ASTR 578: Spring 2026

Prof. Besla (she/her)

Complete this pre-survey please!

Link here:
https://forms.gle/JsRGHw5dw5FbivUJ6

The Main Goals

- To help you understand how to frame an argument - scientific writing is argumentative writing.
- To teach you how to write successful proposals, papers, postdoc applications, abstracts in general.
- To help you understand how to assess and improve the "impact" of your writing through public speaking, proposals, citations, etc.
- To discuss the research ethics that should inform your practice, including how your write/develop a paper/proposal/lead teams.

Why does Improving your Scientific Writing skills Matter?

- In your interest to write well to maintain TRUST in science\
- Accuracy and precision is needed in language to avoid misinterpretation
- Main mode of COMMUNICATION for the field
- Legibility/Readability → improves understanding and impact
- If you know how to write clearly you can also understand scientific writing better
- Impacts policy/legislation/funding
- NO FUNDING IF CAN'T WRITE
- The clearer your writing the more clearly the public will understand the importance of science.

Why does improving your Scientific Oral Communication Skills Matter?

- The way people outside the field learns about science in the subfield is through oral presentations (youtube etc). Need to reach many different audiences. → Policy/taxpayers
- Papers are impersonal – but talks connect to humans.
- Academic jobs involve TEACHING
- Allow space for Questions – opportunities for clarity and improve your presentation/grow research direction.
- To get JOBS

What are Research Ethics?

Code of conduct for being a researcher

APS task force on ethics (Kirby & Houle 2004) :

- Truthful, careful handling and reporting of data
- Responsible, respectful interactions with colleagues and subordinates
- Adherence to publication guidelines, including proper recognition of research contributions

Why do Research Ethics Matter?

- **<u>Trust</u>** - the public and the scientific community need to trust your results
  - Fellow scientists trust your methods
  - Bulding teams (students, postdocs, etc) need to trust that you will support and be a team player
- Funding can be rescinded, you could be FIRED.
- Wasted resources if work is false.
- → which then impacts policy in negative ways

Why do Research Ethics Matter?

The pursuit of science, and scientific excellence, is inseparable from the humans who animate it.

- SotP Appendix N Astro 2020 Decadal

What is the utility of Generative Artificial Intelligence in Scientific Writing?

- Pros?

- Accelerator and not waste time e.g. debugging code. Proofreading.
- Cross check your knowledge – did you miss an idea/references/citations
- Cross check sentence structure and finalize/polish the language especially when you've been staring at the same text for a week
- Checking for contradictions → LOGIC check, check if you have met the requirements.
- Non native English speakers – equalizer
- Help you learn to brag a bit

What is the utility of Generative Artificial Intelligence in Scientific Writing?

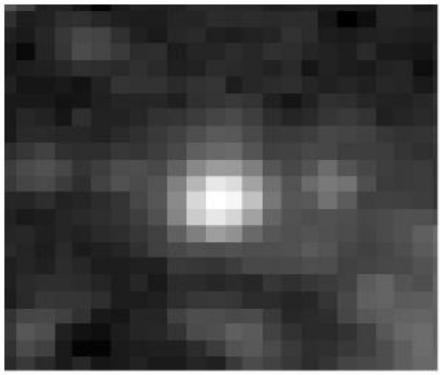
- Cons?

- Lose the skills of writing if you are using AI to do it for you
- Can’t trust it to do it well – could make up information and citations – citing false data
- Lose “brain function” – skills that may not be able to recover.
- Pro : “Check” for citations missed → but it may give you fake ones – need to be double checking (but can lose those skills)
- Plagiarism – particularly for niche topics (which is all your theses)
- Double checking everything can take MORE time → But if you know things then you might be faster
- Lose proprietary information TO THE AI
- WHERE IS THE INDIVIDUALITY? Where are you?
- Productivity → can have negatives to increase the pressure to produce

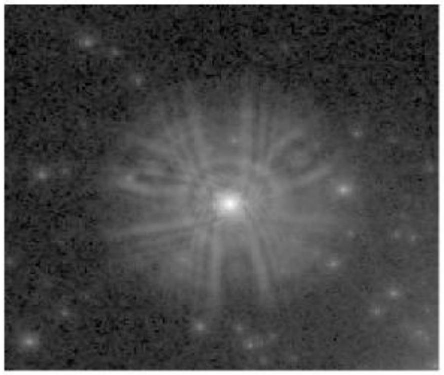
Scientific Writing: Why JWST/HST Proposals?

