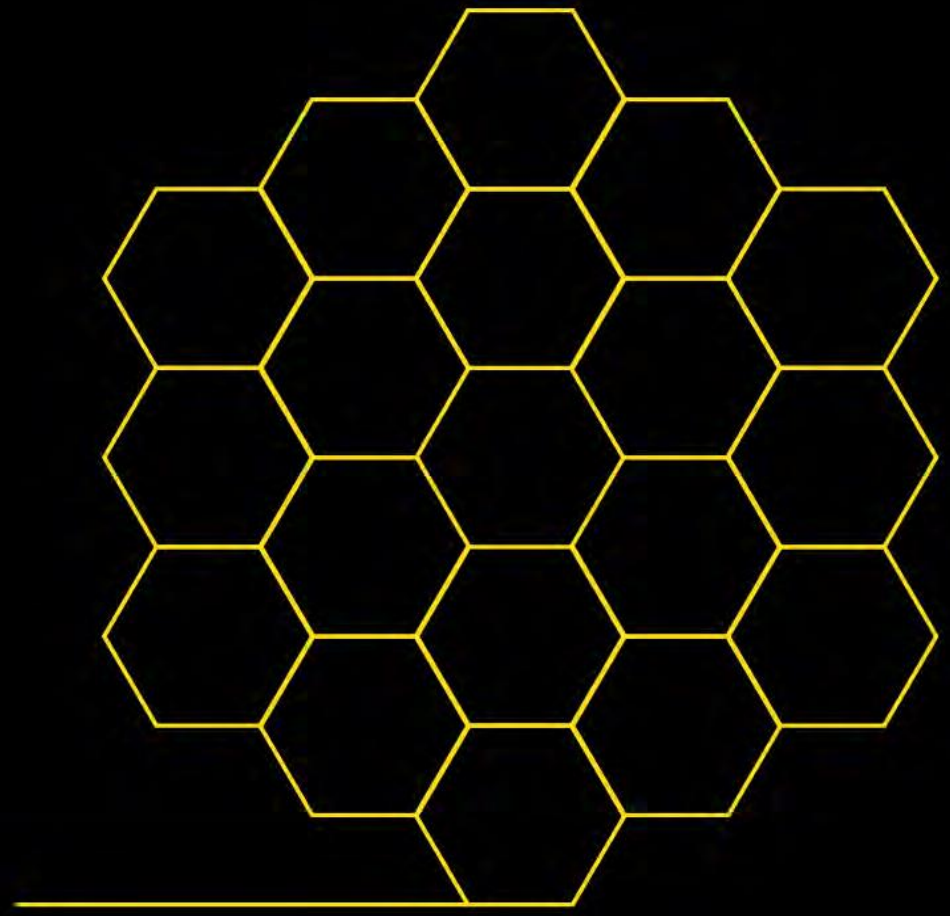



# Sun-Facing Side



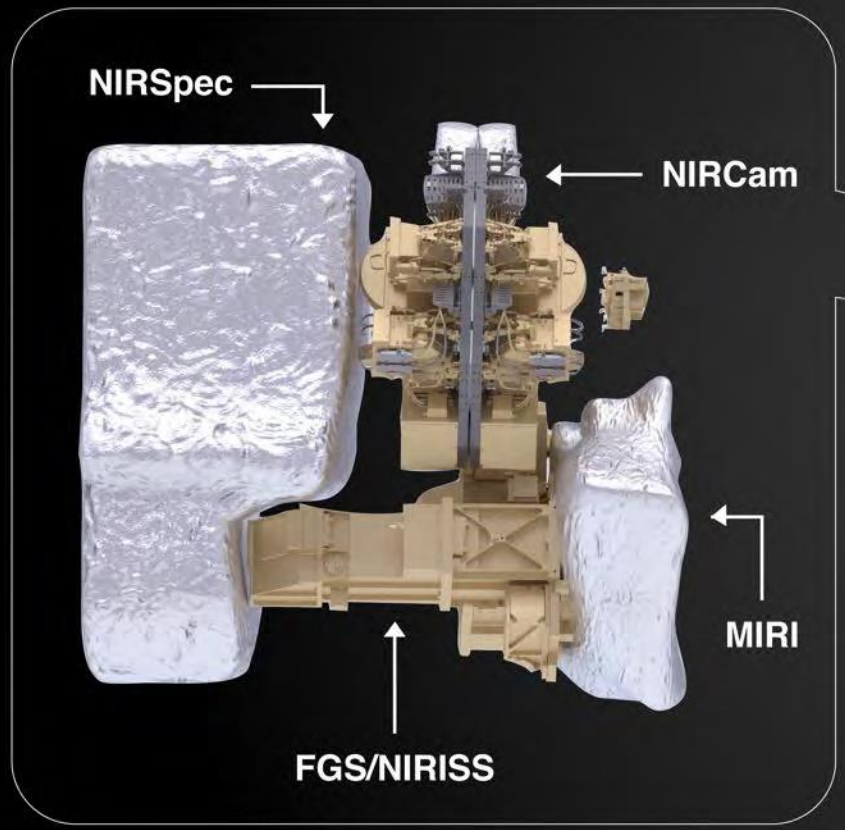
# Capturing Faint, Infrared Light

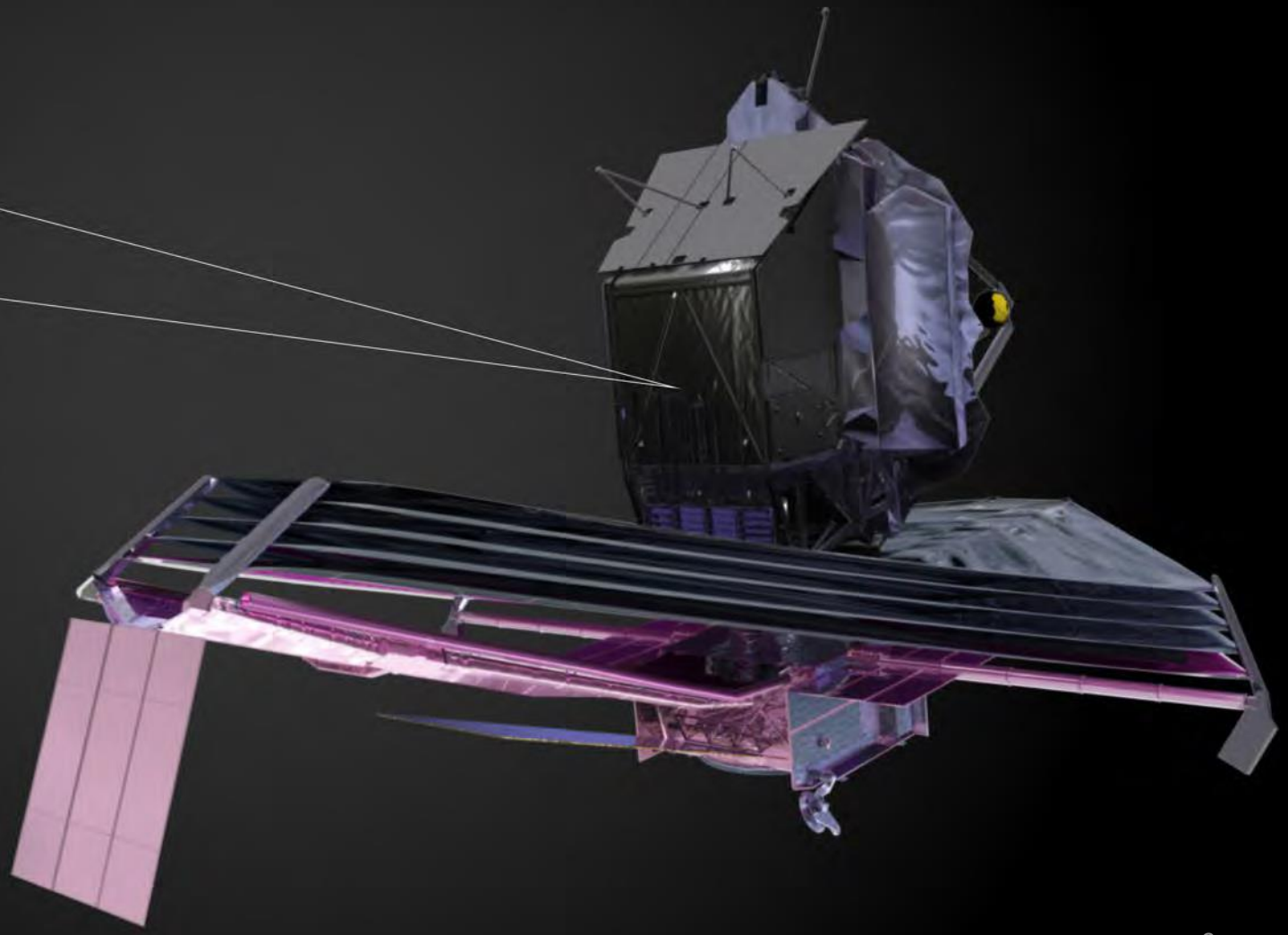
Hubble's PRIMARY MIRROR



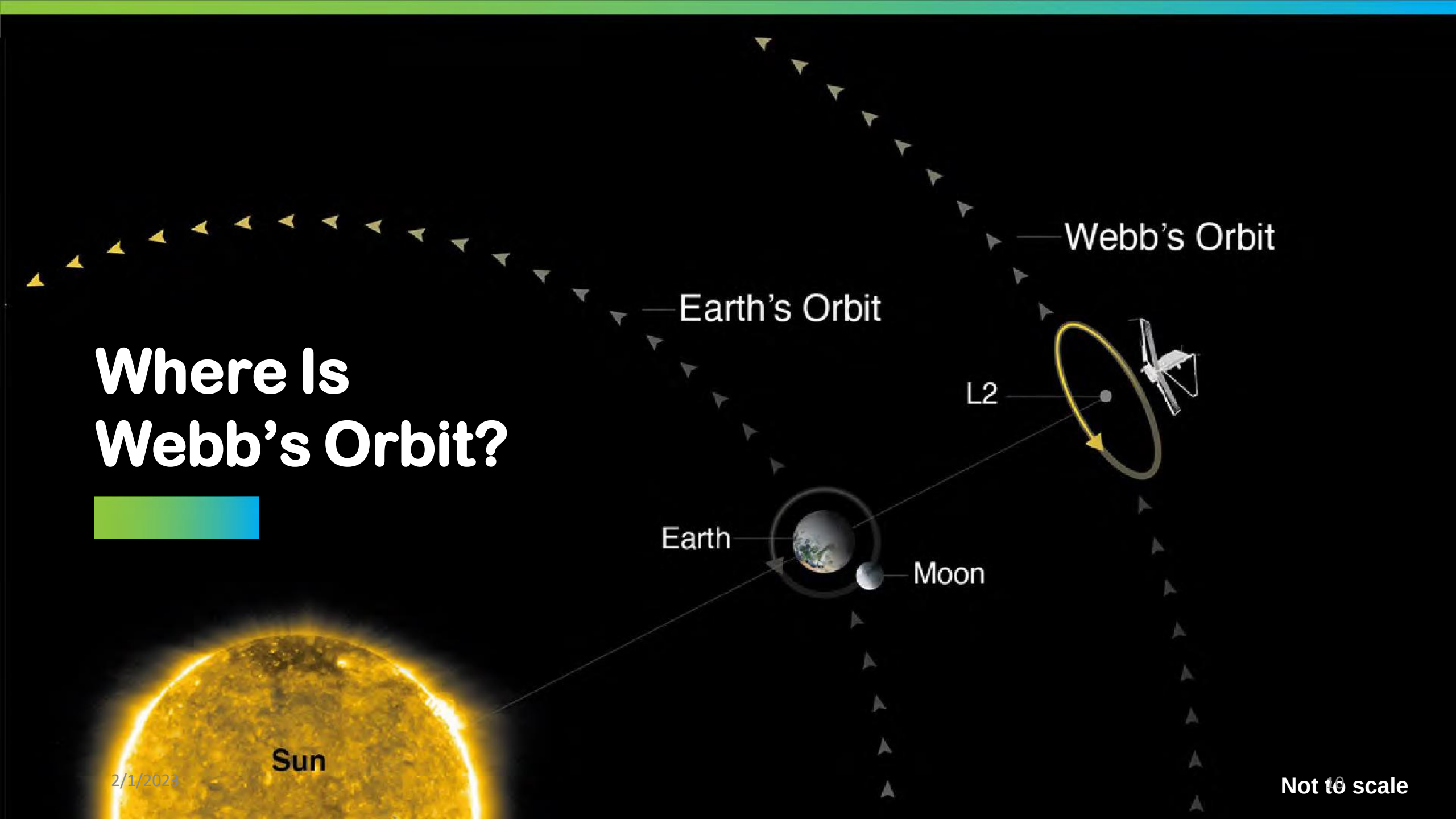
Webb's PRIMARY MIRROR

# Webb's Science Instruments



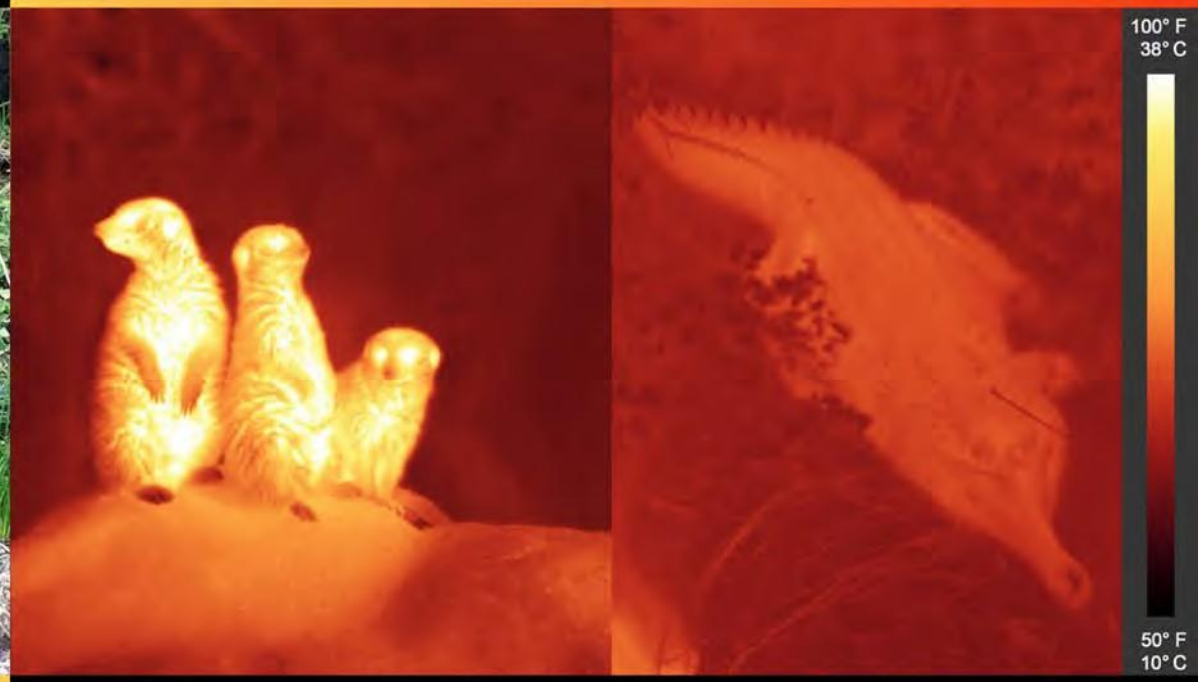
# Where Is Webb's Orbit?




Not to scale

# Why Study Infrared Light?

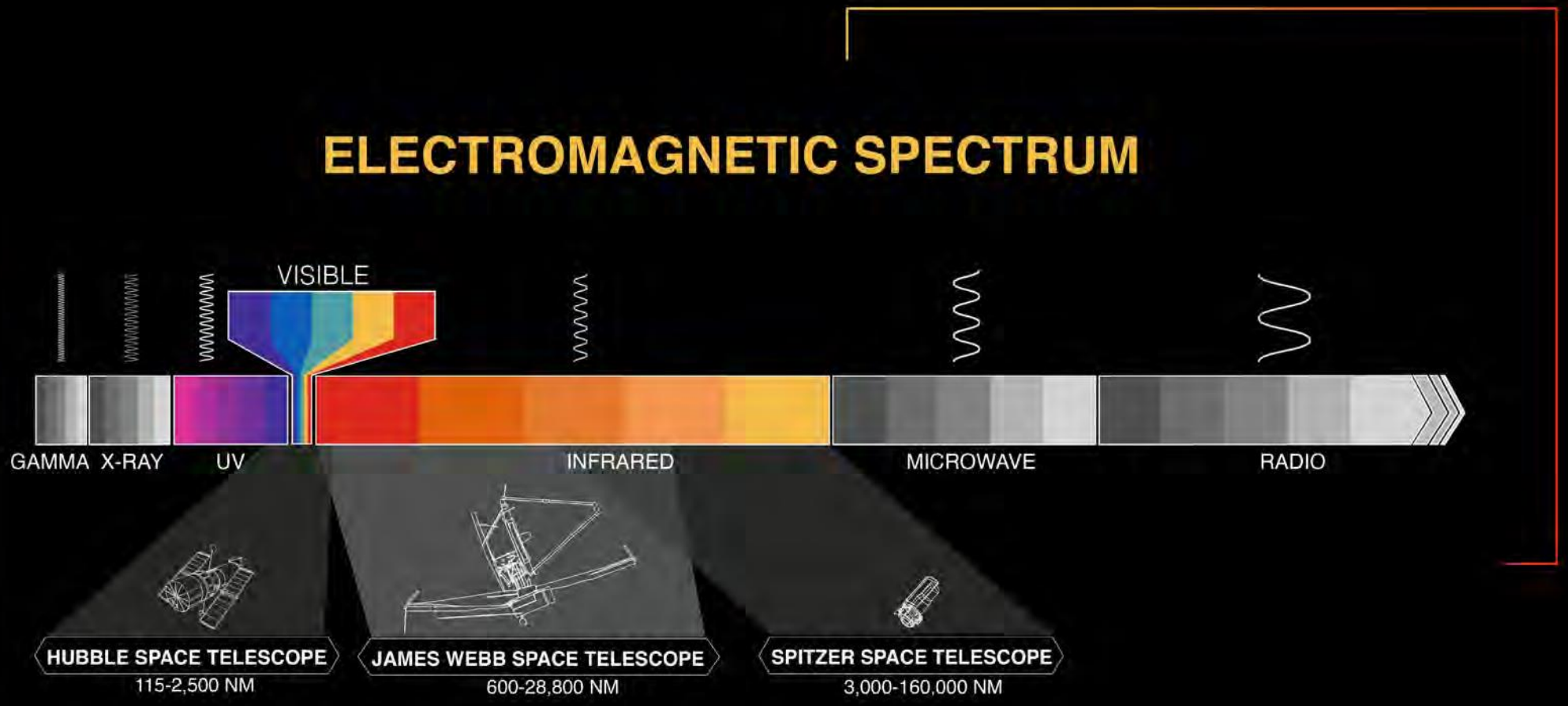
