

40 years of US leadership in space science

pushing

ASTRONOMY'S BOUNDS

A deep field image of galaxies in space, showing various colors and shapes against a dark background. The galaxies are scattered across the frame, with some appearing as bright, distinct points of light and others as more diffuse, elongated structures. The colors range from blue and purple to orange and red, suggesting different stages of galaxy evolution or different types of galaxies. The overall scene is a vast, multi-colored field of celestial objects.

the
FOUNDATION

A SPECTACULAR START

Hubble Space Telescope

Ongoing mission:
1990 – present



- 2.4-meter mirror
- Sensitive suite of instruments
- Razor-sharp eyesight

The most famous Hubble image, the Hubble Ultra Deep Field, has captivated astronomers and the general public by showing us a true view of the distant Universe filled with thousands of galaxies in a tiny field of view. This image provides our most rewarding insights on the formation and evolution of galaxies.

A SPECTACULAR START

Are we alone?

How did we get here?

How does the Universe work?

In 1990, NASA launched the Hubble Space Telescope into orbit around Earth, representing a revolutionary step to characterize and understand our Universe. Hubble's countless discoveries have brought stories from science fiction into reality. It has witnessed supernova explosions, discovered supermassive black holes, seen exoplanets orbiting other stars, and measured the age and expansion of the Universe itself.

The last servicing mission to Hubble, in 2009, provided astronomy's favorite telescope with a new lease on life. Since then, the demand for Hubble observations has been higher than at any point in its history.

Ongoing success demands a new generation of technologies

Hubble has provided answers to some of the biggest questions facing astronomy. But at the same time, one of Hubble's greatest contributions to modern astrophysics has been to open our eyes to new scientific puzzles – the answers to which are beyond its reach.

To help answer these questions, astronomers have put forth a vision for two new telescopes equipped with advanced technologies.

The new generation of technologies will expand Hubble's capabilities in two complementary dimensions – much more power and a much larger field of view.

the
FUTURE

100 TIMES WIDER AREA

Wide-Field Infrared Survey
Telescope (WFIRST)
Early 2020s launch



- Over 100x Hubble's image area
- 2.4-meter telescope
- Array of new-generation detectors

WFIRST will produce large-scale maps of the night sky at the highest resolution we've ever had.



Hubble field

WFIRST wide-field image

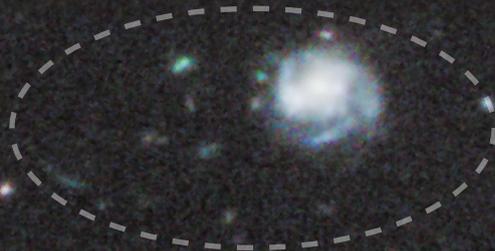
100 TIMES MORE POWER

**James Webb Space
Telescope (JWST)**
2018 launch / 10-year goal

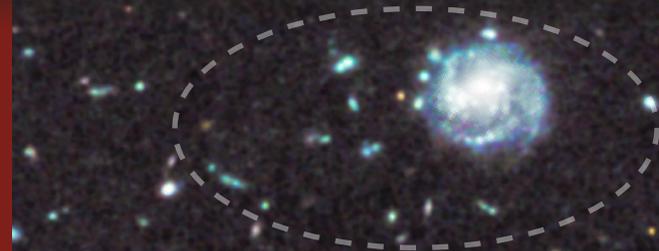


- 100 times as powerful as Hubble
- Mirror: 18 segments, 21-foot span
- Introduced 10 new technologies

JWST's powerful vision will reveal the detailed nature of once-mysterious objects found by WFIRST and other missions.



WFIRST and Hubble resolution



JWST resolution

REMAINING VIBRANT

It is the synergy of Hubble, WFIRST, and JWST that will transform our view of the Universe from a sense of bewilderment to one where we understand its most fundamental properties.

The Hubble Space Telescope has completely transformed the field of astronomy and astrophysics, and represents the pinnacle of US leadership in space science for over 20 years. The discoveries from Hubble have now inspired two new NASA missions that expand Hubble's legacy in two new directions: a factor of 100 gain in sensitivity with the James Webb Space Telescope (JWST) and a factor of 100 gain in field of view with the Wide-Field Infrared Survey Telescope (WFIRST). JWST and WFIRST are the US astronomy community's top science priorities from the 2000 and 2010 US Astronomy and Astrophysics Decadal Surveys, respectively.

Enabling the next breakthrough for US leadership in space science will benefit greatly from syncing the schedule of WFIRST and JWST. WFIRST's countless wide-angle-lens discoveries will provide JWST its most interesting targets across a broad swath of astrophysics. Together, Hubble, WFIRST, and JWST will ensure 40 years of US leadership in space science.