HST: Brief History

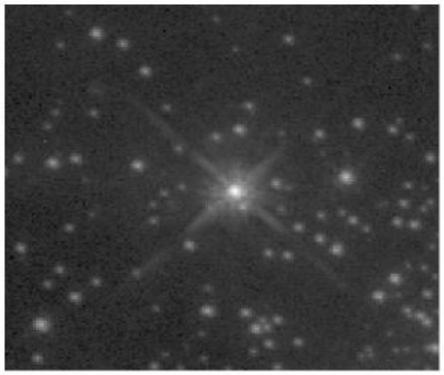
- Envisioned in the 1940s, built in the 70s-80s
- \$1.7 billion at launch (\$4.7 billion adjusted to 2010 inflation) (Lifetime Operation is much higher ~\$11 bill)
- 2.4-meter reflecting telescope
- Deployed in a low-Earth orbit (600 km) by the crew of Discovery on 25 April 1990.
- Spherical Aberration discovered ~month after launch. Endeavour corrected with COSTAR in 1993 (SM1)



Ground Image



Wide Field and Planetary Camera 1



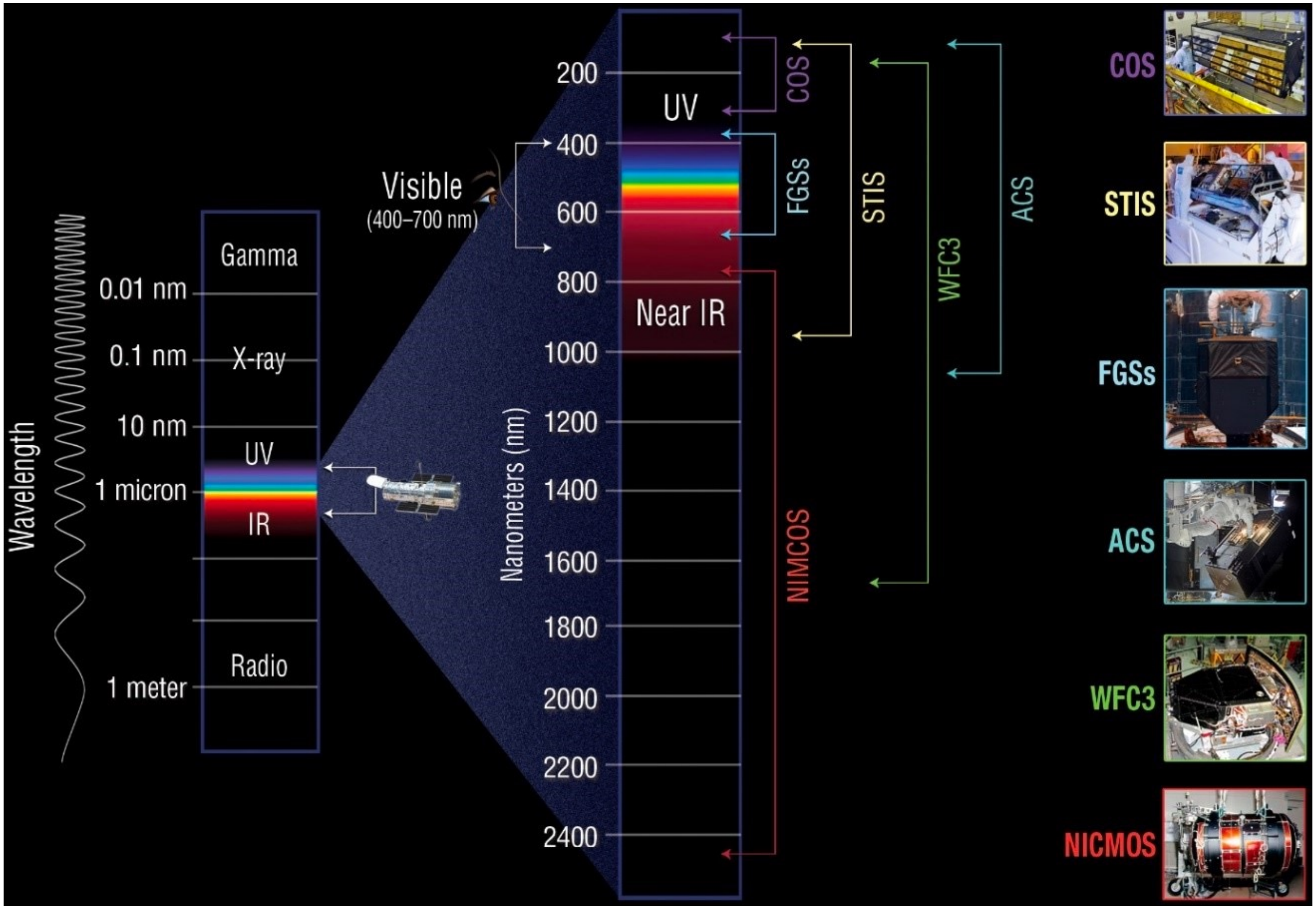
WFPC2

SM4 Servicing Mission (2009)
On-site repair of ACS and STIS, added COS, WFC3

Wide Field Planetary Camera 1

Wide Field Planetary Camera 2

M100



Spectra

Imaging

HST

- Cycle 33: Overall, 282 reviewers from all over the globe reviewed 800 proposals. Of these, 151 proposals were accepted, a success rate of 19%,
- The overall success rate for Cycle 33 proposals was 18.9%, compared to 17.4% in Cycle 32 and 16.7% in Cycle 31.
- Cycle 34 Phase I proposal deadline: **Thursday, April 16, 2026 at 8:00pm EDT**

