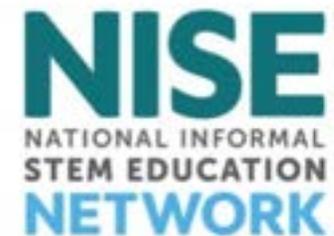


NISE Net Online Workshop

Engaging audiences in the launch of the James
Webb Space Telescope

May 4, 2021



Today's presenters: Space Telescope Science Institute

Alexandra Lockwood, PhD, Project Scientist, JWST Science Communications

Christopher Britt, PhD, Education and Outreach Scientist, Office of Public Outreach

Yesenia Perez, Informal Education Specialist



Welcome!

As we wait to get started with today's discussion, please:

Introduce yourself! Type your name, institution, and location into the Chat Box

Questions? Feel free to type your questions into the Chat Box at any time throughout the webinar or use the raise your hand function in the participants list and we'll unmute your microphone.

Today's discussion will be recorded and shared on nisenet.org at: nisenet.org/events/online-workshop

**MAY
THE 4TH
BE
WITH
YOU!**

MAY THE 4TH BE WITH YOU!



Live on
April 8
2024

Learn more at nisenet.org/sciencefiction

Reconnect and re-engage with the NISE Network – an overview of projects and time to reconnect

Tuesday, June 8, 2021

2pm-3pm Eastern / 11am-12pm Pacific

- Overview & updates – including info about an **all-new funded opportunity!**
- Engage with NISE Network friends and colleagues
- Make new connections with others in the field

Learn more at nisenet.org/events





Unfold the Universe with the Webb Space Telescope

Dr. Alex Lockwood

May 4, 2021



Outline

Motivations for Webb

Infrared Light and Webb Science

About the Telescope

Motivations for Webb



Image credit: NASA/GSFC

Revised November 24, 2019

The Hubble Space Telescope

30 years in space
and a legacy of
images and
discoveries

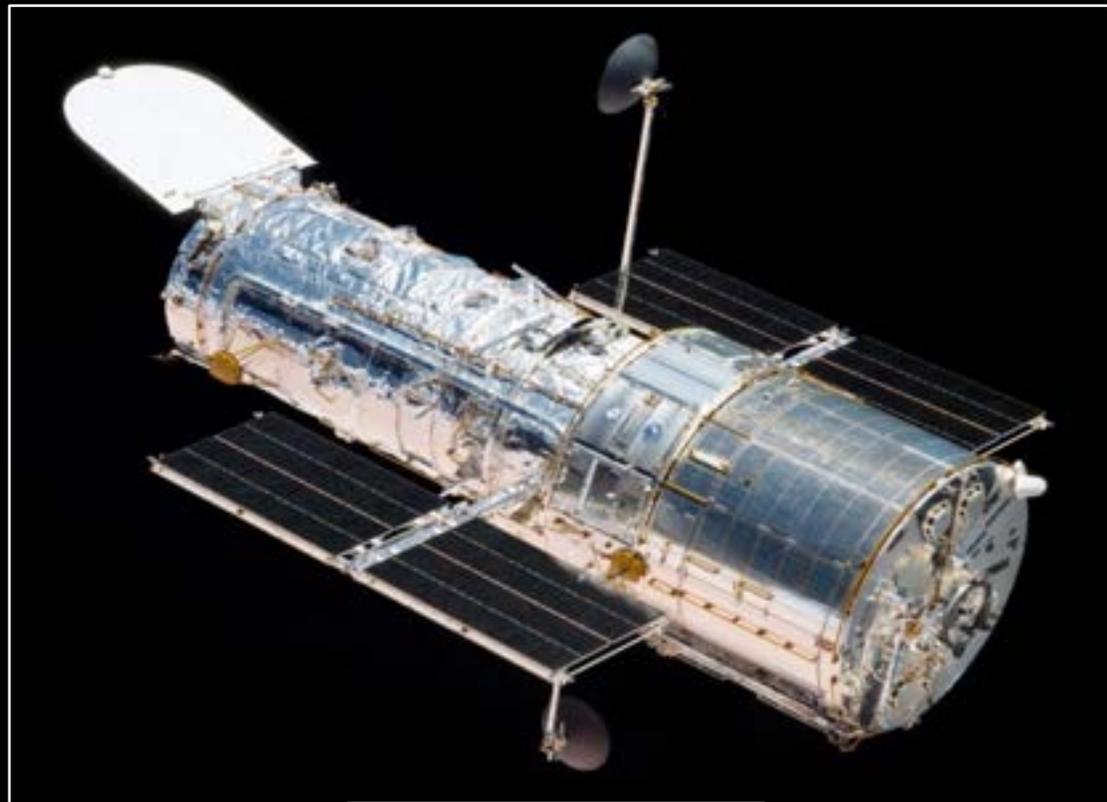


Image credit: NASA; NASA, ESA, and the Hubble SM4 ERO Team; NASA, ESA/Hubble and the Hubble Heritage Team; NASA, ESA, and the Hubble Heritage - ESA/Hubble Collaboration

The Hubble Ultra Deep Field

Image credit: NASA, ESA, H. Teplitz and M. Rafelski (IPAC/Caltech), A. Koekemoer (STScI), R. Windhorst (Arizona State University), and Z. Levay (STScI)



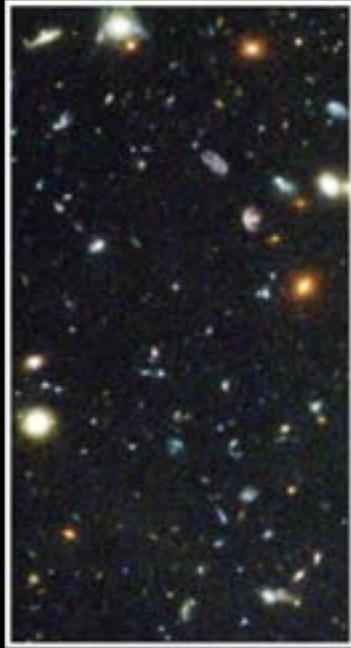
**We can use
deep fields to
construct the
history of
galaxies over
time**

*But what about
the first
galaxies?*



*Image credit: Frank Summers, Alyssa Pagan,
Leah Hustak, Greg Bacon, Zolt Levay, Lisa
Frattare (STScI), Anton Koekemoer, Bahram
Mobasher, and HUDF Team*