# Visible vs. Infrared Light




**Meerkats**

**Freshwater crocodile**

# Webb's Specialization in Infrared Light



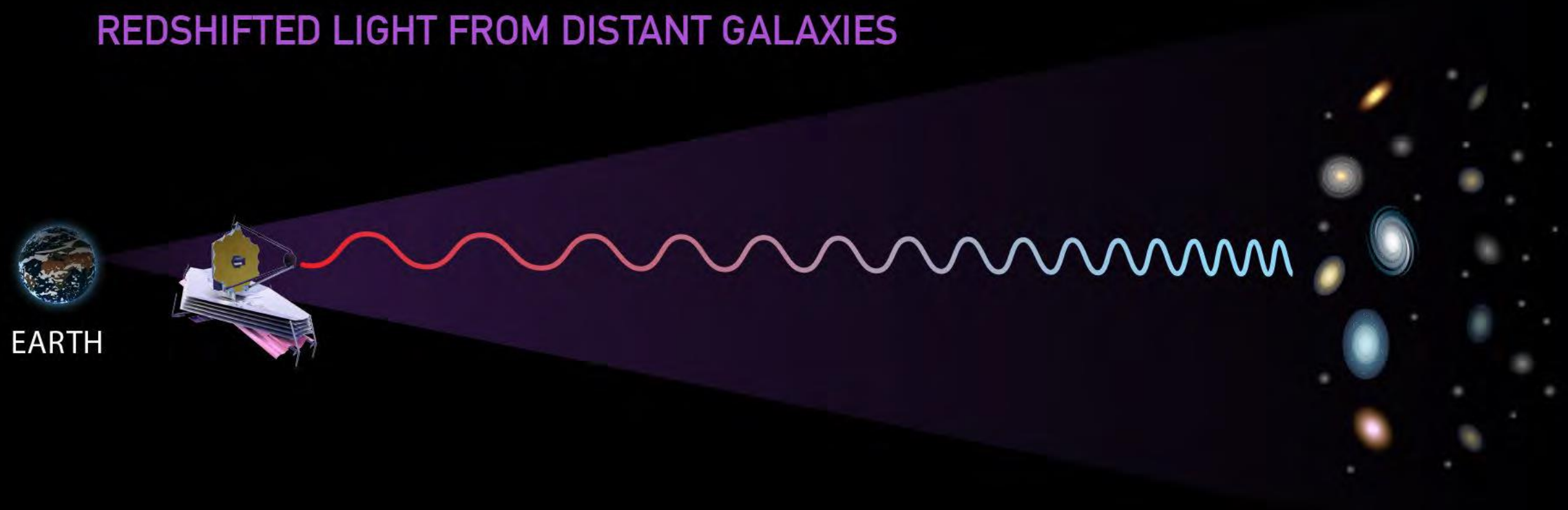
# Webb Can Peer Through *and* Examine Dust

Visible Light (ESO)

Near-Infrared Light (ESO)

Mid-Infrared Light (Spitzer)

# Observing the Ancient Universe



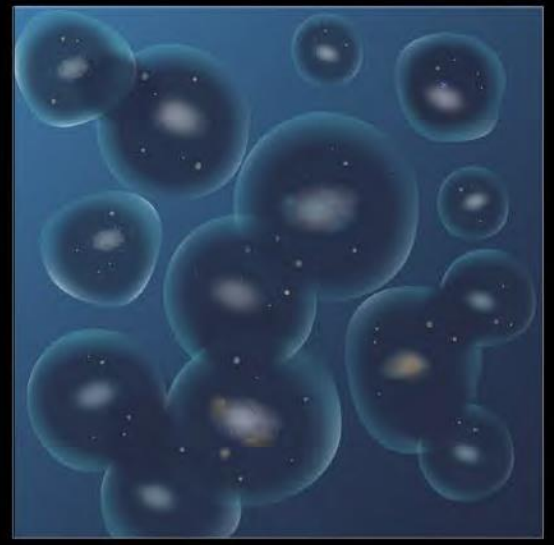
# Exploring the Universe with Webb!