Table 1: Summary of Requested and Approved Proposal Statistics

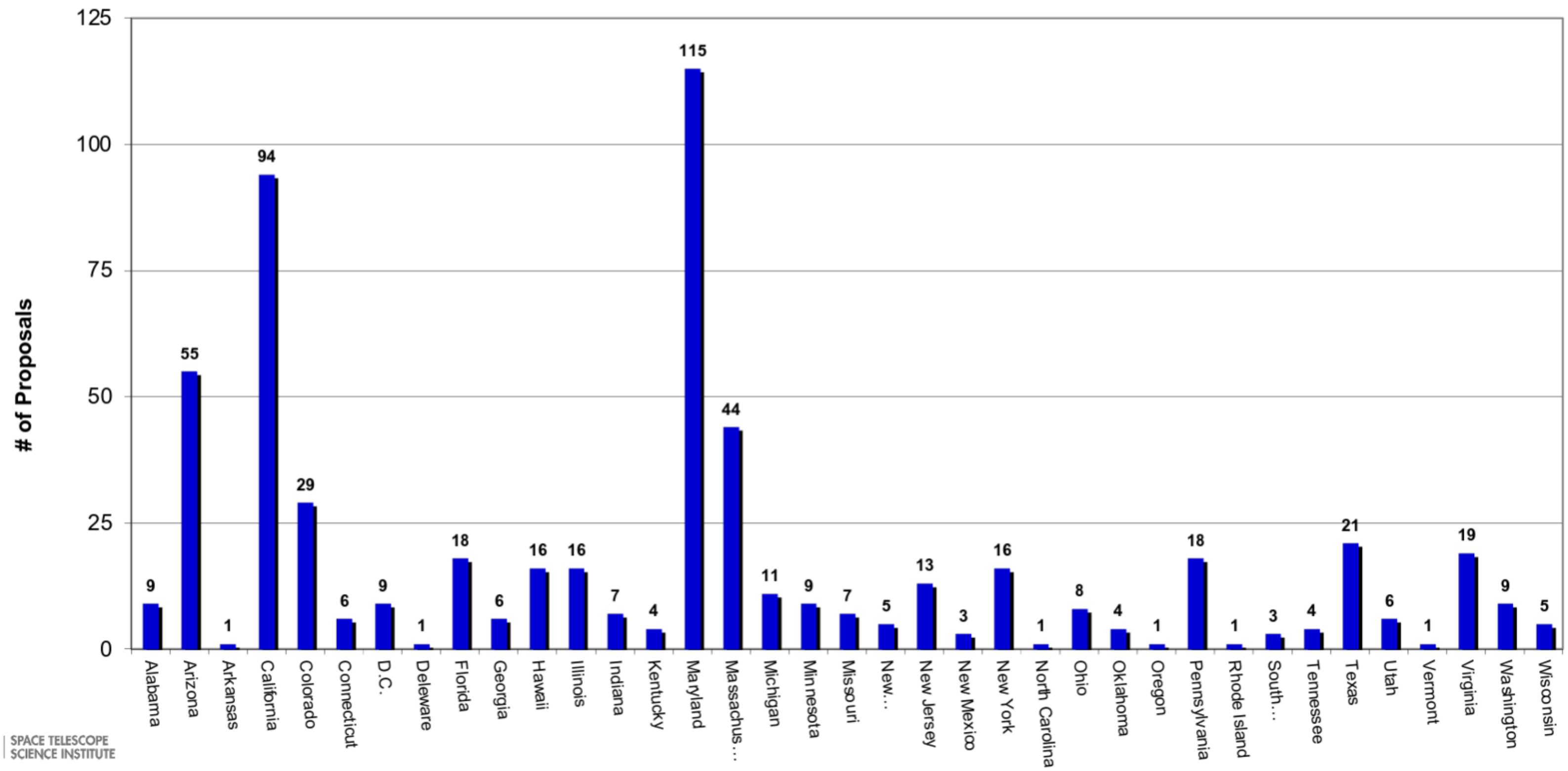
Proposals	Requested	Approved	% Accepted	ESA Approved	ESA % Total
General Observer	**682**	**130**	**19.1%**	**30**	**23.1%**
Very Small Small Medium Large and Treasury*	328 215 98 41	75 36 12 7	22.9% 16.7% 12.2% 17.1%		
Snapshot (SNAP)	**38**	**10**	**26.3%**	**1**	**10.0%**
Archival Research (AR)	**80**	**11**	**13.8%**	**1**	**9.1%**
Regular AR Regular Theory	54 26	8 3	14.8% 11.5%		
Total	**800**	**151**	**18.9%**	**32**	**22.9%**
Primary Orbits	**17,647**	**2,731**	**15.5%**	**530**	**19.4%**