Webb Science and The Infrared



Early Universe



Galaxies
over Time



Star Lifecycle



Other Worlds

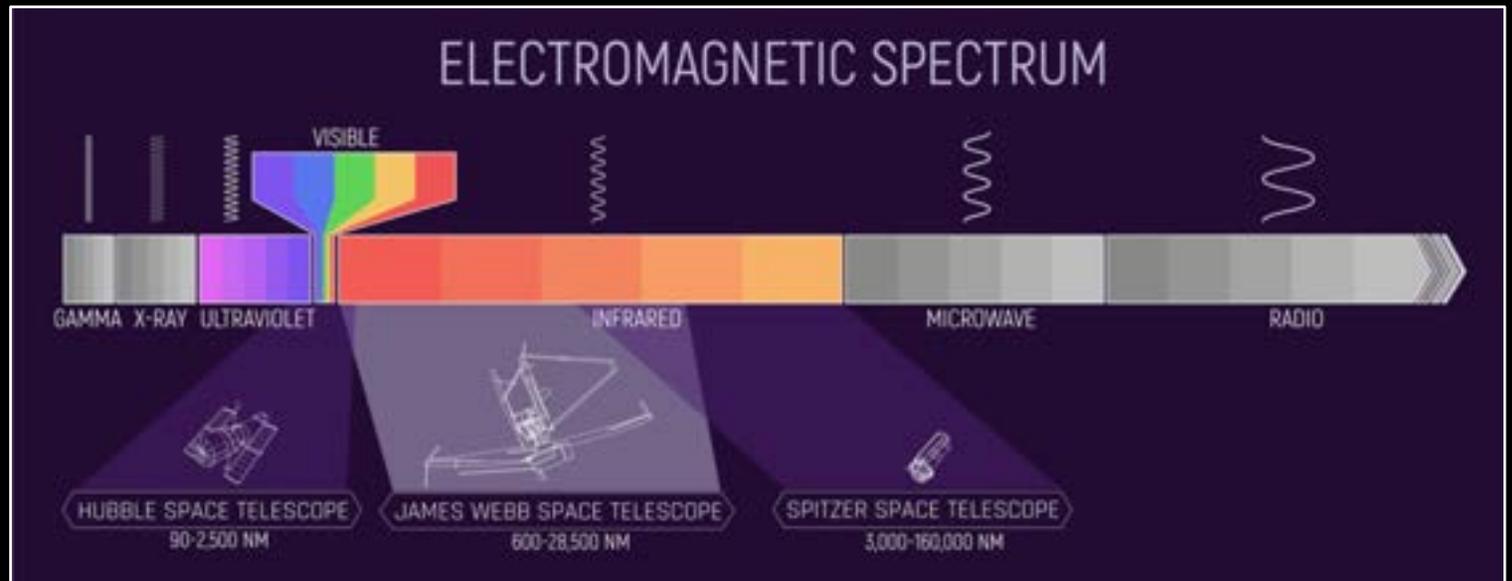
Everything is glowing

What we perceive as heat is infrared radiation



Image credit: Cool Cosmos/IPAC

Webb is tuned to infrared light



Early Universe and the first Galaxies

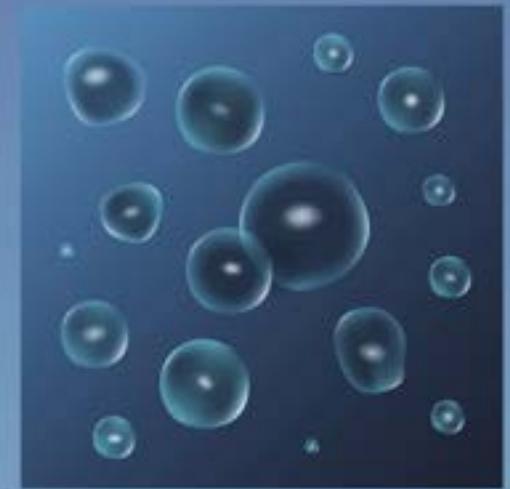
Ultra-deep field will detect the first galaxies (redshift ~ 15).

Spectra of quasars, galaxies, and gamma-ray bursts will show how the galaxies reionized the hydrogen gas that fills the Universe.

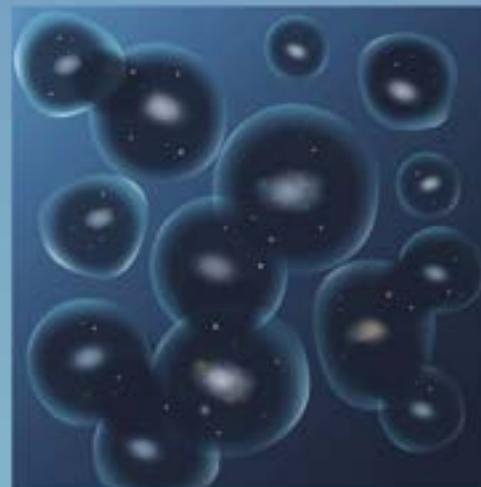
Image credit: NASA, ESA, and L. Hustak (STScI)