# Crisscrossing the Early Universe

Beginning of reionization

Stars begin forming, heating gas

Stars assemble into galaxies

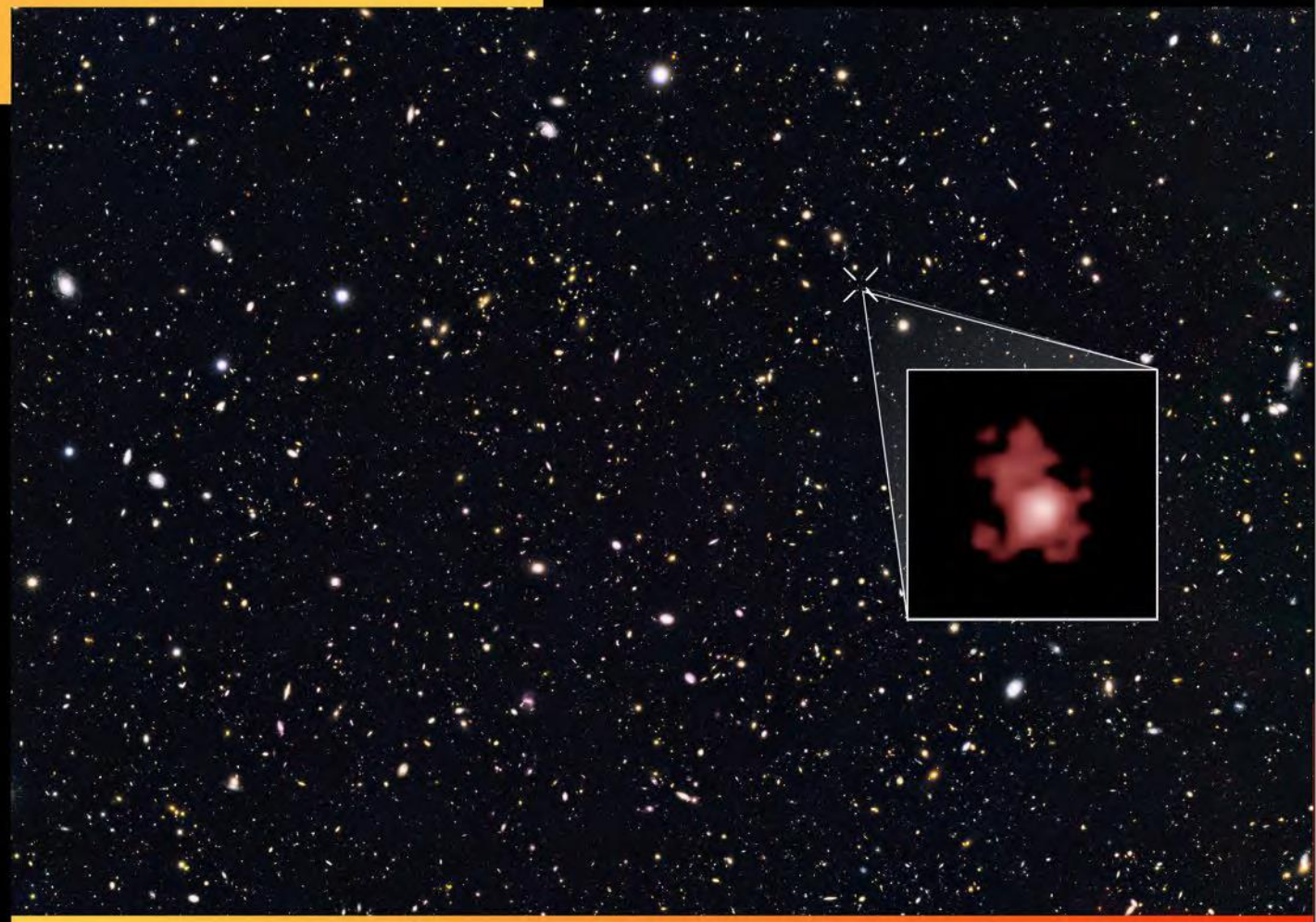


Galaxies become more massive

Clear universe, end of reionization

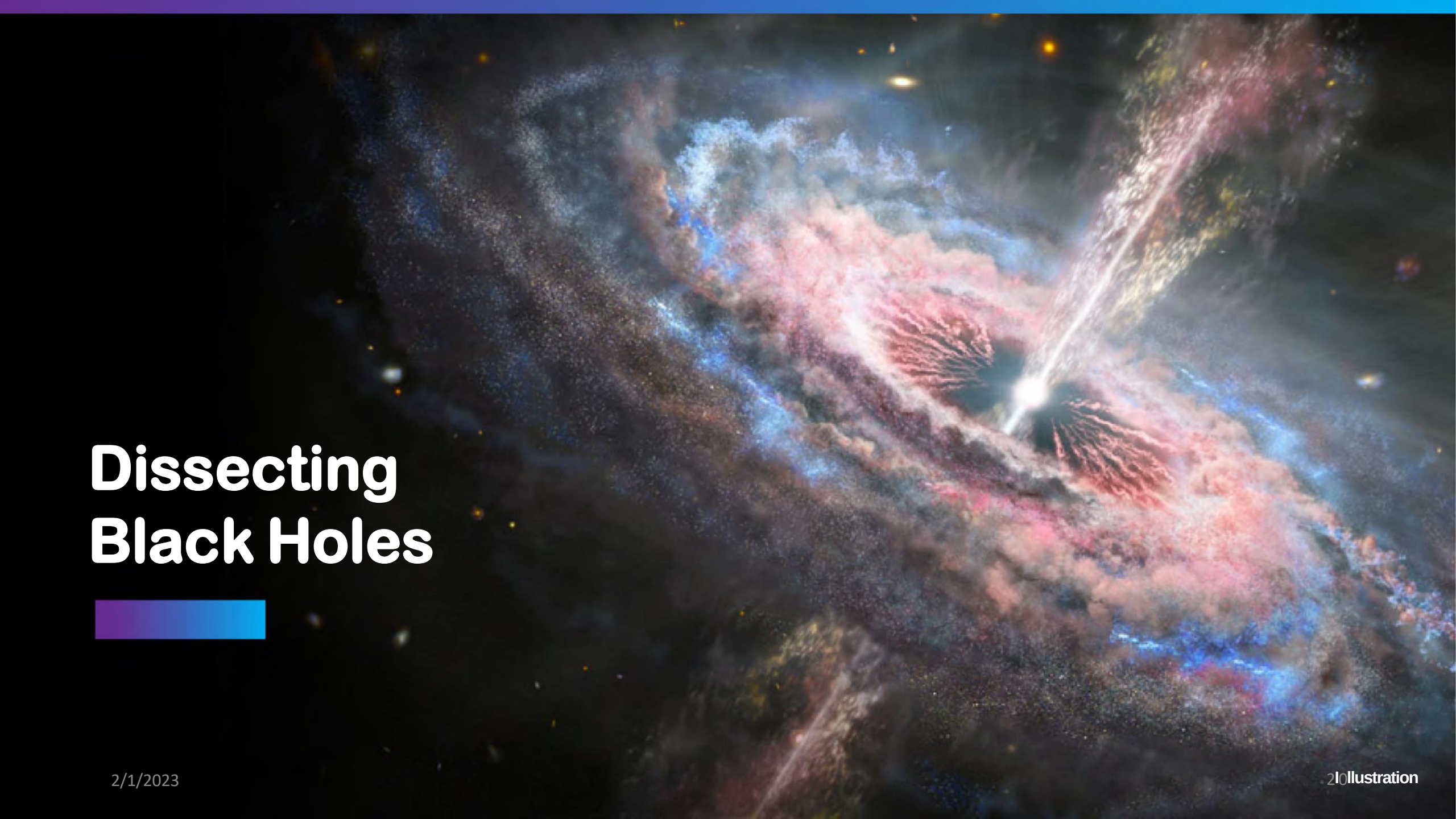
Present day

# Seeking Some of the First Galaxies



# A ‘Flip Book’ of Galaxies Over Time

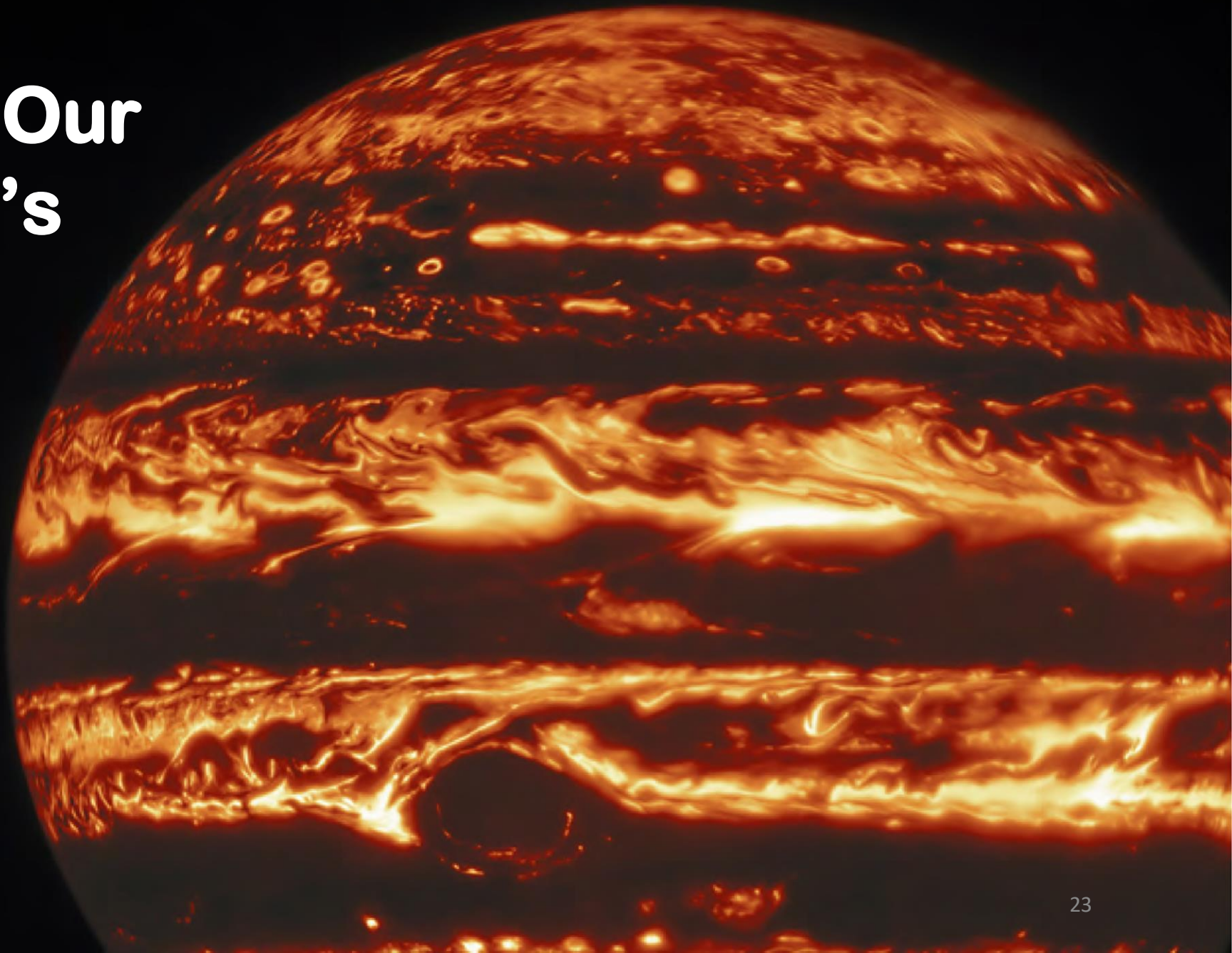
# Dissecting Black Holes



# Reexamining How Stars Form, Live, and Die

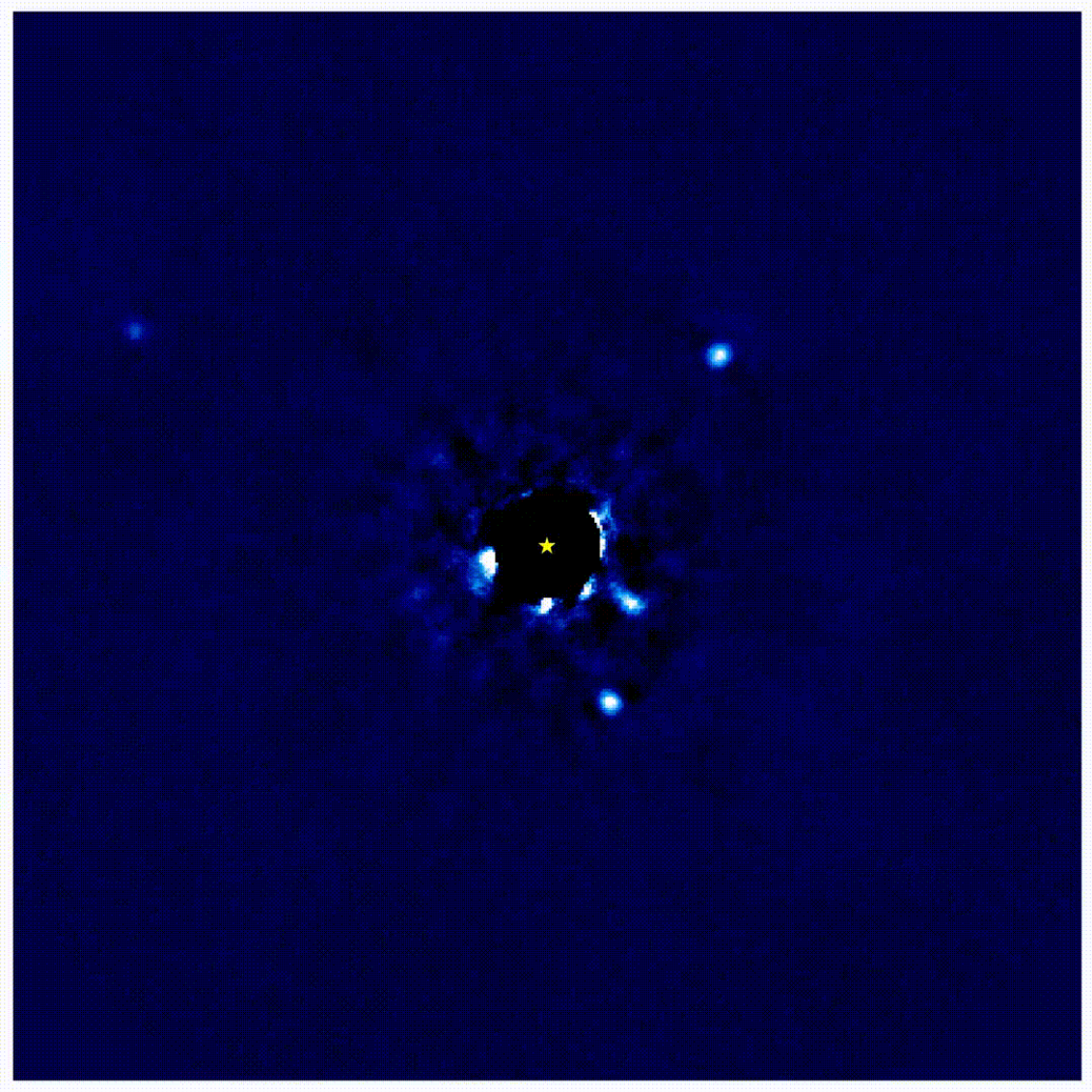
# Detecting Molecules in Star-Forming Regions