2021 .. For reference

Cycle 29 TAC Summary Results

Category	**Requested**	**Approved**	**Percentage Approved**	**ESA Approved**	**ESA Approved Percentage**
GO Proposals	926	126	13.6%	29	23.0%
Snapshots	44	13	29.5%	4	30.8%
Archival	95	28	29.5%	0	0.0%
AR Legacy	21	5	23.8%	0	0.0%
Theory	43	8	18.6%	0	0.0%
Total	1,129	180	15.9%	33	23.7%
Primary Orbits	**22,067**	**2,695**	**12.2%**	**421**	**15.7%**

PI States and Territories

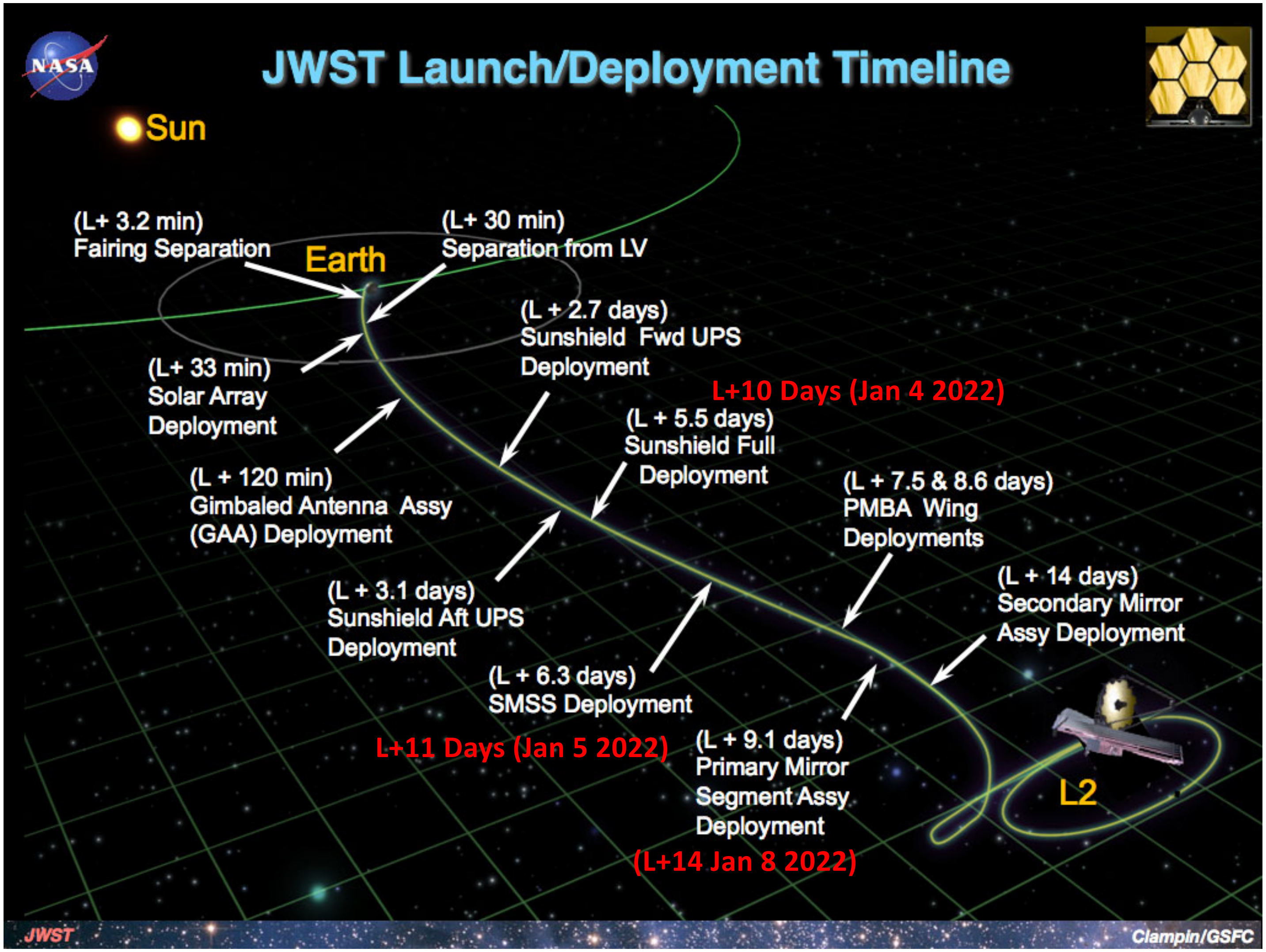


Planning for HST successor began in early '90s

High Prioritization of the "Next Generation Space Telescope" (NGST) in the Astro2000 Decadal.