Stars begin forming, heating gas



Stars assemble into galaxies



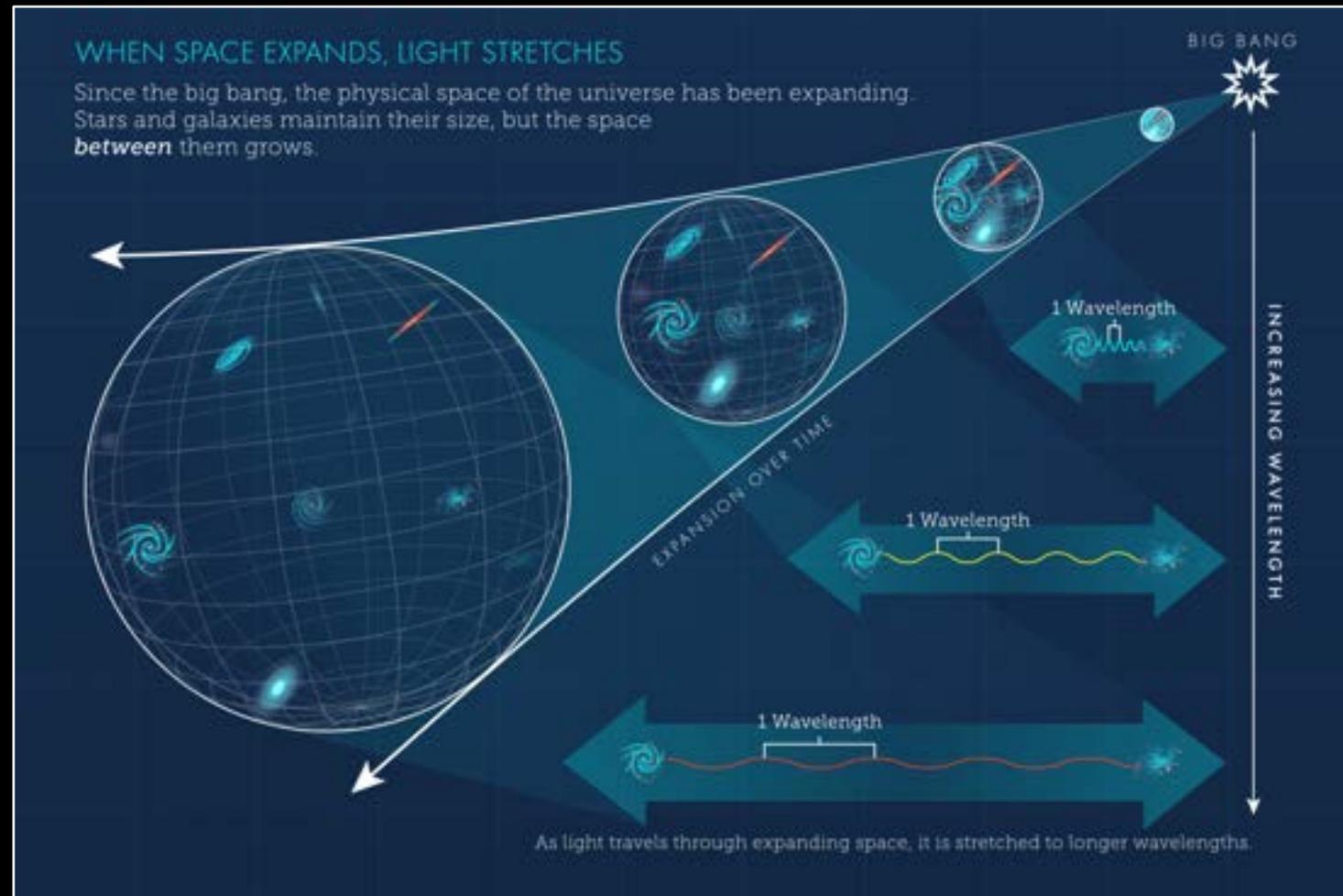
Galaxies become more massive



Clear universe, end of reionization

Seeing into the past

As the Universe expands it stretches light to redder wavelengths



Seeing into the past

Webb will be able to see the first galaxies

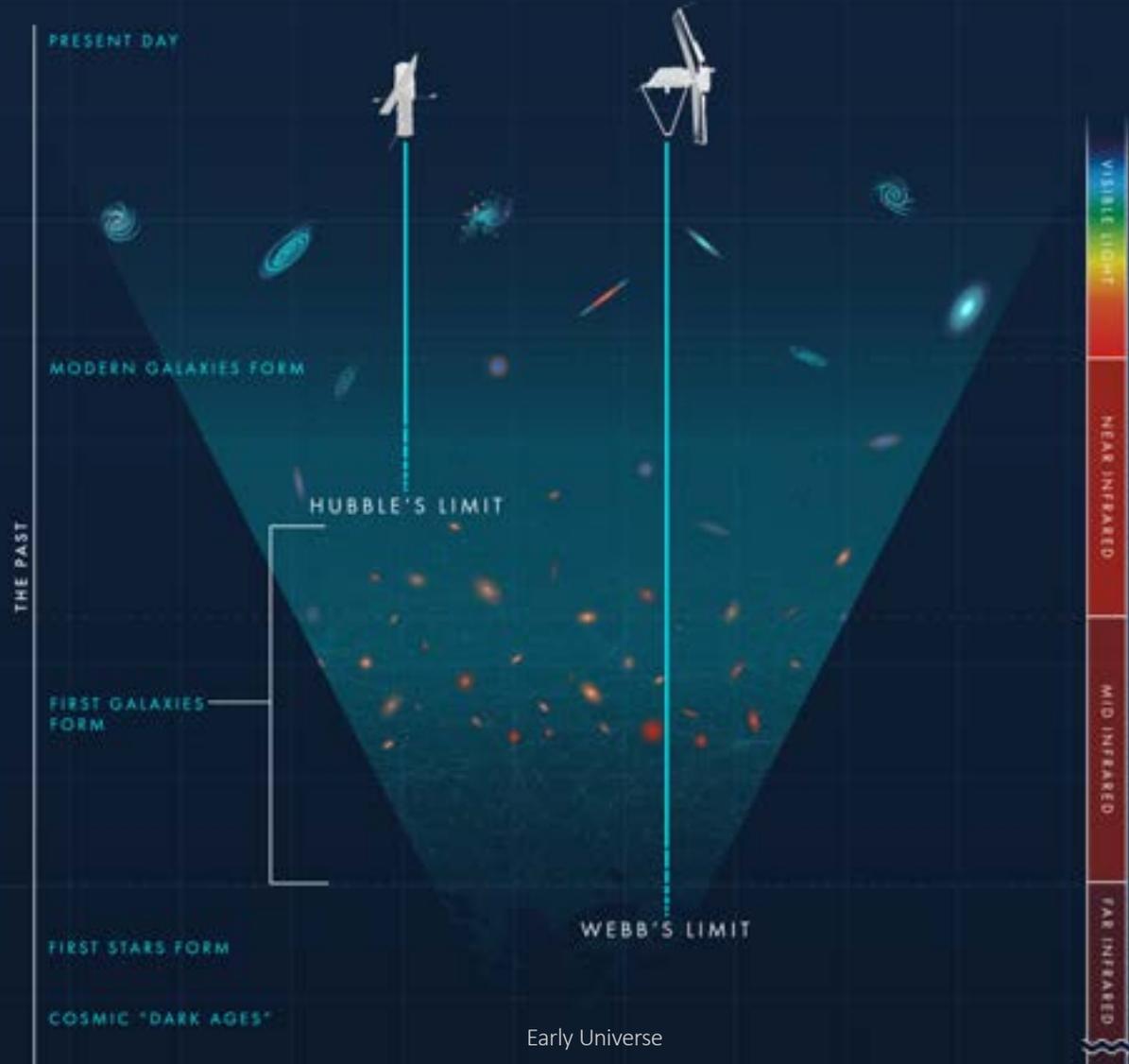
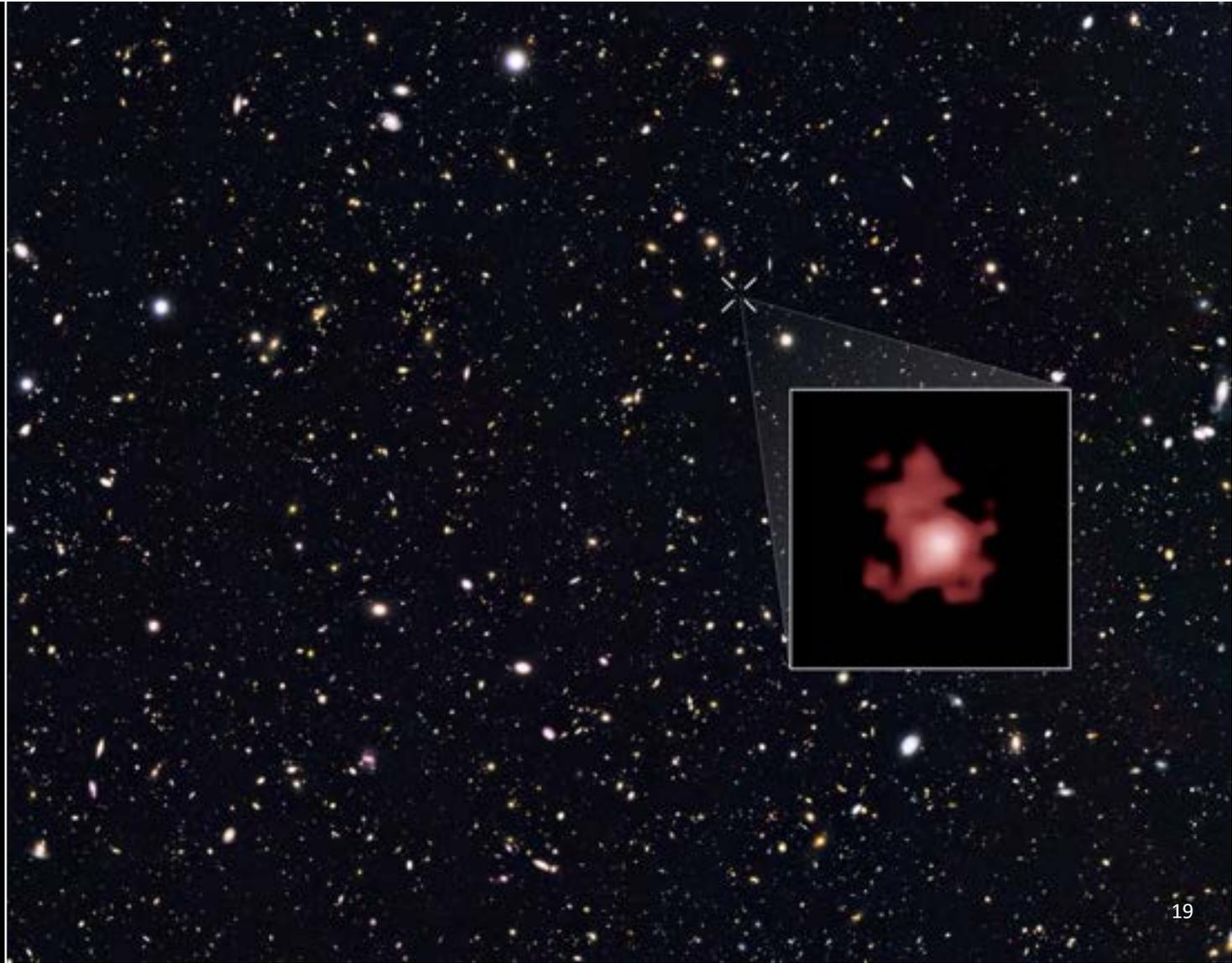


Image credit: NASA, ESA, and L. Hustak (STScI)

Early Universe

**Webb will see
the first few
hundred
million years**

Image credit: NASA, ESA, P. Oesch (Yale University), G. Brammer (STScI), P. van Dokkum (Yale University), and G. Illingworth (University of California, Santa Cruz)



The Assembly of Galaxies Over Time

Webb will follow the history of the merger and growth of galaxies, black holes, and the history of star formation (redshift 1-6).

Webb allows us to study the dust and gas in these galaxies.