# Reexamining Our Solar System's Planets

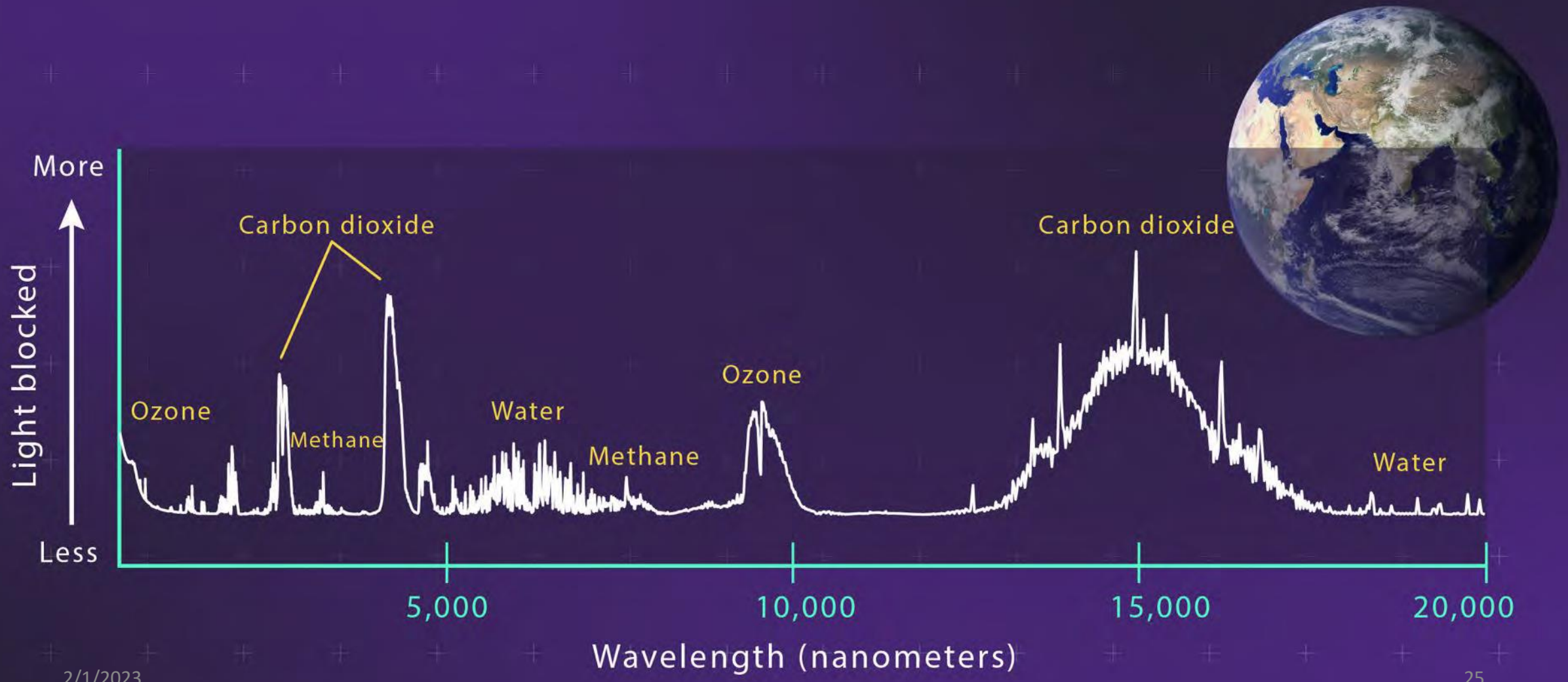


Jupiter in Near-Infrared Light (Gemini North)