Lifetime Cost:
US $9.7 billion
=
US $8.8 billion on design/development

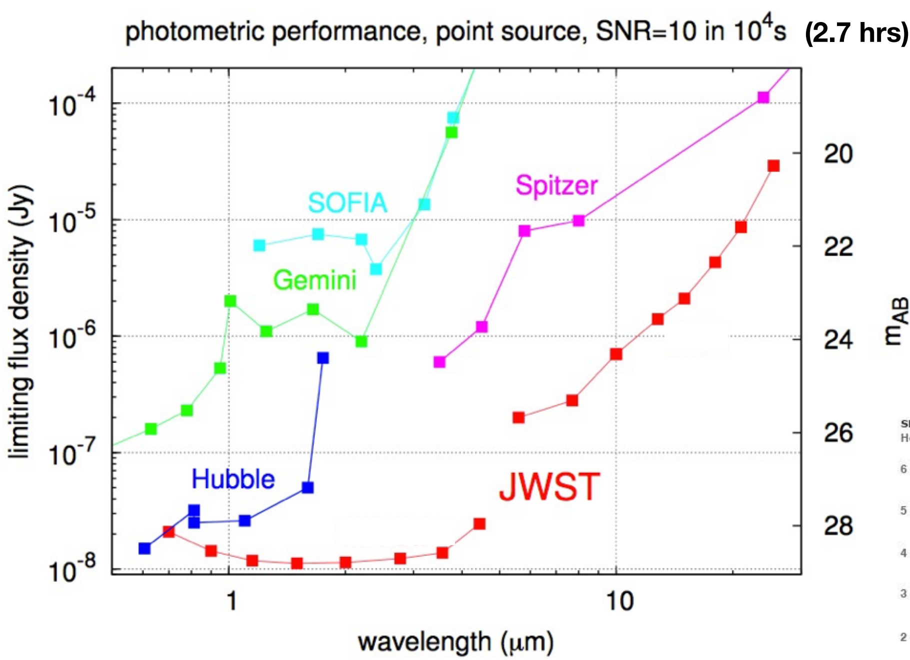
US $861 million for 5yrs of mission operations

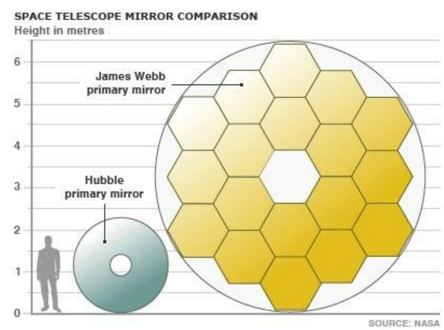


Cycle 5 Science Timeline

Date	Milestone
August 1, 2025	Cycle 5 Call for Proposals
October 15, 2025	JWST Cycle 5 Proposal Deadline
November 12, 2025	Cycle 5 Proposals Released to the TAC
February 2– 6, 2026	Telescope Allocation Committee Meetings: Discussion Panels
February 9 – 12, 2026	Telescope Allocation Committee Meetings: Executive Committee
February 26, 2026	Director’s Review
Mid March, 2026	PI notification letters are distributed
July 1, 2026	Beginning of Cycle 5 Observations

JWST: Largest astronomical mirror in space
Most sensitive infrared instruments





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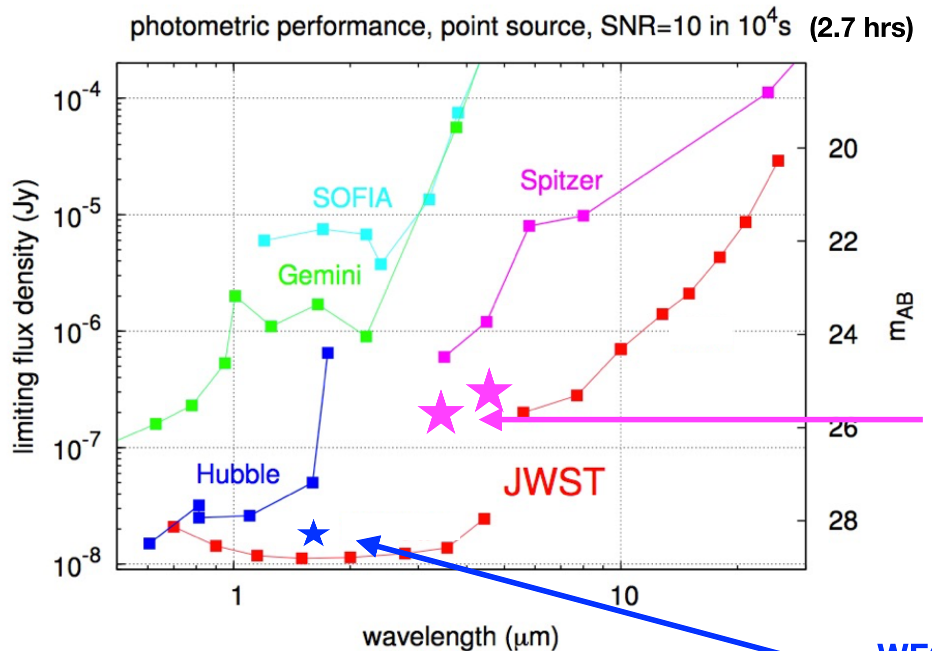
JWST: Largest astronomical mirror in space
Most sensitive infrared instruments