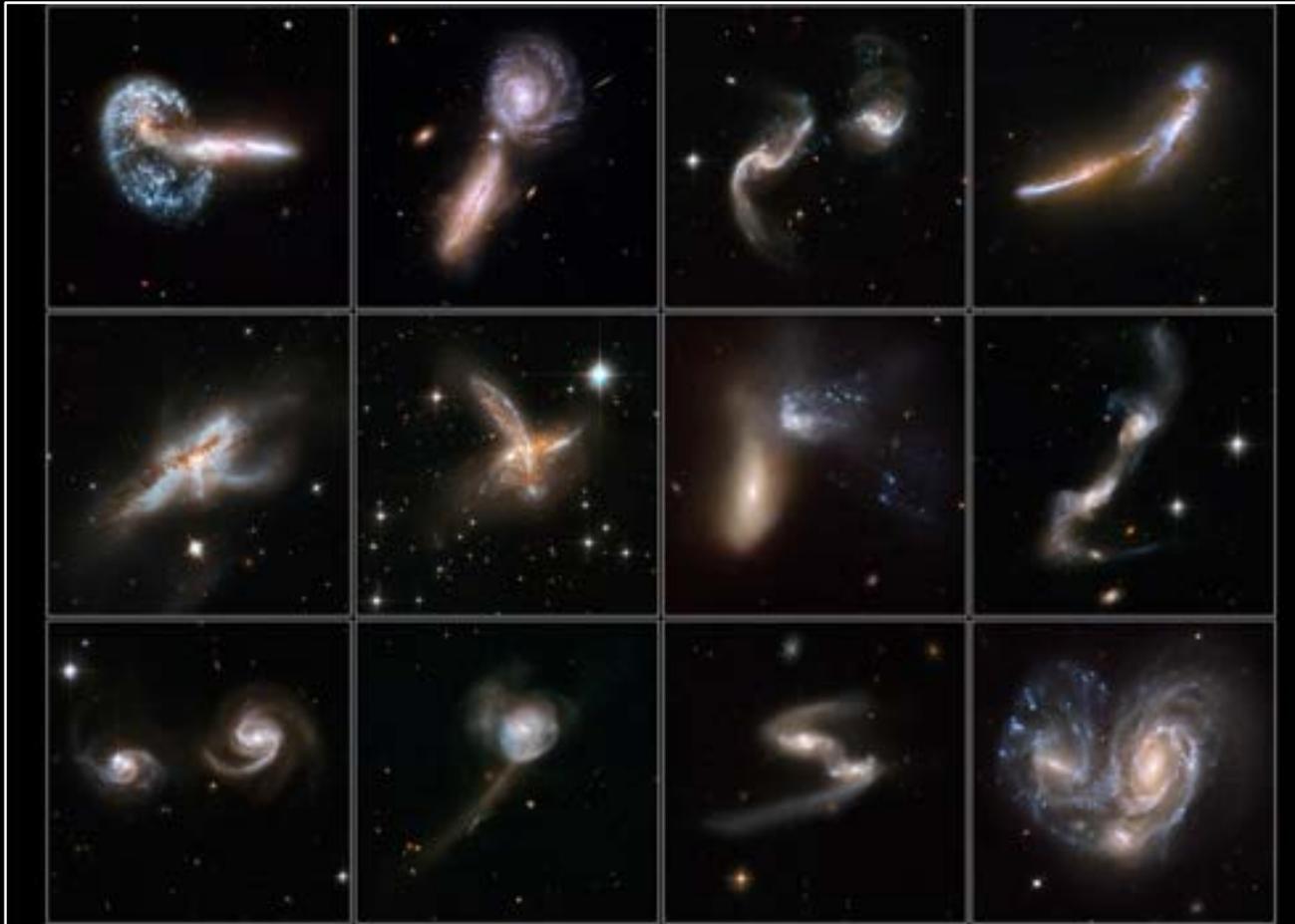


Image credit: NASA, ESA, the Hubble Heritage (STScI/AURA)-ESA/Hubble Collaboration, and A. Evans (University of Virginia, Charlottesville/NRAO/Stony Brook University)

The Birth of Stars and Protoplanetary Systems

Infrared wavelengths allow us to see through the dust, allowing surveys of molecular clouds and star-forming regions.

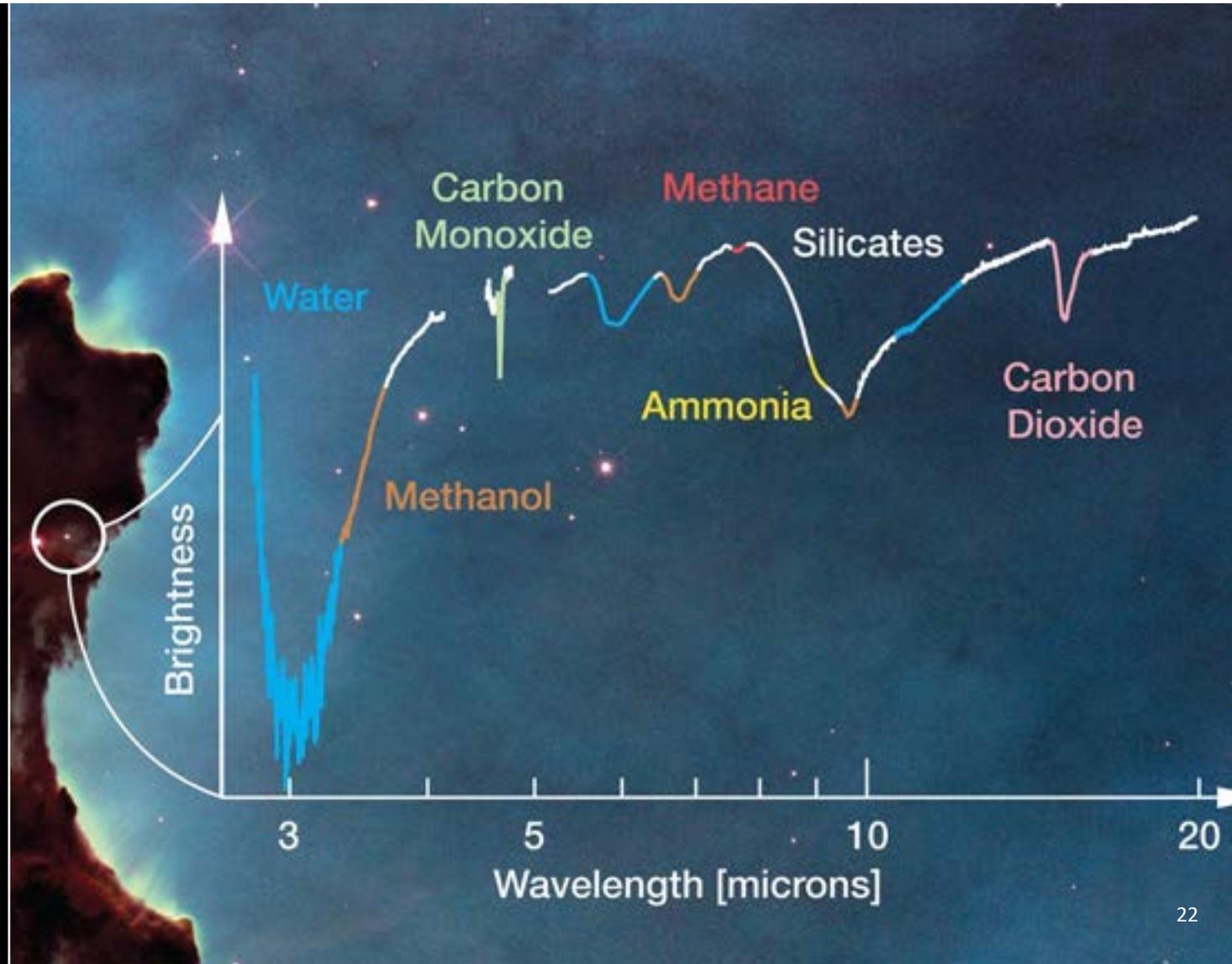


Image credit: M. McCaughrean (Max-Planck-Institute for Astronomy), C. Robert O'Dell (Rice University), and NASA; NASA, ESA, and the Hubble Heritage Team (STScI/AURA); NASA, ESA/Hubble and the Hubble Heritage Team

You can study molecules

In planetary atmospheres or nebulas

Image credit: NASA, ESA, the Hubble Heritage Team (STScI), and M. McClure (Universiteit van Amsterdam) and A. Boogert (University of Hawaii)

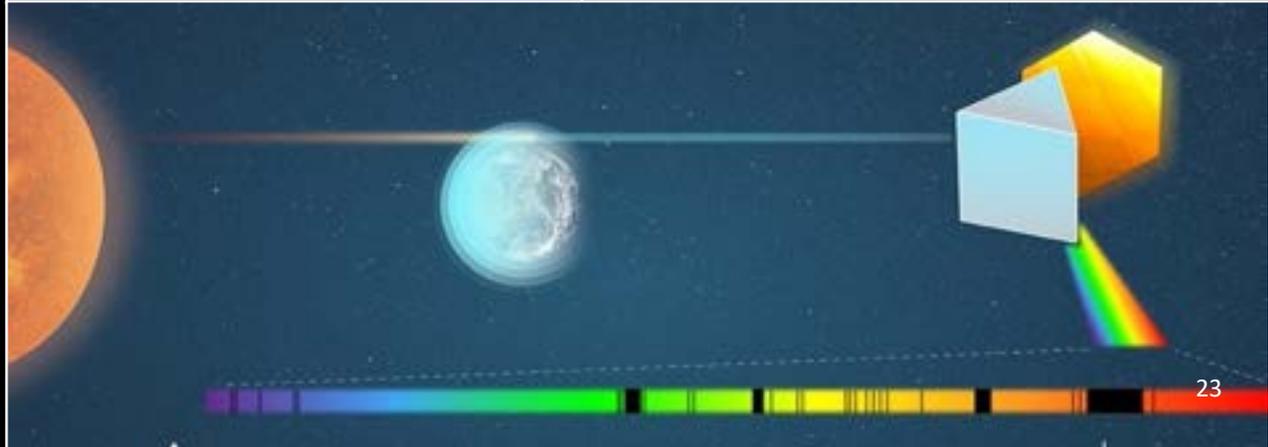
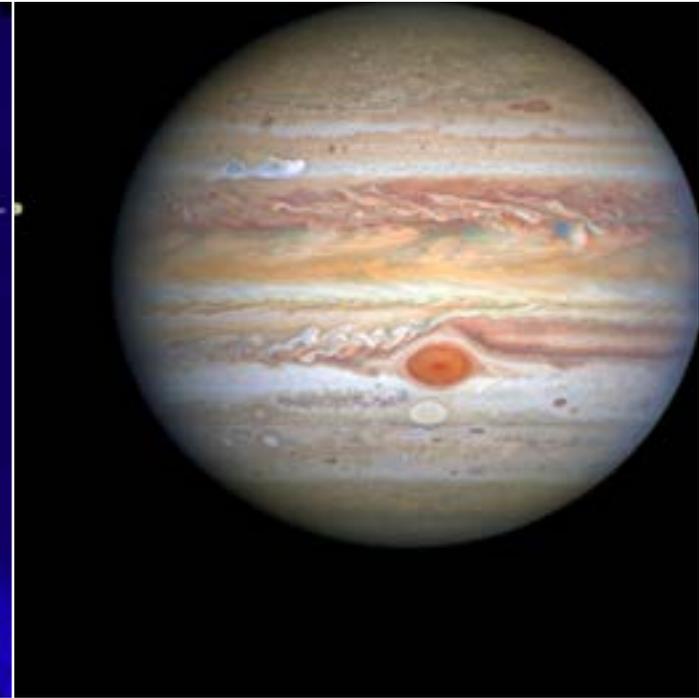
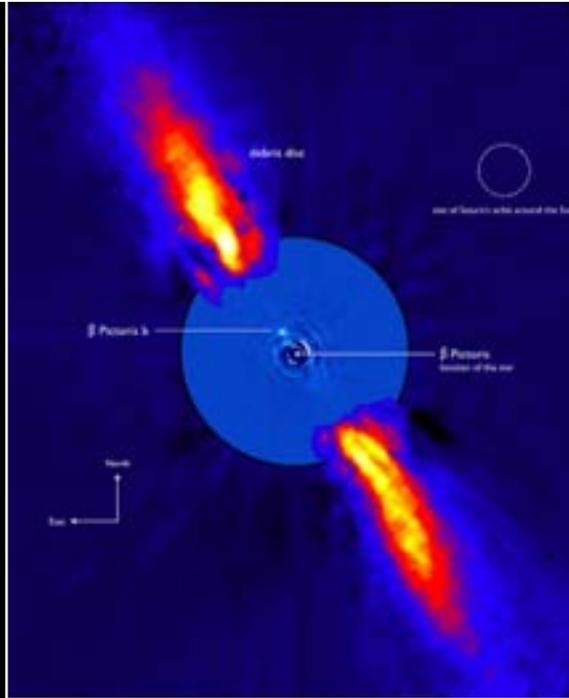