# Infrared Light Helps Us Find Distant Planets



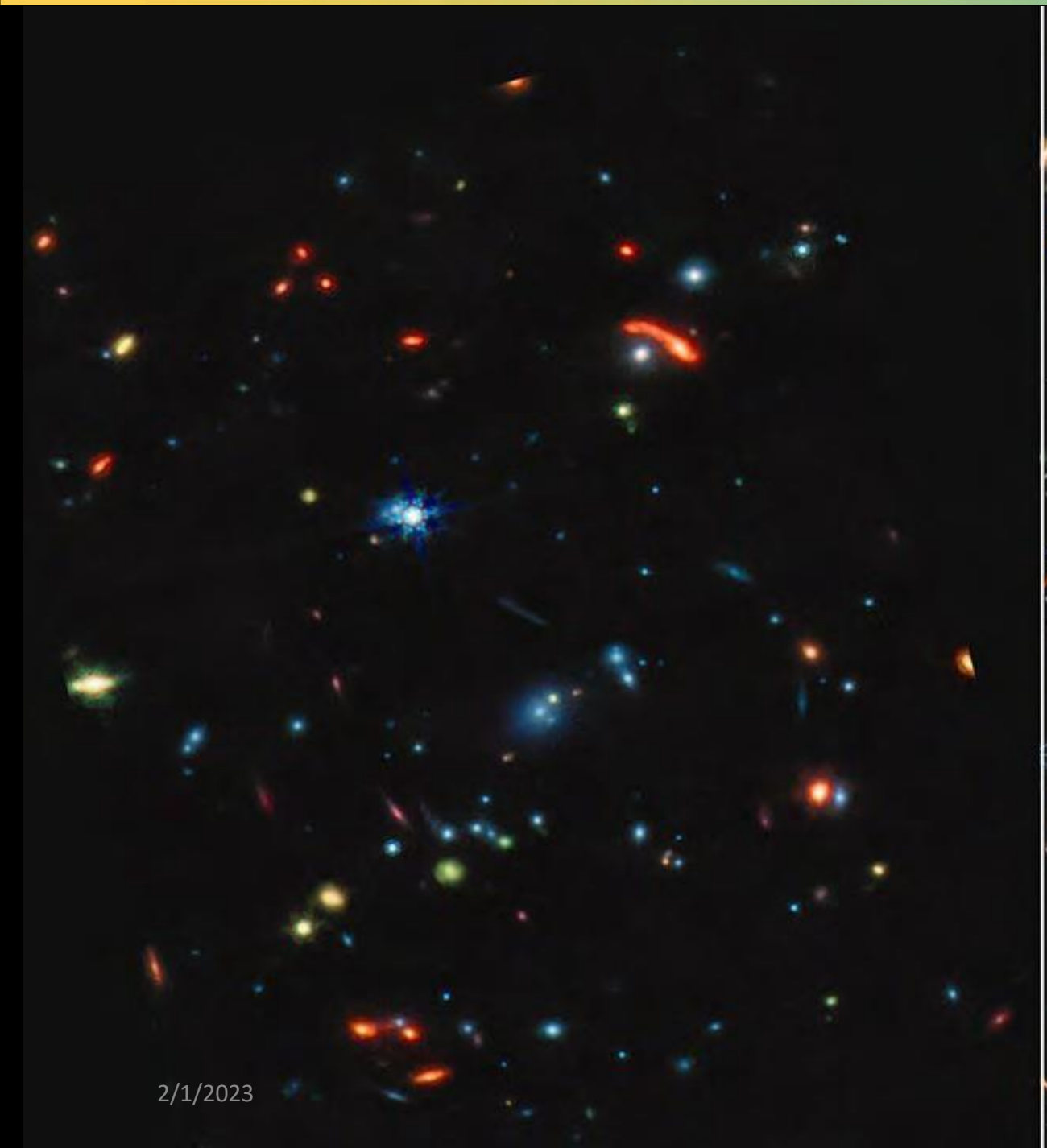
# Decoding Planets' Atmospheres



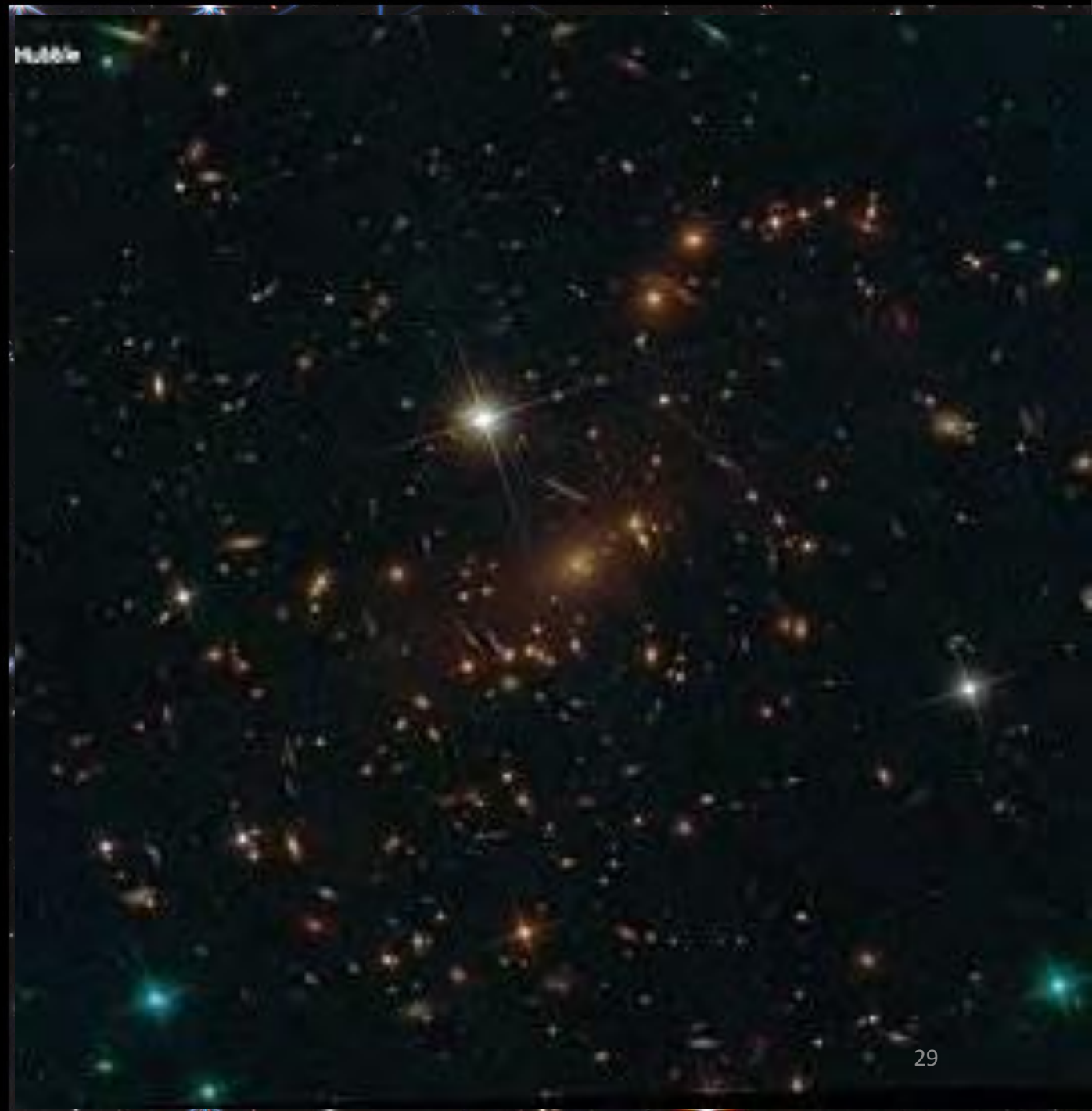
# Webb's First Observations

# Webb's First Deep Field SMACS 0723

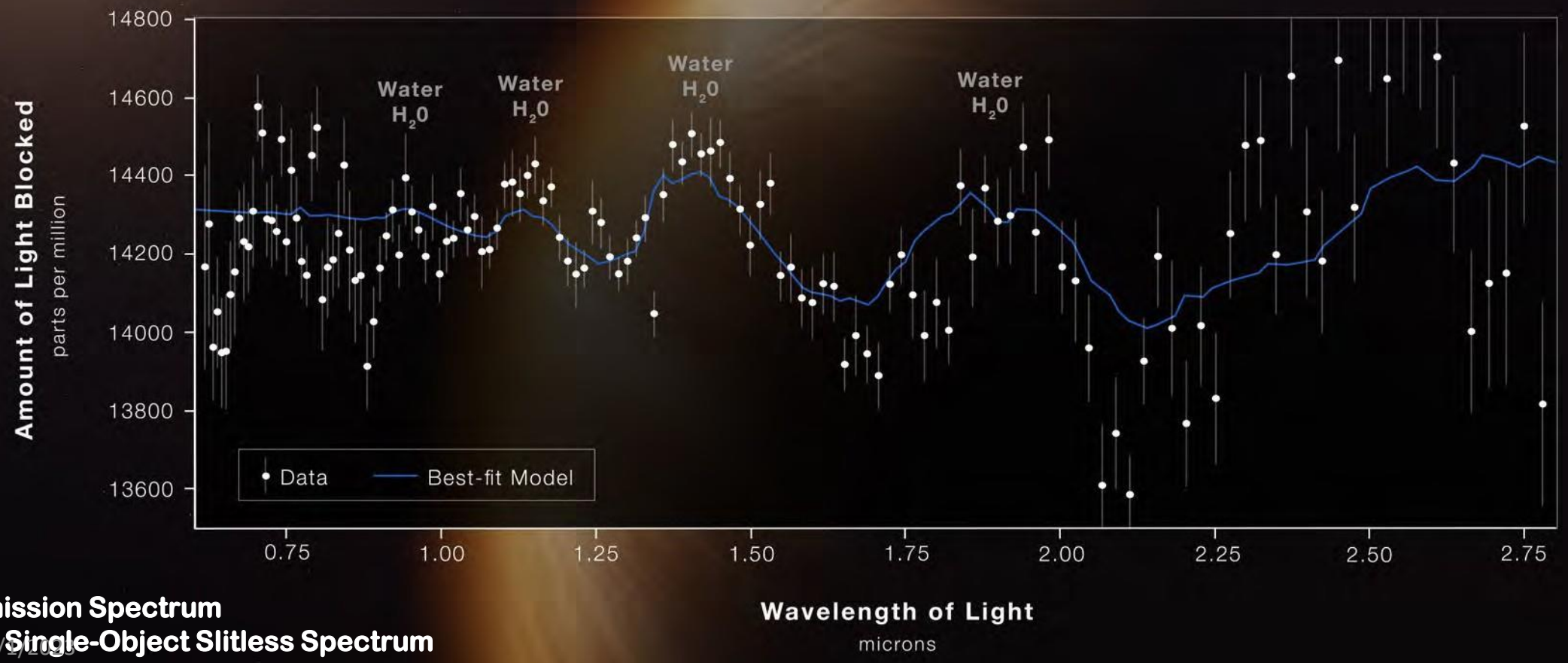
**Near-Infrared Light NIRCam Image**



# Hubble view of SMACS 0723



# Exoplanet |WASP-96 b



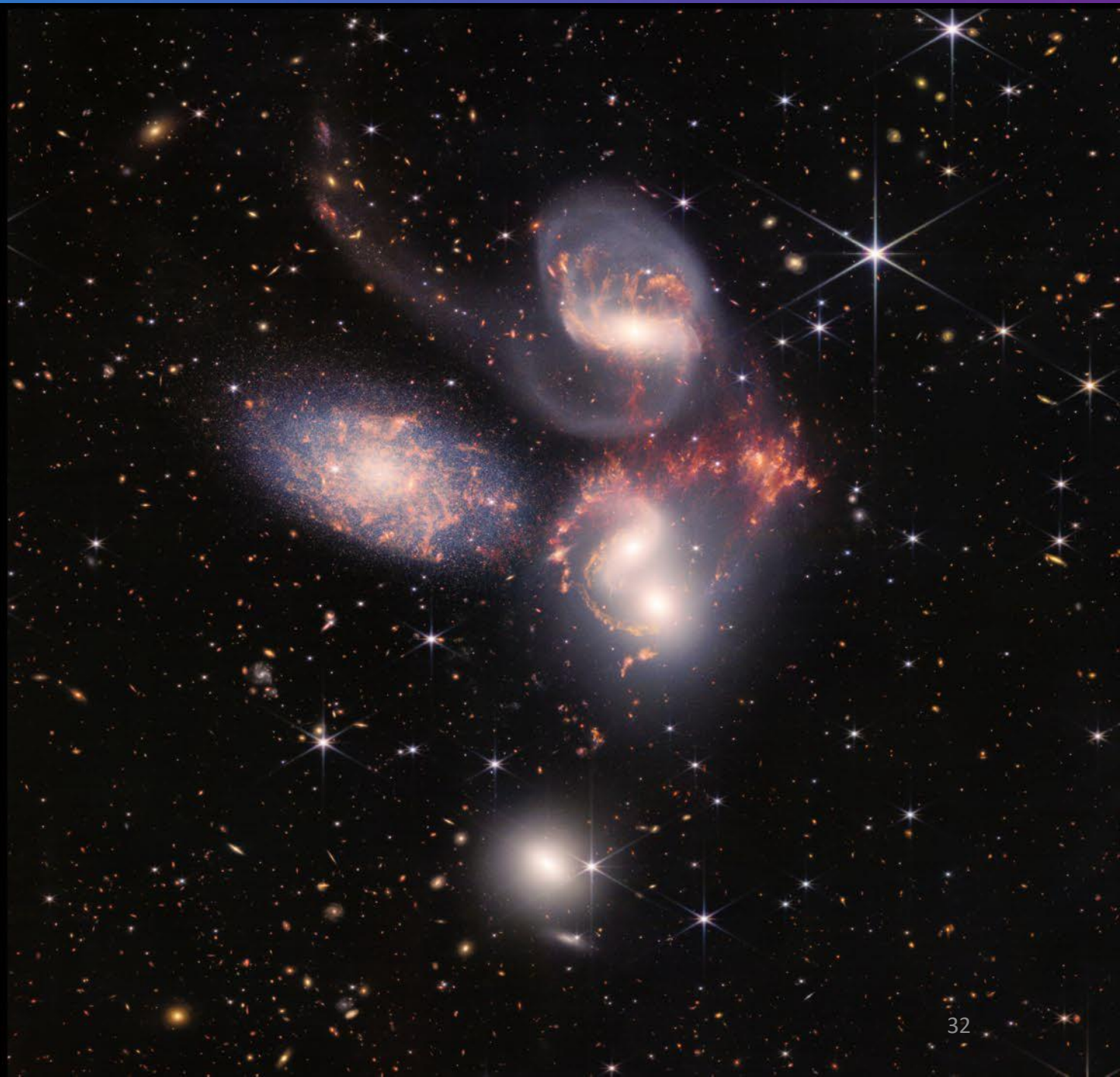

**Transmission Spectrum**
**NIRISS Single-Object Slitless Spectrum**

# Planetary Nebula |Southern Ring Nebula

Near-Infrared Light
NIRCam Image

Mid-Infrared Light
MIRI Image

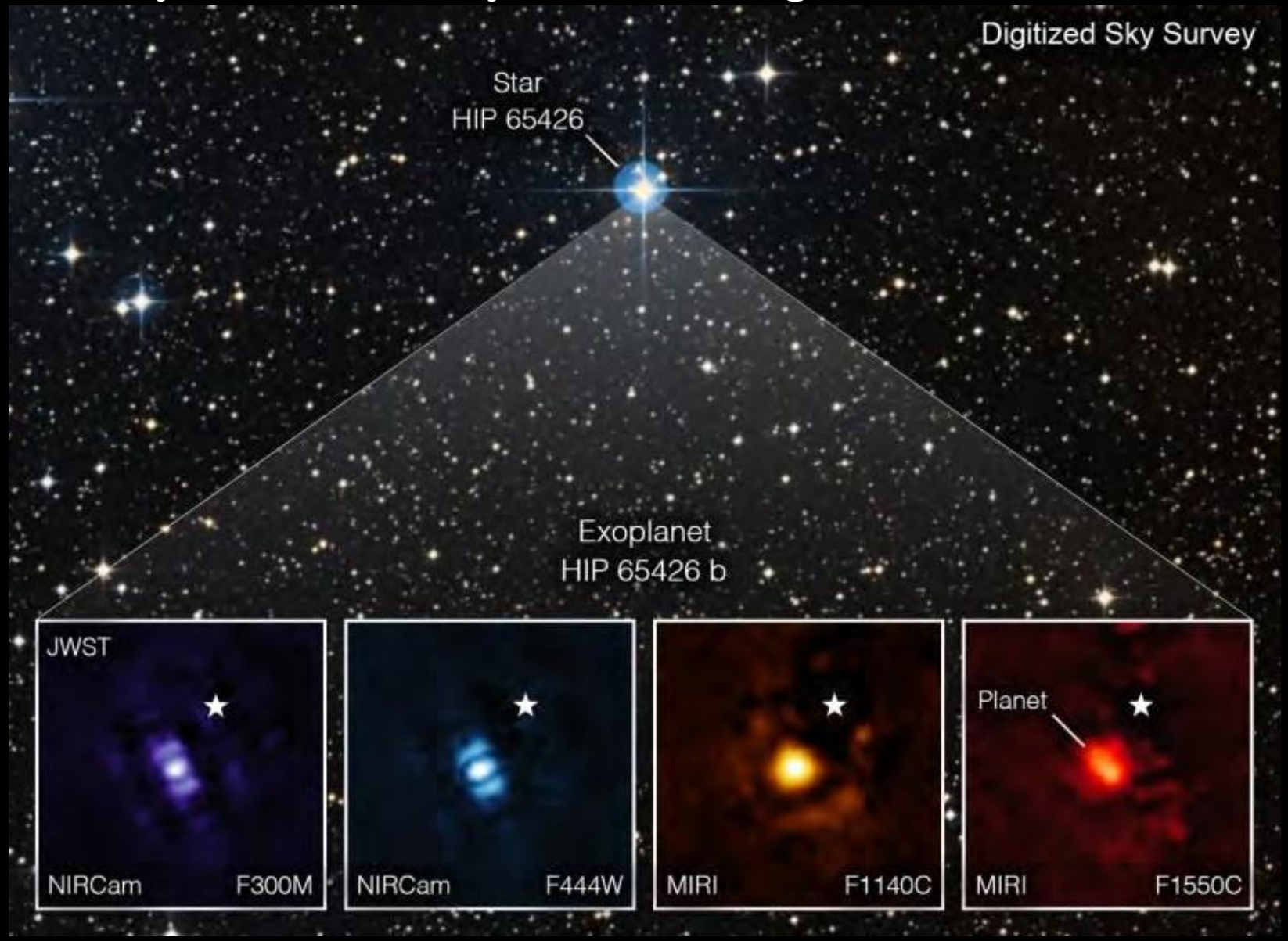
# Interacting Galaxies Stephan's Quintet