Deepest Spitzer image to date: ABmag~25.8 (10sig; 200 hrs)

WFC3/F160W depth of XDF: ABmag~28.5 (10sig; 66 hrs)

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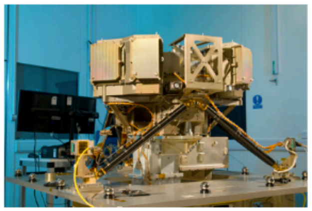
JWST Instrument Summary



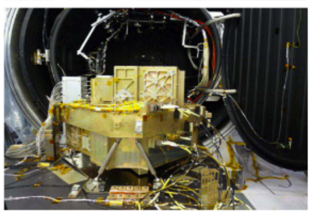
MIRI = Mid-InfraRed Instrument

50/50 partnership between a nationally funded consortium of European institutes (MIRI EC) under the auspices of ESA and NASA/JPL

PIs: G. Wright and G. Rieke

NIRSpec = Near-infrared Spectrograph

Provided by the European Space Agency, built by an industrial consortium led by Airbus Defence and Space

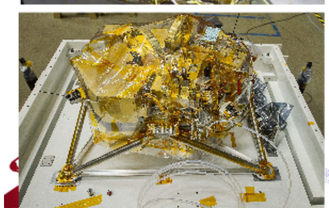


NIRISS = Near-infrared Imager and Slitless Spectrograph

FGS = Fine Guidance Sensor

Provided by the Canadian Space Agency

PIs: R. Doyon & C. Willott



NIRCam = Near-InfraRed Camera

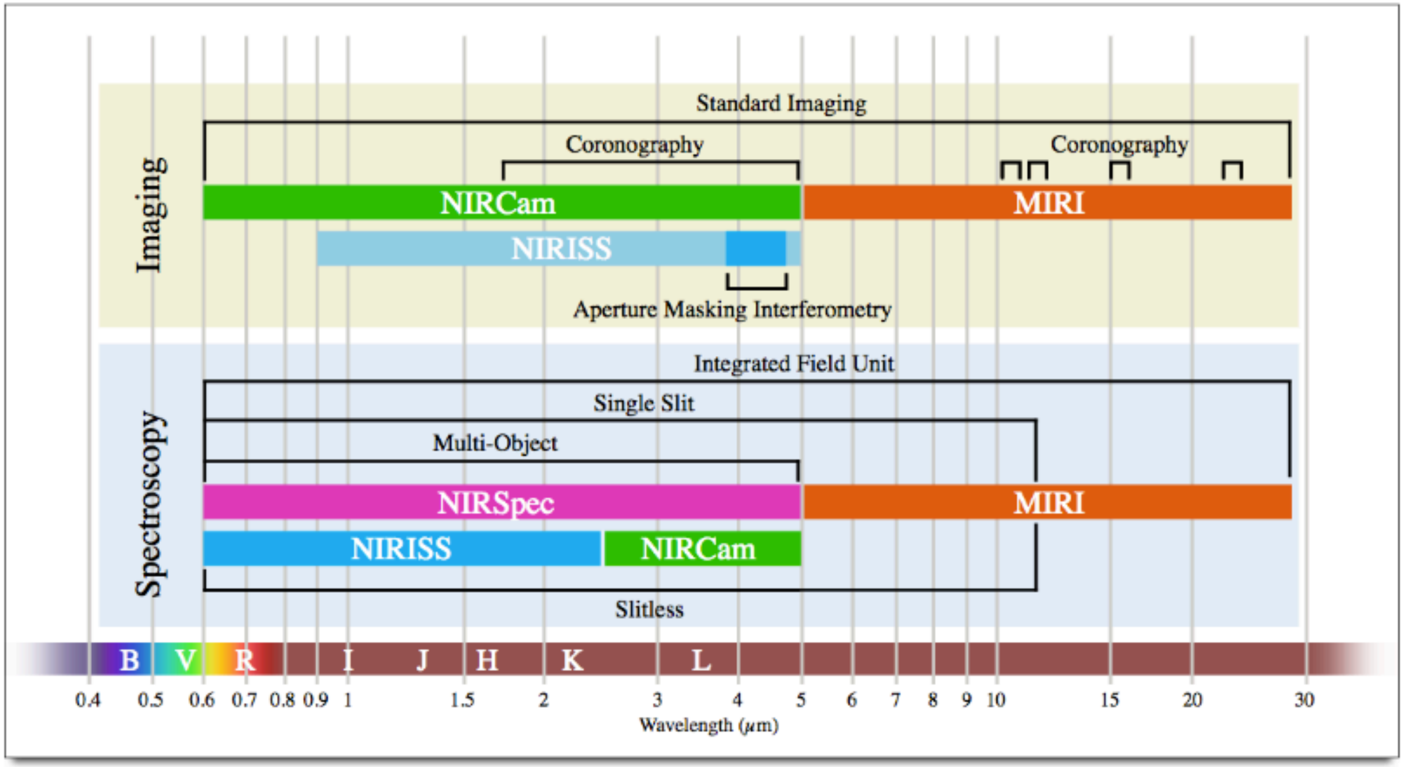
Developed under the responsibility of the University of Arizona