Other Worlds

Webb will be able to observe exoplanets and their atmospheres.

It can also observe solar system objects beyond the orbit of Mars.

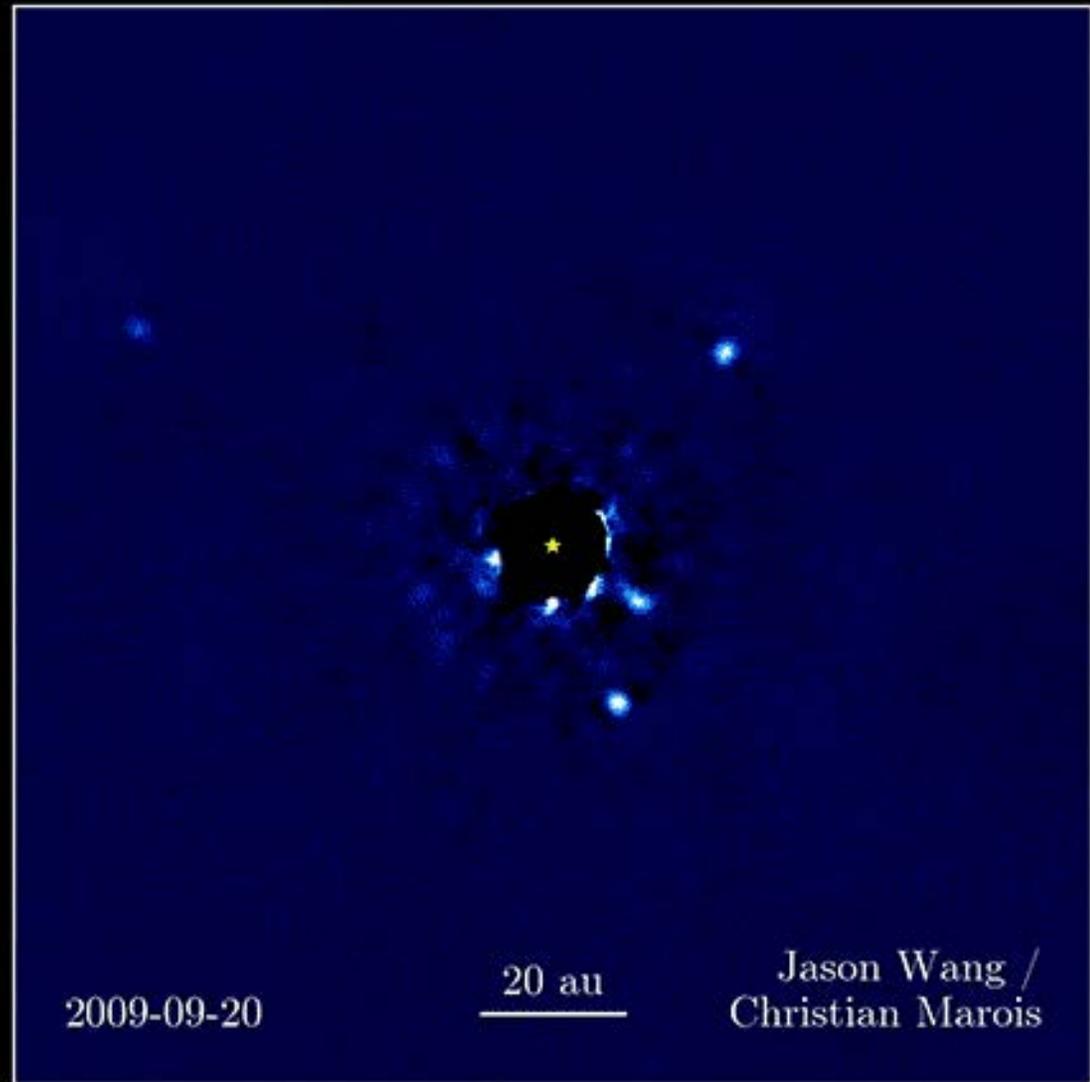
Image credit: ESO/A.-M. Lagrange et al.; NASA, ESA, STScI, A. Simon (Goddard Space Flight Center), and M.H. Wong (University of California, Berkeley) and the OPAL team; STScI



**Some things
are
intrinsically
bright in the
Infrared**

Like exoplanets

Image credit: Credit: J.Wang (Caltech)/C. Marois (NRC Herzberg)



The Telescope

Webb will have to be:

“a large cold telescope, with a wide field of view, exceptional angular resolution and sensitivity, and wide wavelength coverage in both imaging and spectroscopy.”