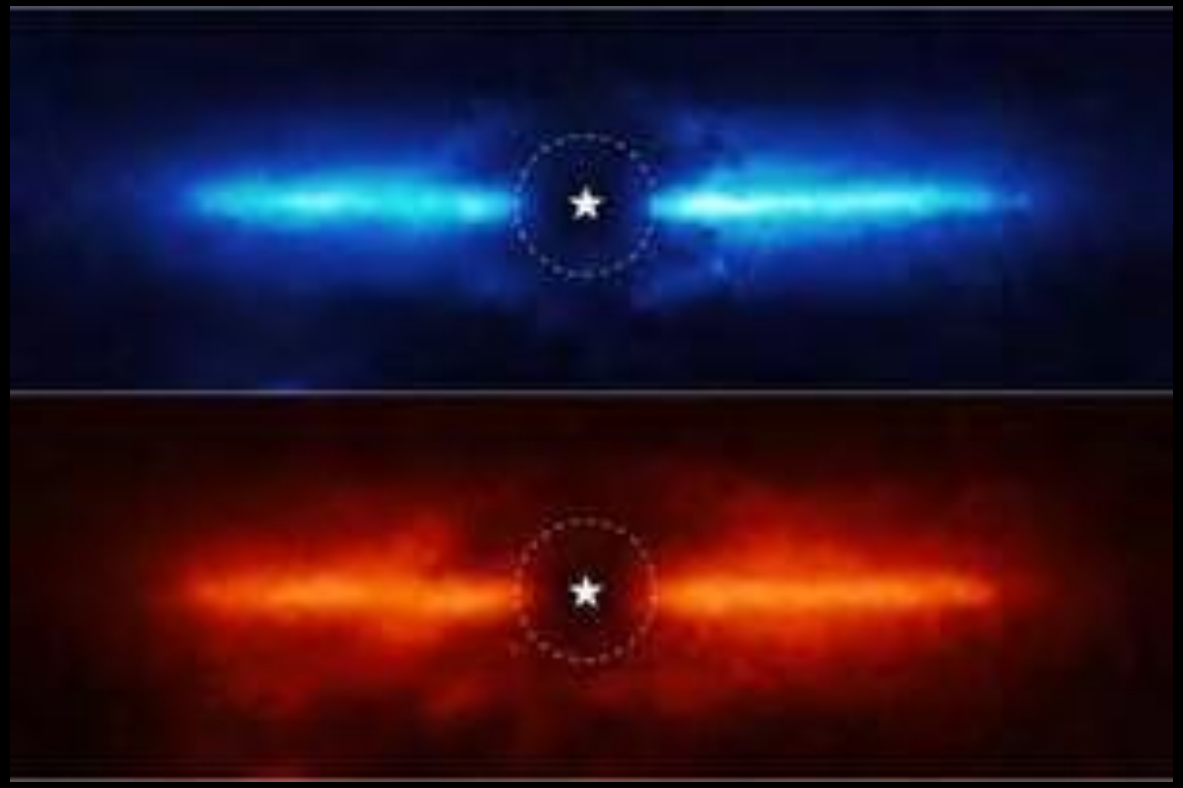
**Near- and Mid-Infrared Light**
**Combined NIRCam and MIRI Image**

# Star-Forming Region I Carina Nebula

# First Exoplanet captured by JWST!



# AU Mic debris disk



Observations at two different wavelengths

# CEERS

CEERS JWST/NIRCam F115W F150W F200W F277W F356W F410M F444W
NASA/STScI/CEERS/TACC/S. Finkelstein/M. Bagley/R. Larson/Z. Levay

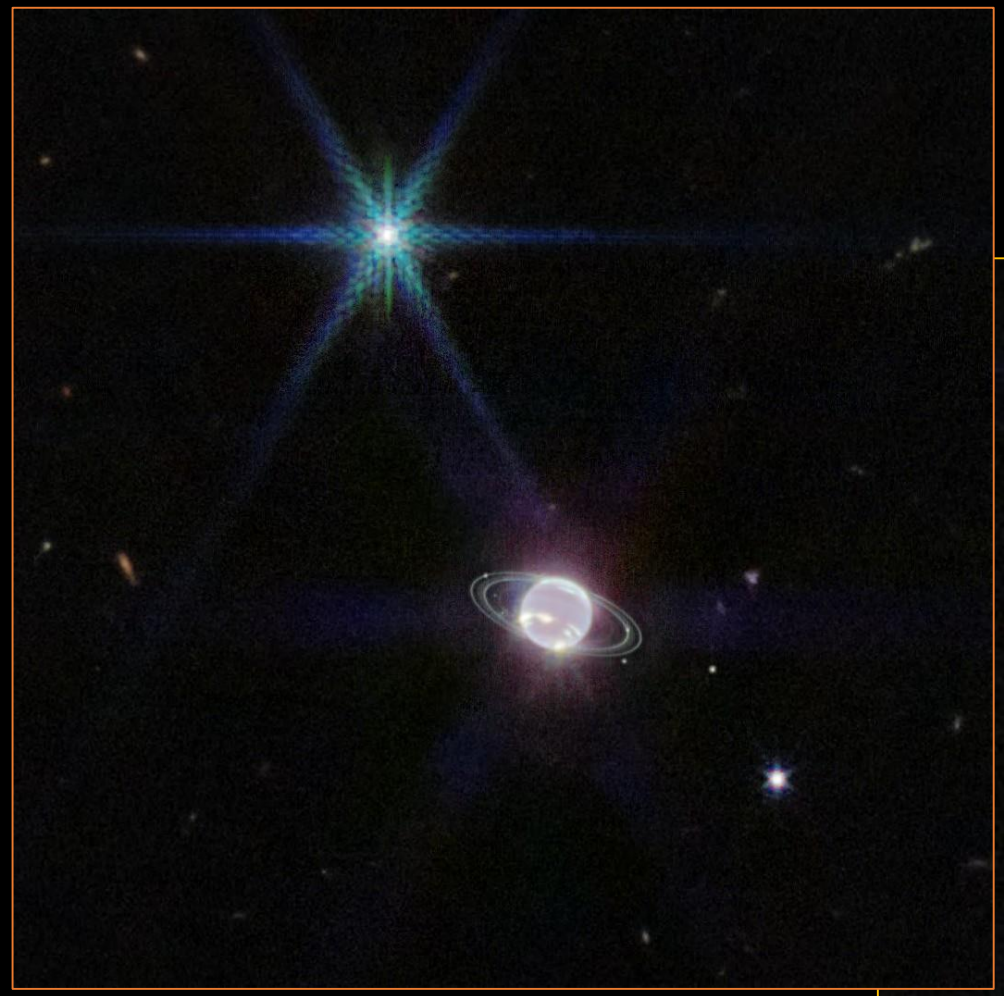
# Neptune

Voyager 2 (1989)

Hubble (2021)

Webb (2022)

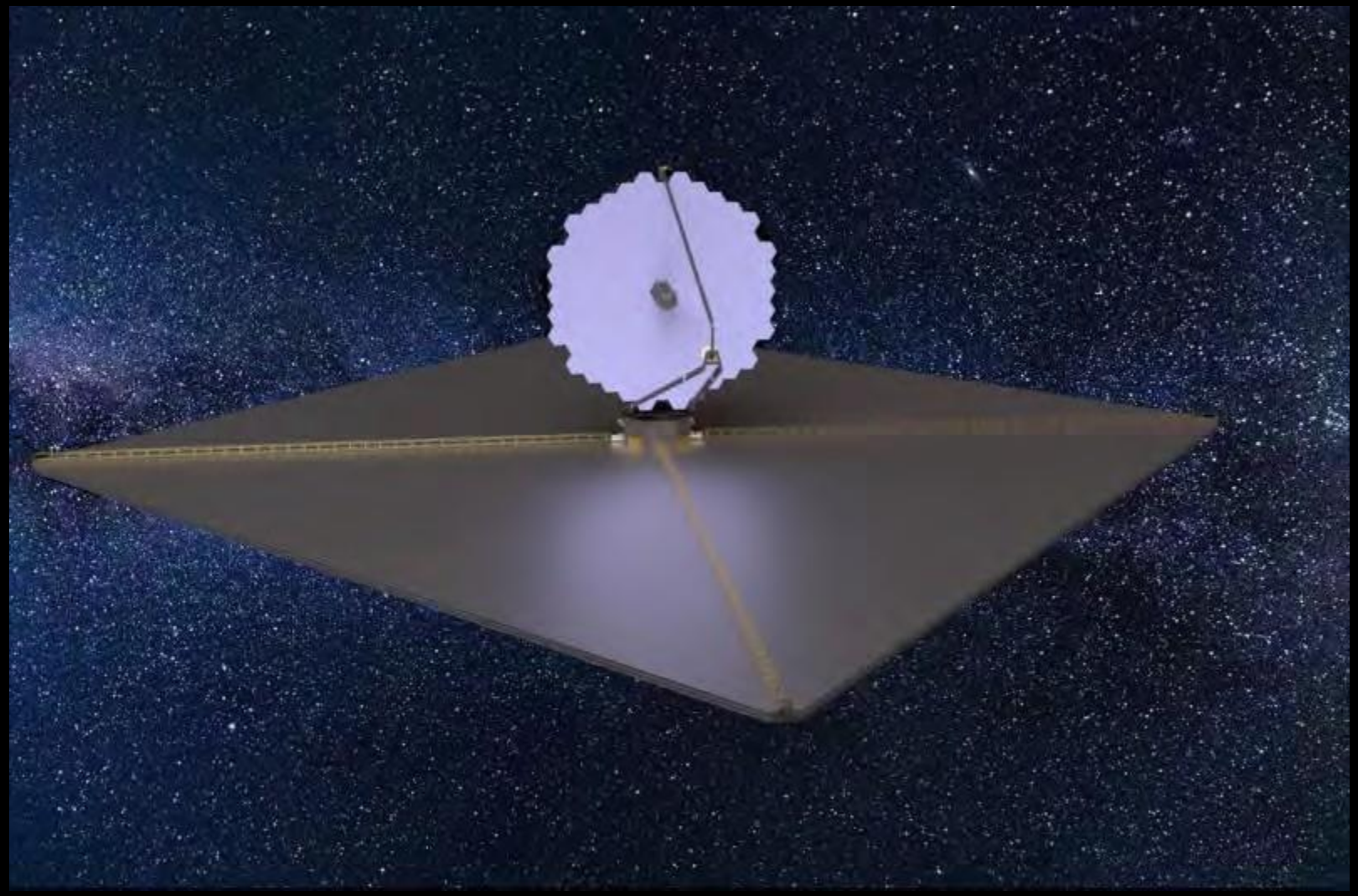
# Neptune



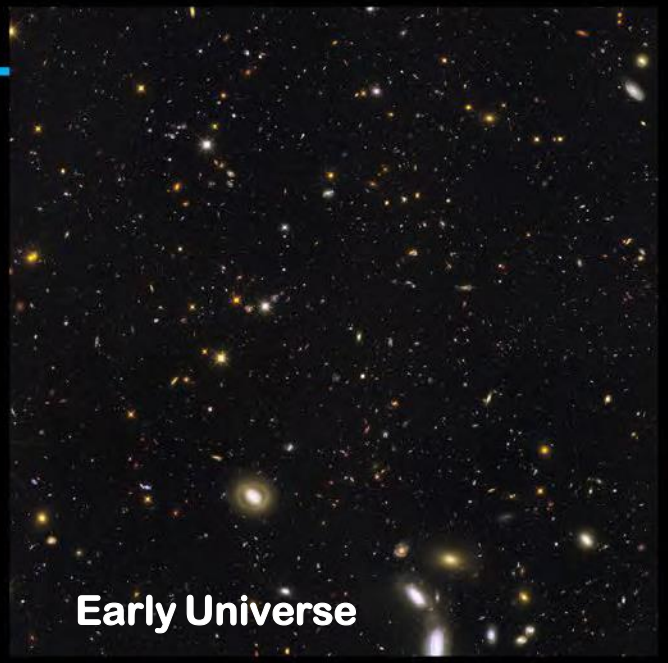
# NEXT UP: Nancy Grace Roman Telescope

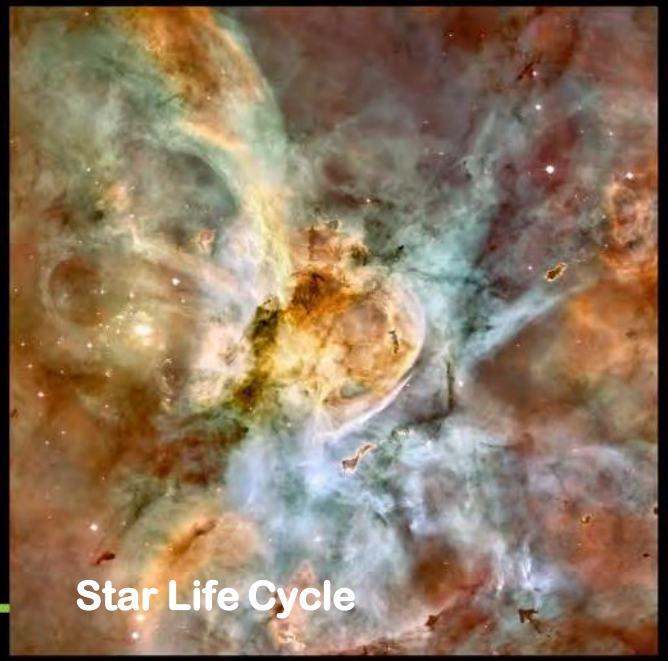
Named after NASA's first female Chief of Astronomy – same sized mirror as Hubble, with 100x the field of view.