PI: M. Rieke

European Space Agency

mages/Diagrams credits: NASA / ESA / CSA / Airbus / Northrop Grumman / STScI

JWST capabilities



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Credit: STScI

JWST Cycle 4

Summary Results

Proposals	Reviewed	Approved	% Accepted
General Observer	2082	241	12%
Survey	50	8	16%
Regular AR	106	15	14%
AR Legacy	20	2	10%
Theory	88	8	9%
Total	***2346***	***274***	***12%***
Primary Hours	**74538**	**8530**	**11%**

JWST Cycle 1 for reference

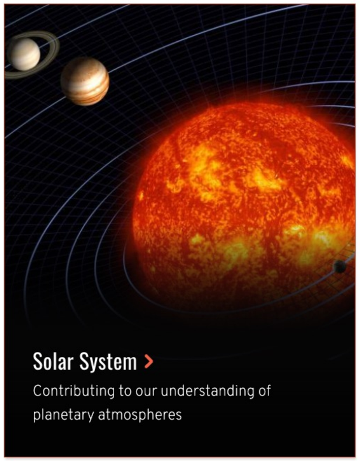
Summary Results

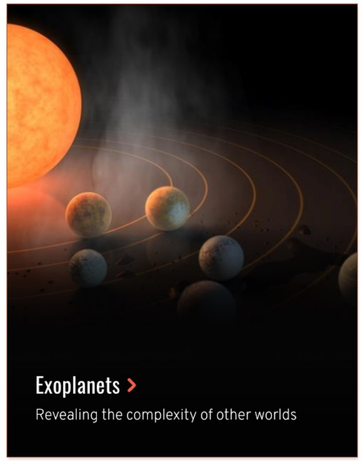
Proposals	Requested	Approved	% Accepted	CSA Accepted	CSA % Total	ESA Accepted	ESA % Total
General Observer	1084	266	25%	10	4%	89	33%
Survey	13	0	0%	0	0%	0	0%
Regular AR	41	15	37%	0	0%	0	0%
AR Legacy	3	0	0%	0	0%	0	0%
Theory	31	5	16%	0	0%	0	0%
Total	***1172***	***286***	***24%***	***10***	***4%***	***89***	***33%***
Primary Hours	**24440**	**6031**	**25%**	**249**	**4%**	**1786**	**30%**

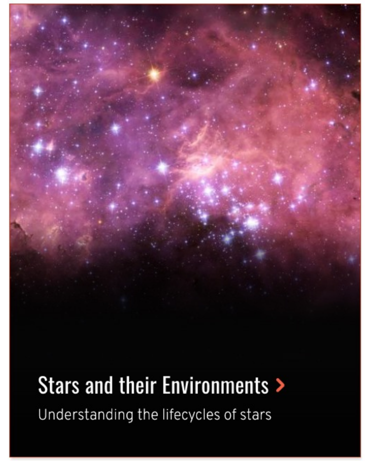
- CSA & ESA Hours/Proposals are for GO/Survey only
- 50 Hours are from Calibration Pool

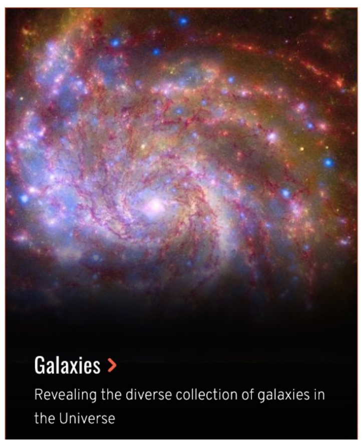
Key Science Research Themes Being Studied with HST