-Gardner 2006

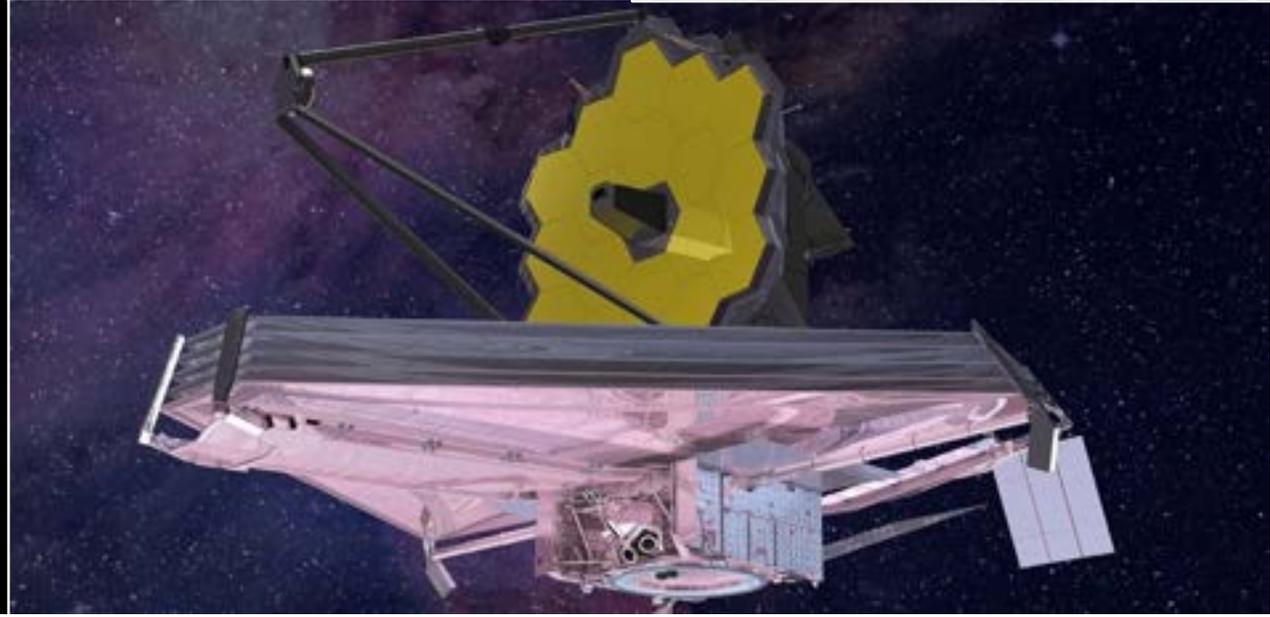
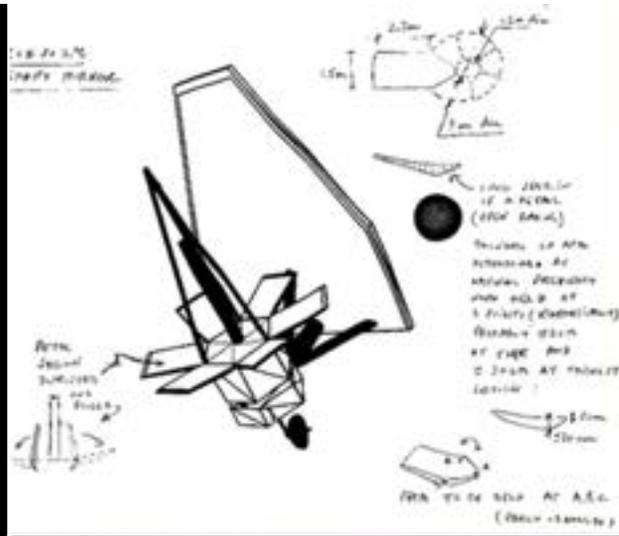
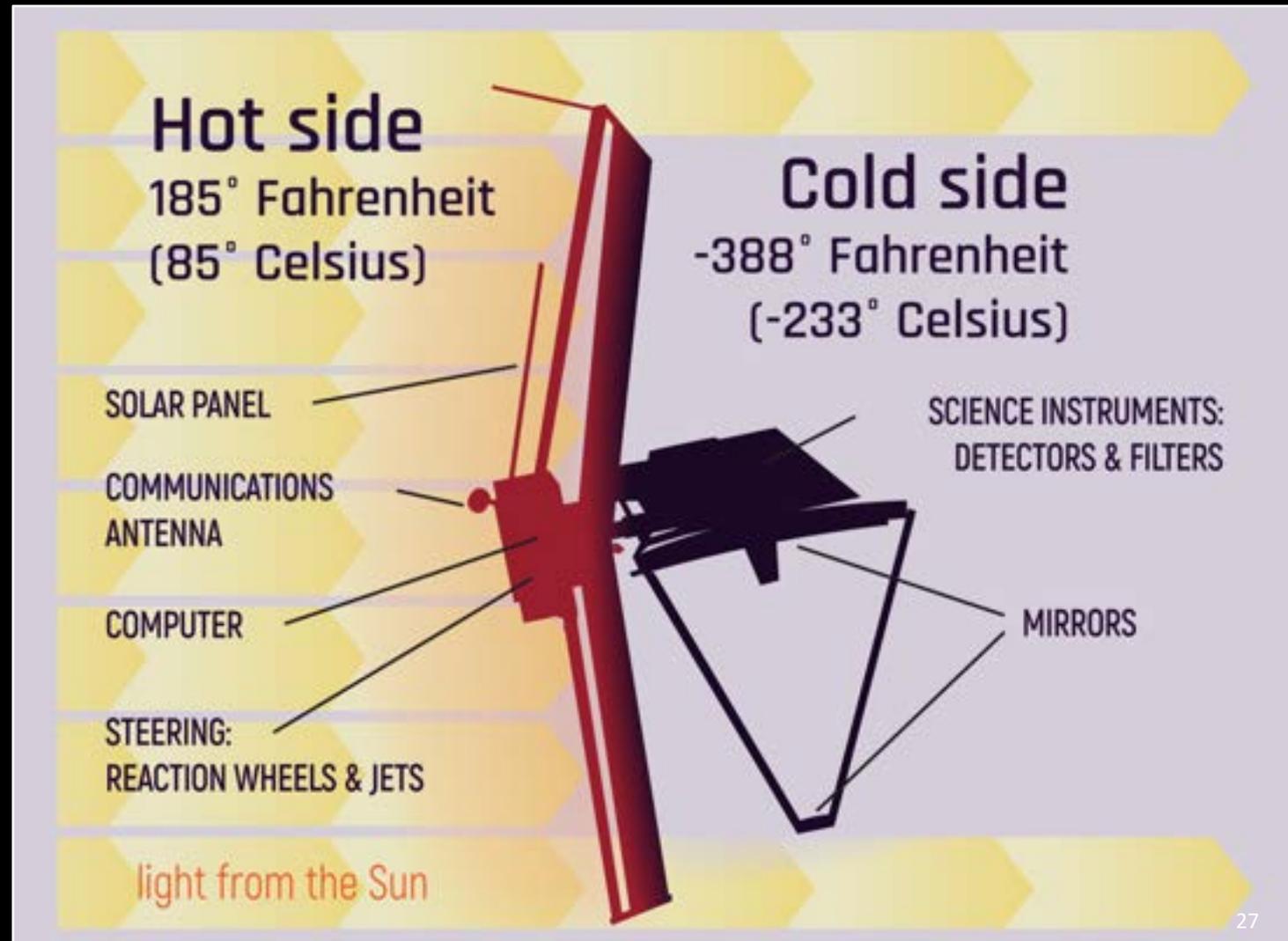


Image credit: P. Bély/GSFC, NASA and the James Webb Team, NASA, ESA, and Northrop Grumman