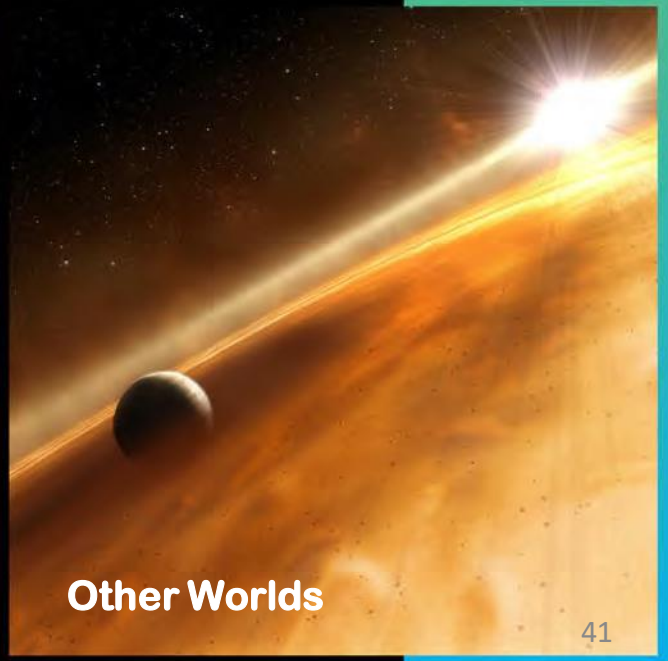
# Habitable Worlds Observatory

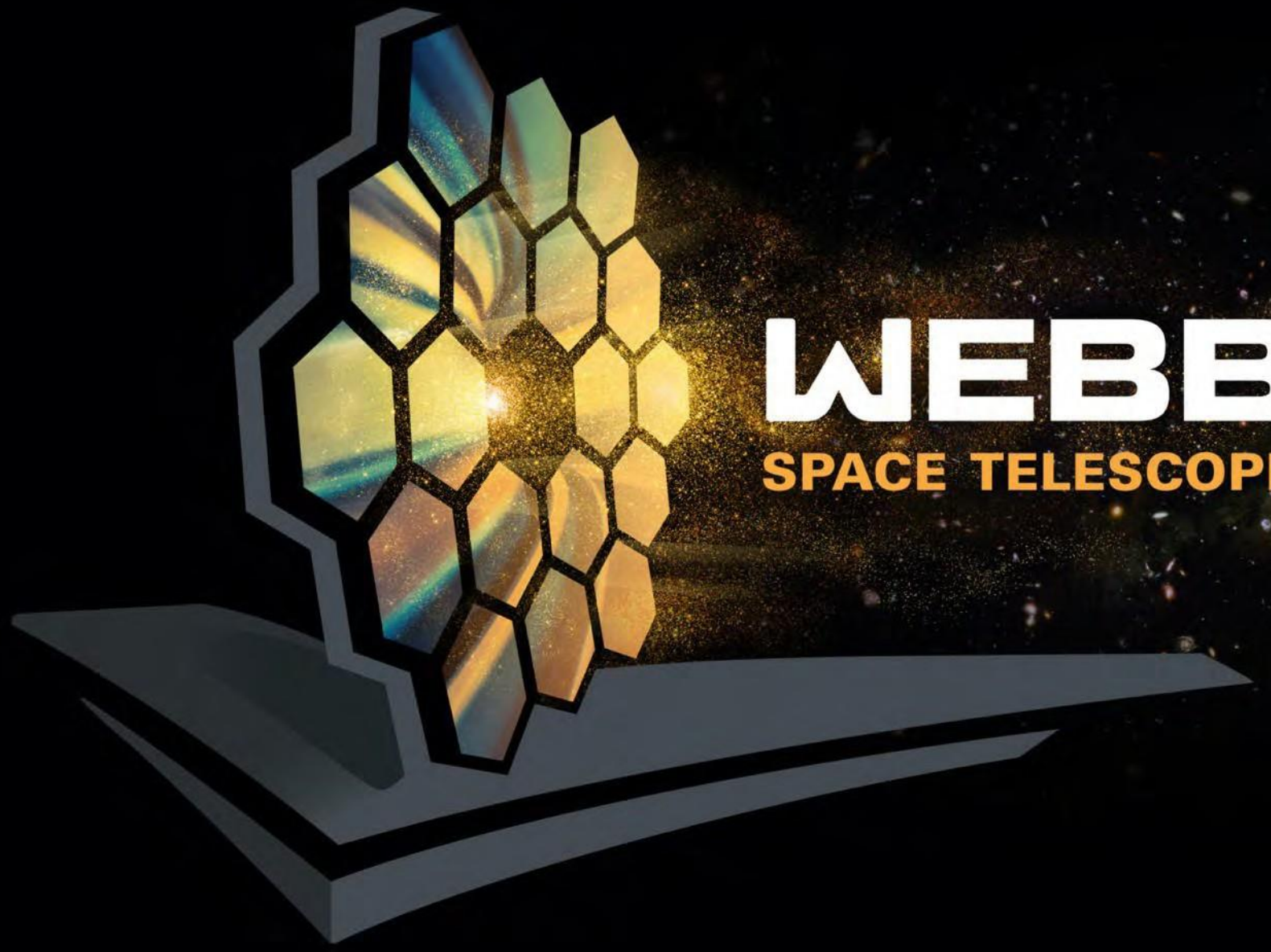


# Webb's Exciting Discoveries





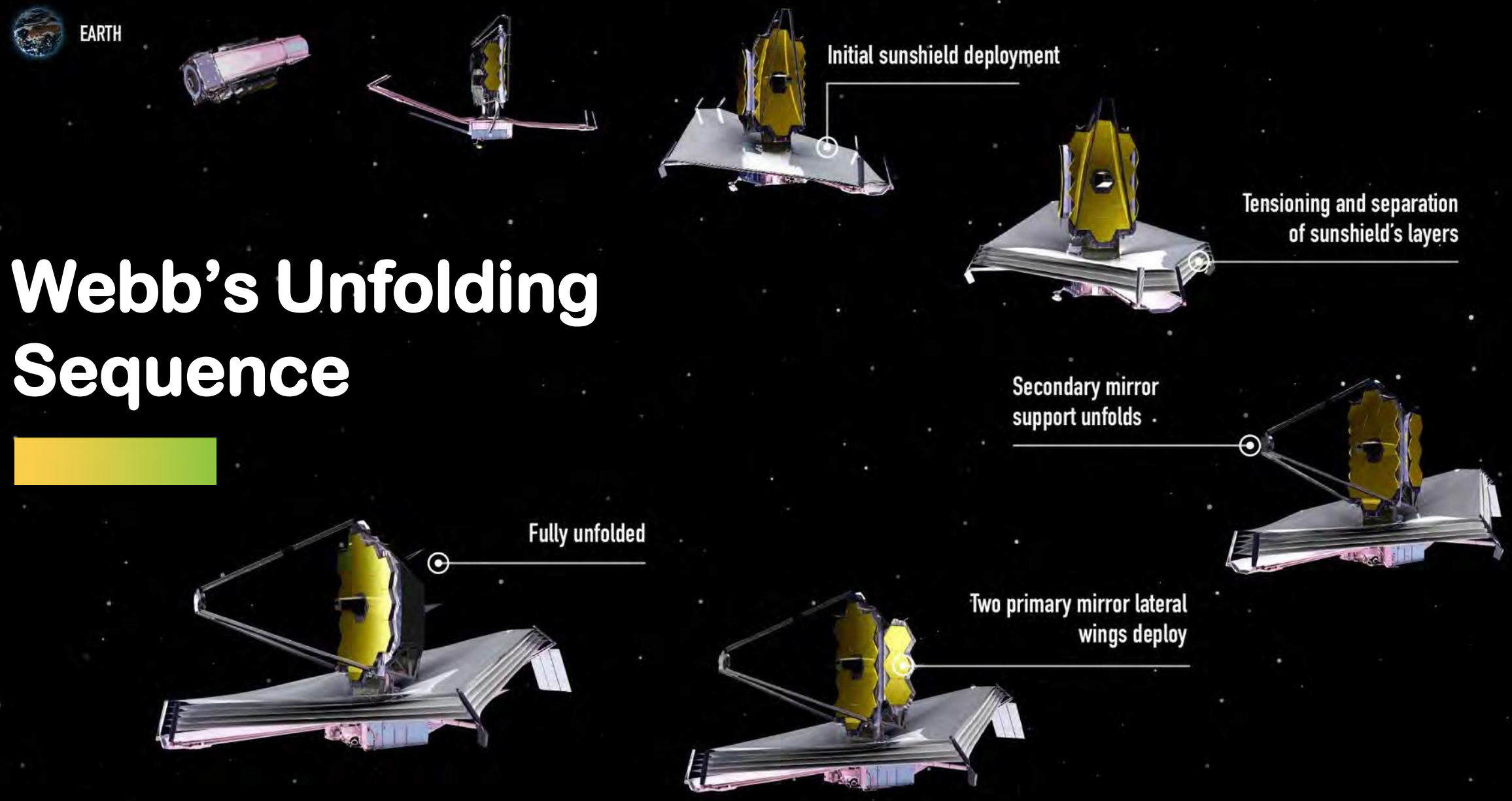



# Questions?

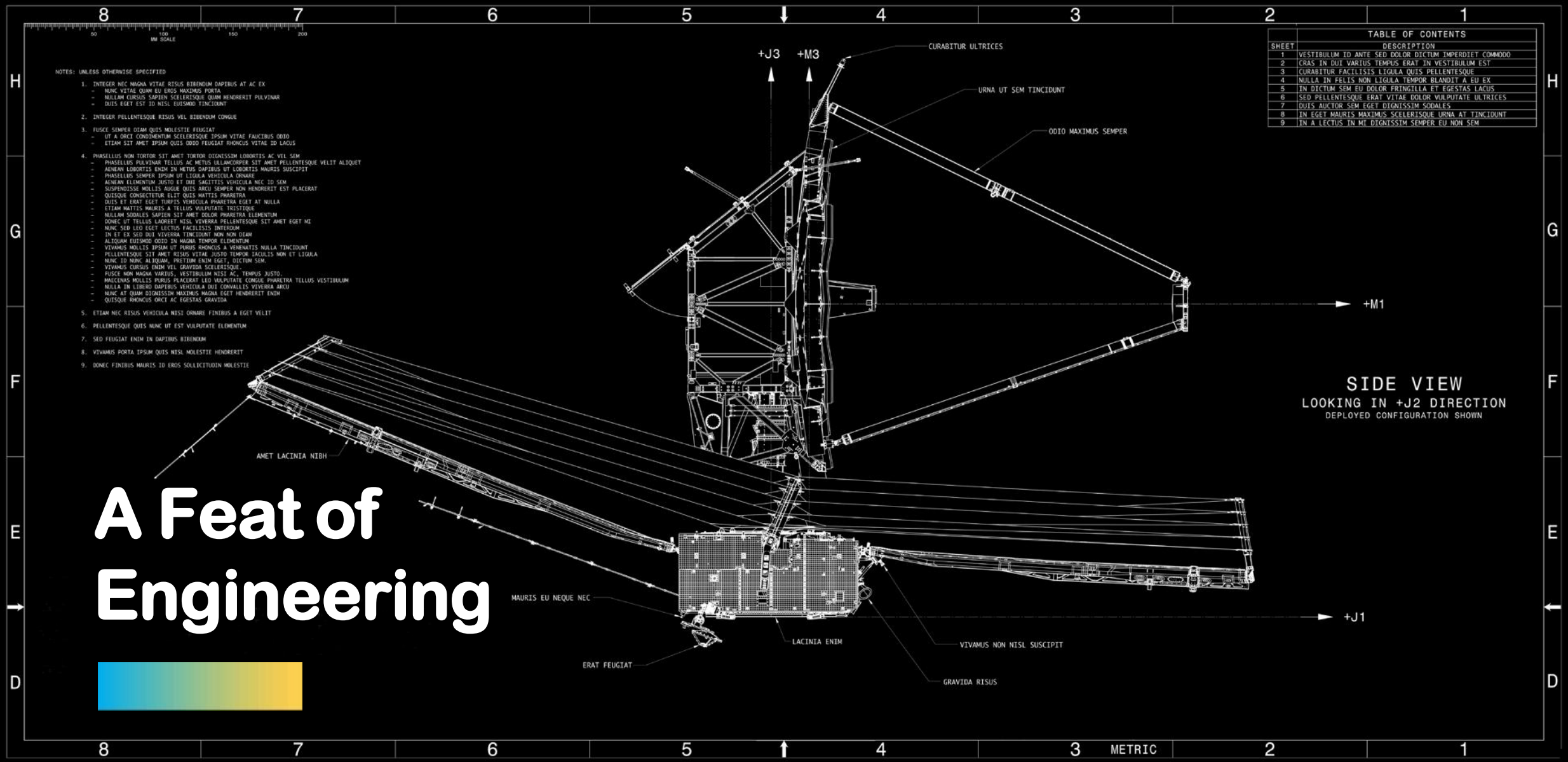
# Backup Slides

Sample Label Text

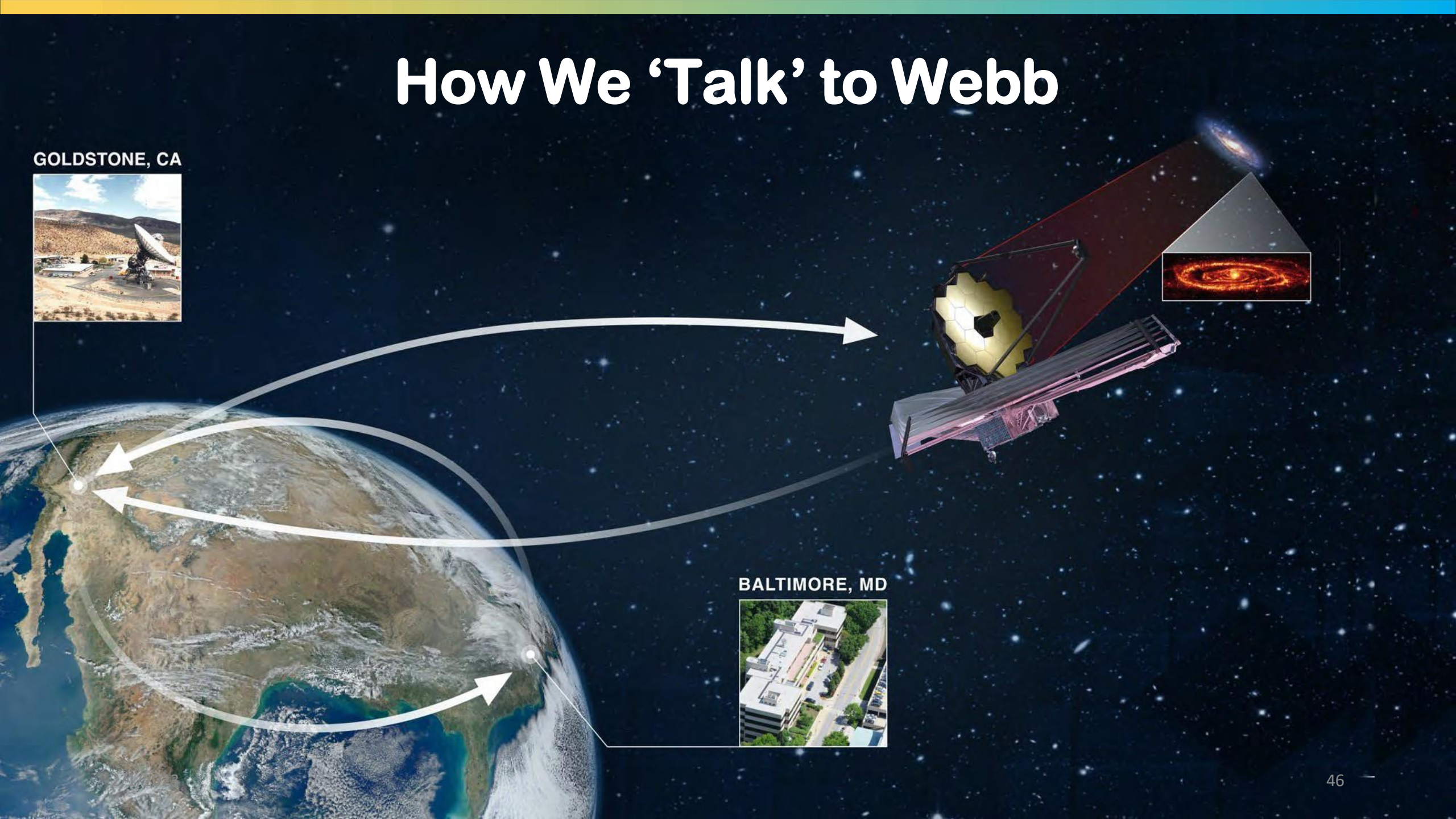