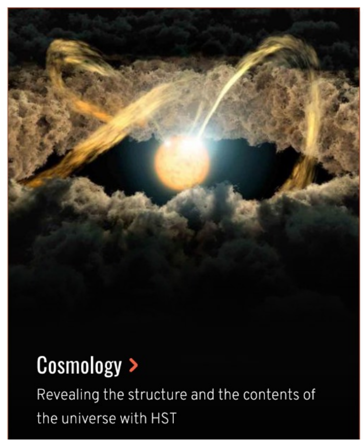
https://www.stsci.edu/hst/about/key-science-themes











https://science.nasa.gov/mission/webb/science-overview/

SCIENCE

Webb's Science Themes

> *The James Webb Space Telescope will be a giant leap forward in our quest to understand the Universe and our origins. Webb will examine every phase of cosmic history: from the first luminous glows after the Big Bang to the formation of galaxies, stars, and planets to the evolution of our own solar system.*

Early Universe

Webb will be a powerful time machine with infrared vision that will peer back over 13.5 billion years to see the first stars and galaxies forming out of the darkness of the early universe.

Read More ▶

Galaxies Over Time

Webb's unprecedented infrared sensitivity will help astronomers to compare the faintest, earliest galaxies to today's grand spirals and ellipticals, helping us to understand how galaxies assemble over billions of years.

Read More ▶

Star Lifecycle

Webb will be able to see right through and into massive clouds of dust that are opaque to visible-light observatories like Hubble, where stars and planetary systems are being born.

Read More ▶

Other Worlds

Webb will tell us more about the atmospheres of extrasolar planets, and perhaps even find the building blocks of life elsewhere in the universe. In addition to other planetary systems, Webb will also study objects within our own Solar System.

Read More ▶

JWST Key terms: https://jwst-docs.stsci.edu/jppom/jwst-proposal-level-information/jwst-science-keywords#gsc.tab=0

SOLAR SYSTEM ASTRONOMY:
This includes all objects belonging to the solar system (except the Sun, Mercury, and Venus), such as planets, minor planets, comets, asteroids, planetary satellites, and Kuiper-belt objects.

EXOPLANETS AND EXOPLANET FORMATION:
This includes all objects belonging to known extrasolar planetary systems, and observations of their host stars, as well as all studies of circumstellar and proto-planetary disks.

STELLAR PHYSICS AND STELLAR TYPES
: This includes stars of all temperatures and evolutionary phases, including pre-main sequence stars, supernovae, pulsars, X-ray binaries, CVs, and planetary nebulae. It also applies to ISM and circumstellar matter in the Milky Way.

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STELLAR POPULATIONS AND THE INTERSTELLAR MEDIUM
: This includes resolved stellar populations in globular clusters, open clusters or associations, and the general field of the Milky Way and other nearby galaxies. Studies of color-magnitude diagrams, luminosity functions, initial-mass functions, internal dynamics and proper motions are in this category.

•

GALAXIES

: This includes studies of the initial mass function, stellar content and globular clusters in distant galaxies, galaxy morphology and the Hubble sequence, and low surface-brightness galaxies. Starbursts, IR-bright galaxies, dwarf galaxies, galaxy mergers and interactions may fall under this heading. This category also includes studies of gas distribution and dynamics in distant galaxies. Starbursts, IR-bright galaxies, dwarf galaxies, galaxy mergers, and interactions may also fall under this heading if the emphasis is on the ISM.

THE INTERGALACTIC MEDIUM AND THE CIRCUMGALACTIC MEDIUM

: This category includes the physical properties and evolution of absorption-line systems detected along the line of sight to quasars, inflow and outflow of gas to the CGM /IGM, and other observations of the diffuse IGM, and the spectroscopy and imaging of damped Ly-alpha systems.

SUPERMASSIVE BLACK HOLES AND ACTIVE GALAXIES

: This encompasses active galaxies and quasars, including both studies of the active phenomena themselves, and of the properties of the host galaxies that harbor AGNs and quasars. The definition of AGN is to be interpreted broadly; it includes Seyfert galaxies, BL Lac objects, radio galaxies, blazars, and LINERs.

LARGE SCALE STRUCTURE OF THE UNIVERSE

: This includes studies of the structure and properties of clusters and groups of galaxies, strong and weak gravitational lensing, galaxy evolution through observations of galaxies at intermediate and high redshifts (including for example, the Hubble Deep Fields), cosmology in general, the structure of the universe as a whole, cosmological parameters and the extra-galactic distance scale.