The Two Sides of the Webb Telescope



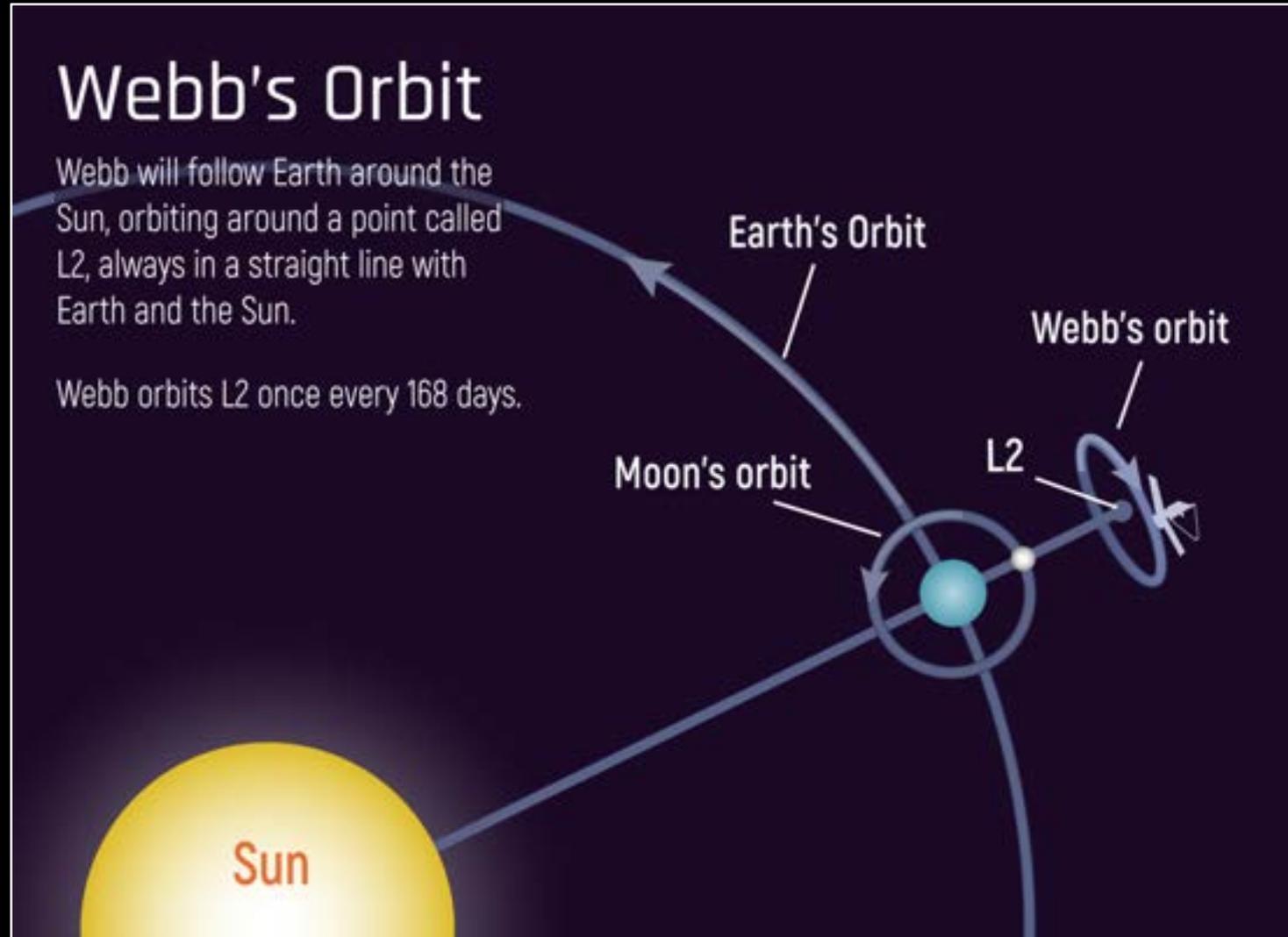
Webb will orbit at L2

The Second Lagrange Point (L2) is a stable orbit that balances the Earth's and the Sun's gravity.

Webb's Orbit

Webb will follow Earth around the Sun, orbiting around a point called L2, always in a straight line with Earth and the Sun.

Webb orbits L2 once every 168 days.



Webb is an international collaboration between NASA, the European Space Agency, and the Canadian Space Agency.



The Main Innovations

The two most striking and novel parts of the telescope are the primary mirror and the sunshield.



*Image credit: NASA/Desiree Stover ;
NASA/Chris Gunn*

Webb will launch from Kourou, French Guiana on an Ariane 5 rocket.



**Webb is on
track to
launch by
October 2021**



Image credit: K. Lepo (STScI)

**Webb will
unfold in space
and have a 6.5
month
commissioning
period.**

We expect the
first science from
the observatory
in summer 2022!

Image credit: K. Lepo (STScI)



Thank you!

Questions?

The background is a dark blue gradient with faint, light blue celestial patterns. On the left side, there is a large, semi-circular scale with tick marks and numbers ranging from 140 to 260. Several circular orbits with arrows indicating direction are scattered across the scene, set against a backdrop of small white stars.

WEBB SPACE TELESCOPE COMMUNITY EVENTS

DIFFERENT KINDS OF PARTICIPATION POSSIBLE

- Official NASA supported events:
 - Will be promoted on NASA's website
 - Direct connection with a Webb subject matter expert, in your area or remotely
 - Launch countdown lawn signs
 - Large celebratory banner
 - Find more information and propose your event by **May 16** through <https://outerspace.stsci.edu/display/WSTCE/>
- If you can commit in Summer to hosting an event
 - Direct connection with a Webb subject matter expert, in your area or remotely
- Anyone can use with no prior commitment:
 - Activity guides
 - Videos, infographics, other digital assets



“Your event here!”

TO SIGN UP:

- Complete the Google Form with details about your institution and event plans linked at <https://outerspace.stsci.edu/display/WSTCE/> by **May 16**
- Sites designated as “official NASA sites” receiving support will be based on:
 - Location
 - Reach - number of people they serve
 - A plan for engaging underserved audiences
 - Hosting a free, publicly accessible event
 - A safety plan, including COVID-19 considerations, as well as a digital back-up plan for in person events
 - Connections to local partners (e.g. school districts, county governments, other community organizations, etc)
 - A plan for continuing engagement with community beyond the single event
 - Engaging subject matter experts in their programming

EVENTS SELECTED TO RECEIVE OFFICIAL STATUS WILL REPRESENT THE DIVERSITY ACROSS THE U.S.:

- A mix of small and large organizations
- Organizations in both rural and urban locations
- Organizations targeting audiences underrepresented in STEM
- Locations that have not previously received similar NASA resources
- Locations that target all aspects of the STEAM (science, technology, engineering, arts, mathematics) fields

IF YOU CANNOT COMMIT NOW, DON'T WORRY! YOU CAN STILL PARTICIPATE

- After May 16, info page at <https://outerspace.stsci.edu/display/WSTCE/> will be updated with new, simpler form to request activity guides, printed materials, and/or connection to a Webb subject matter expert
- We can connect a Webb expert to your event given 2 months notice.

James Webb Space Telescope Community Engagement: Tools and Resources



Image credit: NASA/Desiree Stover



Host an Event

- Official NASA sites can receive:
 - Promotion of your event on NASA's Webb launch website
 - Trainings on the Webb Space Telescope and Webb science
 - Direct connection with a Webb subject matter expert, in your area or remotely
 - Activity guides
 - Launch countdown lawn signs
 - Large celebratory banner
- Print Materials:
 - Webb folder to hold materials
 - Lithographs, Posters, Decals
 - Fun Pads, Lapel Pins, Bookmarks



Image credits: [NASA](#)/MSFC/David Higginbotham

Contacts

- Organizations interested in hosting an event should contact:
- Peter Sooy: peter.r.sooy@nasa.gov
- Chris Britt: cbritt@stsci.edu
- For more information on hosting an event, check out:
<https://outerspace.stsci.edu/display/WSTCE>

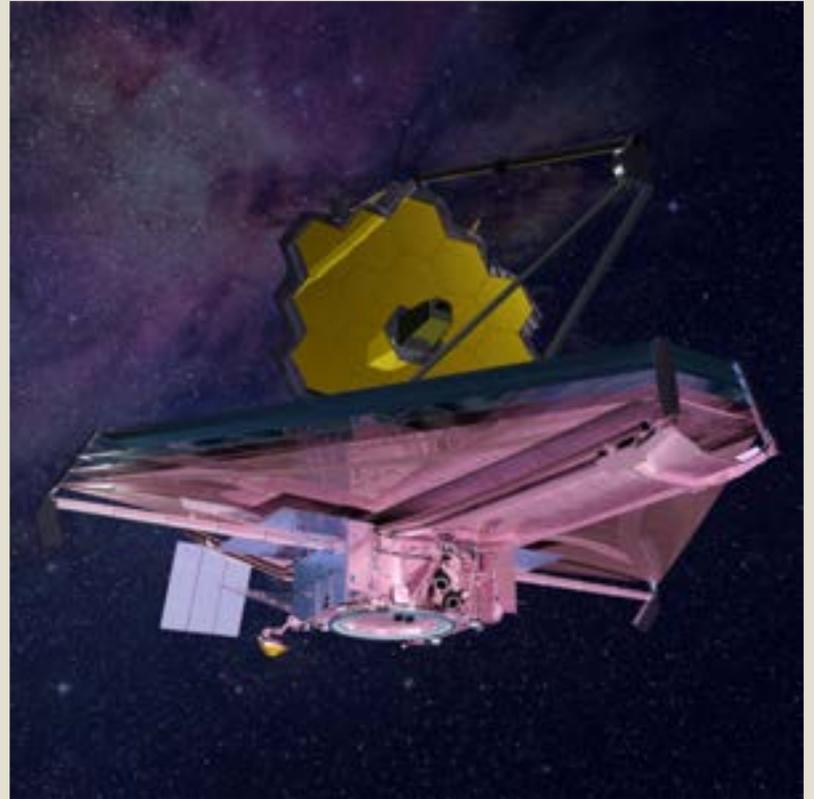
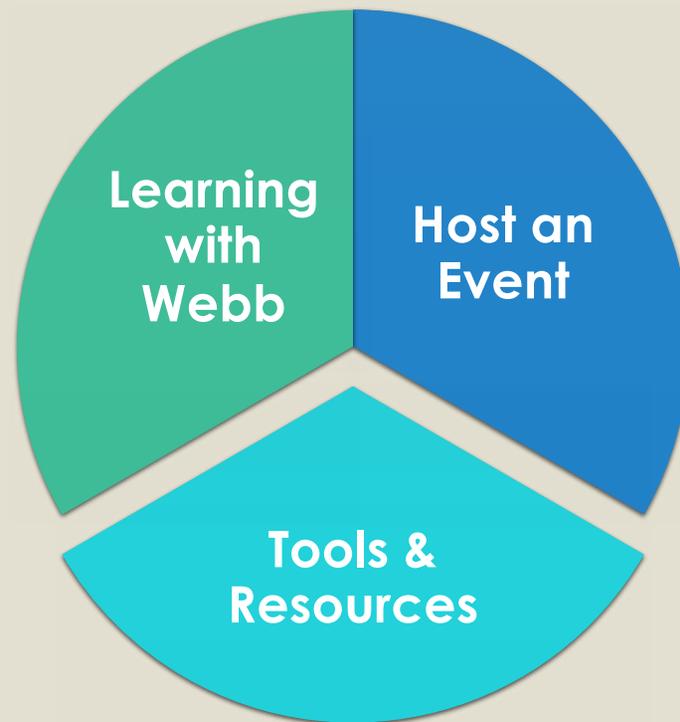