# Webb's Unfolding Sequence



# A Feat of Engineering

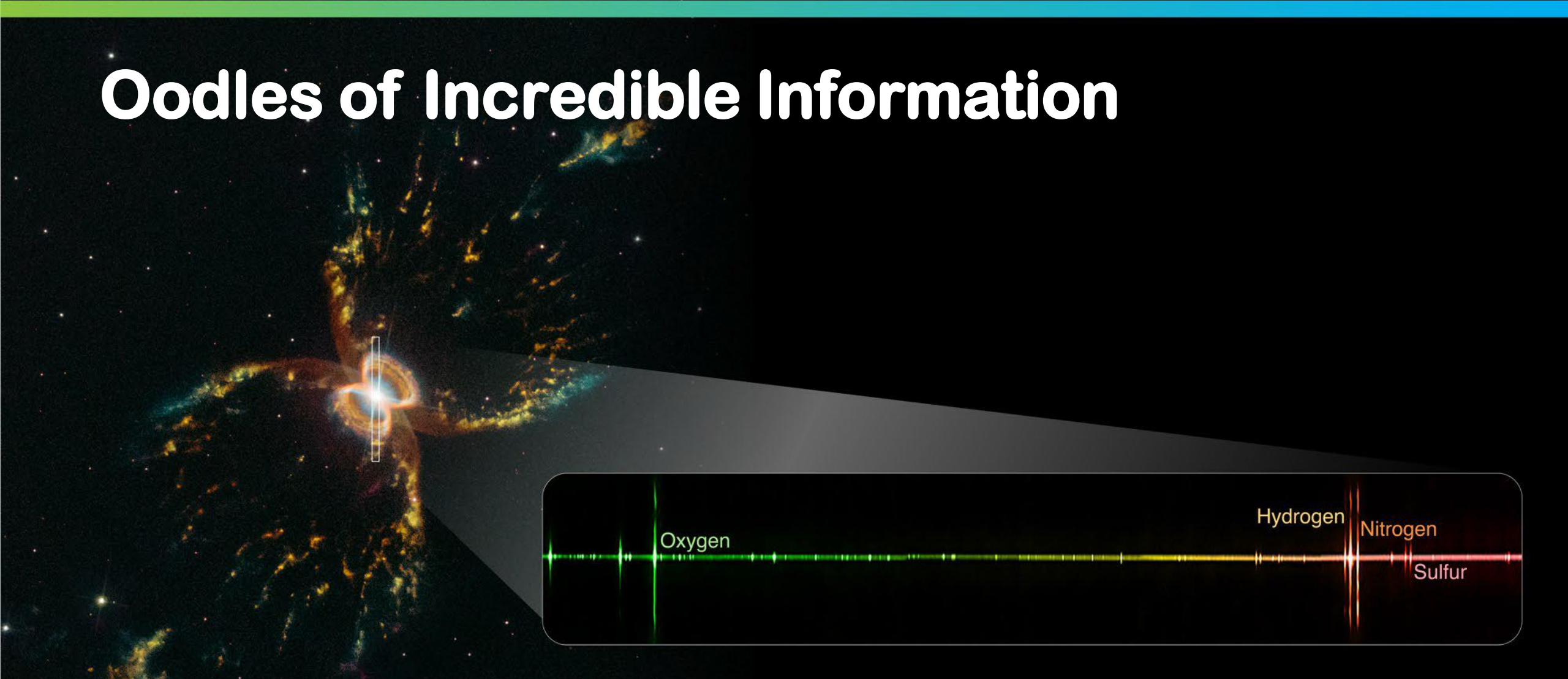


# How We 'Talk' to Webb

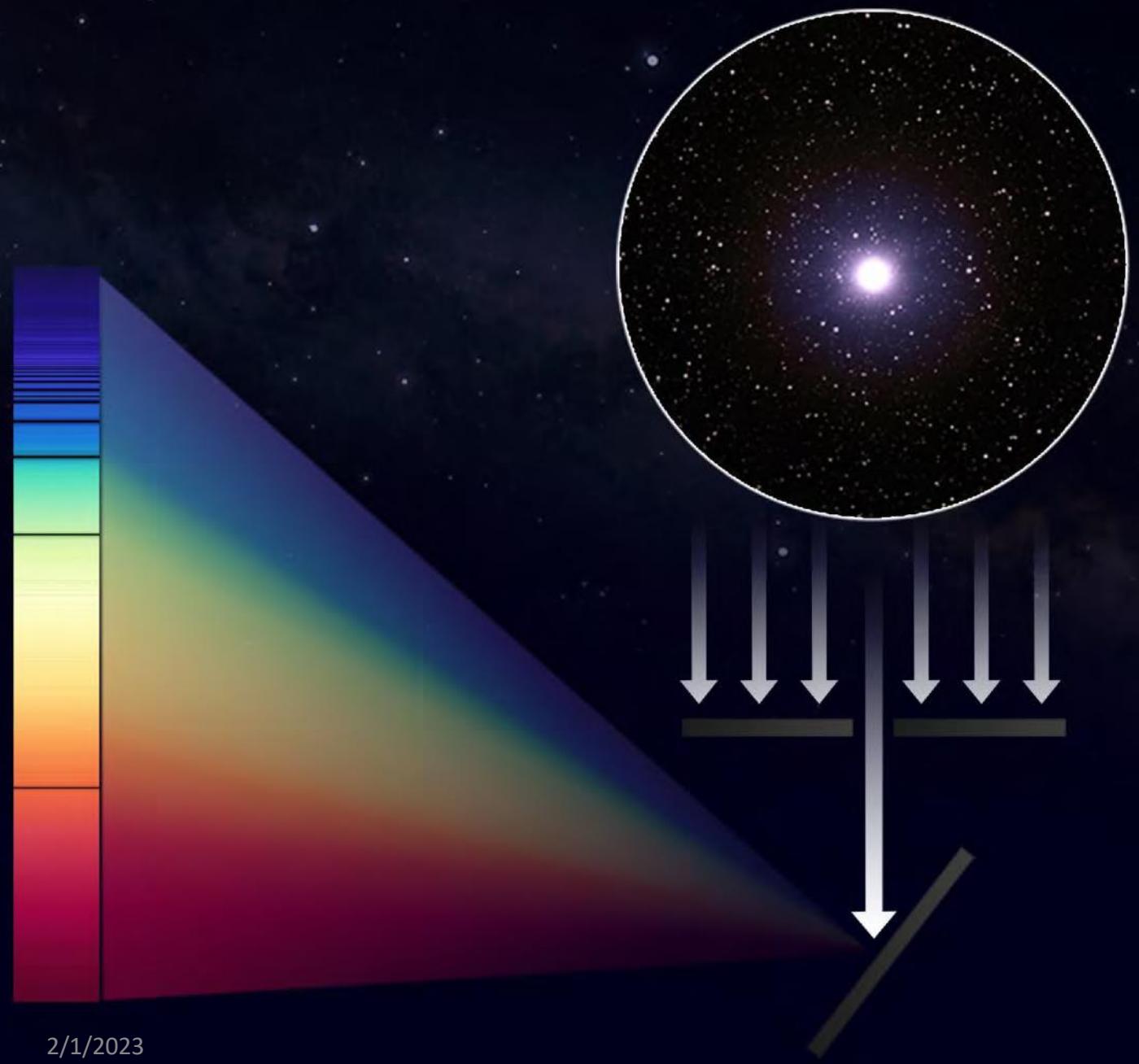


# Commanding Webb from Baltimore, Maryland

# Oodles of Incredible Information




**Hubble Image and Spectrum**



# Splitting Light with Webb