Image credit: Northrop Grumman

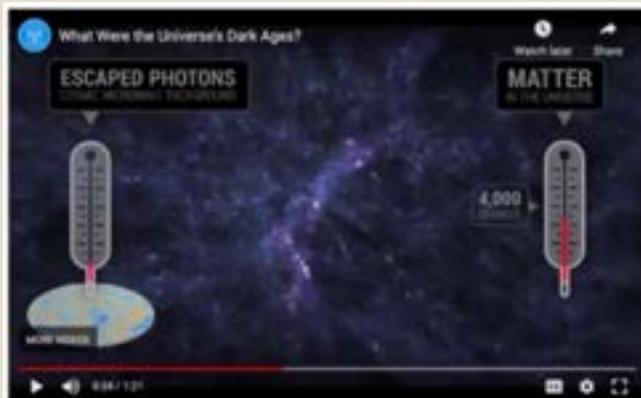


Learning with Webb

- Webb Provides an exciting opportunity to engage learners in fundamental concepts of science and technology.
- Uncover the hidden universe with Webb's infrared-detecting technology: stars shrouded in clouds of dust, water in the atmospheres of other worlds, and the first light from the earliest galaxies ever formed.
- Explore our Webb resources at: webbtelescope.org
- Contact us to learn more about how our resources are being used to create successful and impactful learning engagements.



Explore Webb Science: webbtelescope.org



Science Activation: NASA's Universe of Learning

- ViewSpace videos and online interactives
- MicroObservatory AstroPhoto Challenges
- Science Briefings, in partnership with:
 - Museum and Informal Education Alliance
 - Solar System Ambassadors
- Informal Learning Network Program Models
- Find Subject Matter Experts for your Webb event

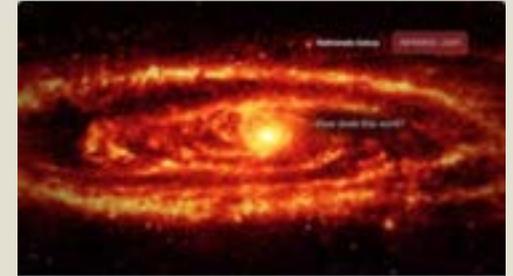


<https://www.universe-of-learning.org>

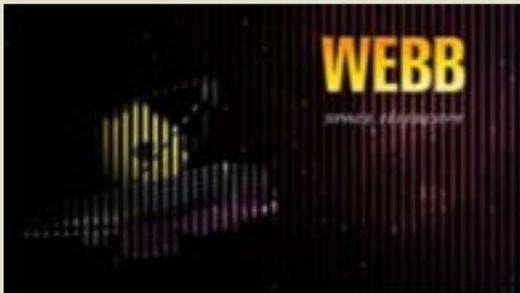


Myth vs Reality: Seeing with Webb vs Seeing with Hubble

ViewSpace



At a Glance: Seeing the Invisible—Using Infrared to See Dust



Celestial Tour: The Journey of Light



Above and Beyond: The Eagle Nebula in Visible and Infrared Light



At a Glance: The First Galaxies—Observing with The Webb Space Telescope

MicroObservatory

YouthAstroNet

Join the **YouthAstroNet community** of students and educators using our MicroObservatory Robotic Telescope Network.



Recent Image Directory

The **Image Directory** lists all MicroObservatory images taken over the last 30 days, plus an archive of past interesting images.

Image ID	Filter	Exposure	Time	RA	DEC	Object
1000000001	RGB	300	2020-01-01 12:00:00	15:00:00	+30:00:00	NGC 1068
1000000002	RGB	300	2020-01-01 12:05:00	15:00:00	+30:00:00	NGC 1068
1000000003	RGB	300	2020-01-01 12:10:00	15:00:00	+30:00:00	NGC 1068
1000000004	RGB	300	2020-01-01 12:15:00	15:00:00	+30:00:00	NGC 1068
1000000005	RGB	300	2020-01-01 12:20:00	15:00:00	+30:00:00	NGC 1068

NASA's Astrophoto Challenges

Standout entries are up for the Winter 2020 season, featuring **M82 Galaxy!**

[MicroObs](#) | [NASA Data](#)



Transit of Mercury

Make animations in **JS9-4L** of Mercury's 2016 and 2019 transit of the Sun. Its next transit isn't until 2032!



Astro Chats

Explore the world of astronomy through a series of **hangouts with experts** from the Center for Astrophysics



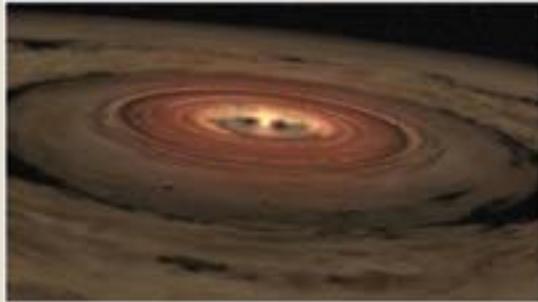
Astro Chats

Experts from the Center for Astrophysics



Black Holes, Out of the Shadows

BLACK HOLES



Understanding the Origins and Diversity of Planets

SOLAR SYSTEM, EXOPLANETS, PLANET FORMATION



Exploring Exoplanets Today and Tomorrow

EXOPLANETS



The Magnetic Universe

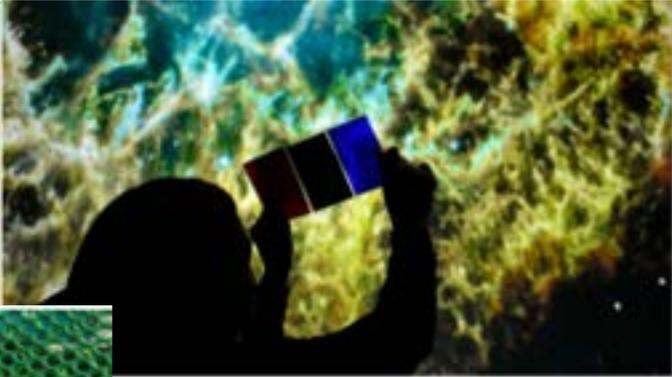
STELLAR DEATH, GALAXY EVOLUTION, MAGNETIC FIELDS



Women in Astronomy: The Past Inspires the Future

STEM, GIRLS STEAM AHEAD

Science Briefings



Informal Learning Network

Subject Matter Experts

- Find Subject Matter Experts for your Webb event
 - NASA's Universe of Learning works to ensure that Subject Matter Experts (SMEs) are paired with educators and learners in a way that makes sense. If you are working on a product or an event and have an opportunity that could be enhanced with a SME, please follow the link Request a SME for a Learning Activity
 - <https://www.universe-of-learning.org/sme-request>

Explore More: Science Activation Partners

- National Informal STEM Education Network (NISENet)
 - Resources, activities and tool kits related to Webb
 - <https://www.nisenet.org/webb>
- Bringing the Universe to America's Classrooms
 - Astronomical Images in Different Wavelengths
 - Analyzing Light Curves of Transiting Exoplanets
 - https://mpt.pbslearningmedia.org/collection/universe/#.YEu9_uZOnxU
- World Wide Telescope Astronomy Interactives
 - Life Cycle of Stars
 - Hubble's Evidence for the Big Bang
 - <https://wwtambassadors.org/>

Thank You

- If you have any questions on the resources shared today please reach out to: Yesenia Perez, yperez@stsci.edu



Q & A

Future Online Workshops

Reconnect and re-engage with the NISE Network – an overview of projects and time to reconnect

Tuesday, June 8, 2021
2pm-3pm Eastern / 11am-12pm Pacific

[Learn more at nisenet.org/events](https://nisenet.org/events)



Get Involved

Learn more and access the
NISE Network's online digital resources
nisenet.org



**Subscribe to the
monthly newsletter**
nisenet.org/newsletter



**Continue the online
conversation**
bit.ly/nisenetryver



Follow NISE Net on social networking
nisenet.org/social

Thank You



This material is based upon work supported by NASA under cooperative agreement award numbers NNX16AC67A and 80NSSC18M0061. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the view of the National Aeronautics and Space Administration (NASA).