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NASA's Hubble Space Telescope reveals a bow shock (created, in space, when “two streams of gas collide”) around a very young star known as LL Ori (located near the Great Nebula in Orion). Image Credit: NASA and [The Hubble Heritage Team \(STScI/AURA\)](#).

During the 1920s, [Hermann Oberth](#) (1894-1989) first conceived of a space telescope. As a young boy, he had read *From Earth to the Moon* (by Jules Verne) and became obsessed with the idea that fiction could become reality. And, if one could go to the Moon, why not build a telescope which could orbit in space?

A visionary thinker, Oberth's doctoral dissertation (addressing the concept of rocket-powered flight) was rejected by the University of Heidelberg. His professors thought Oberth's ideas were too speculative. They, of course, were wrong.

During the 1960s, [Lyman Spitzer](#) - who had previously conducted [pioneering research](#) (in controlled thermonuclear reactions) at Princeton University - pushed both NASA and Congress to create, and deploy, a large space telescope. [His efforts](#) ultimately [resulted in](#) the Hubble telescope.

That Earth-orbiting observatory is named for [Edwin Hubble](#) (1889-1953) - depicted in this undated photo watching the stars at [Palomar Mountain](#) - who [believed](#) that the [universe is expanding](#).

Lockheed Martin [built](#) Hubble [which is](#) forty-three feet [tall](#), fourteen feet [wide](#) and twenty-five thousand pounds. Perkin Elmer (now Hughes Danbury Optical Systems, Inc.) fabricated its [primary mirror](#) which measures 2.4 meters (eight feet).

After many years of [delay](#) caused by various problems, including the [Challenger disaster](#), *Discovery* (during its STS-31 mission) [carried](#) [Hubble](#) to space on April 24, 1990.

The next day, the shuttle's astronauts [deployed](#) the [telescope](#) about 353 miles (569 kilometers) [above](#) the Earth, where it has remained ever since. [Beginning](#) its working life in space, Hubble [reflected sunlight](#) on its [solar panels](#).

Weightless in space, traveling approximately five miles per second, [Hubble orbits](#) the Earth [once every 97 minutes](#). (Follow the link to see its current location.)

Because Earth's atmosphere tends to [distort](#) our view “looking up,” Hubble - which is above the atmosphere - has a much clearer [vision](#) of objects in space.

A reflecting telescope, employing a [Cassegrain design](#), it is [commanded](#) and [controlled by](#) specialists at NASA's Goddard Space Flight Center in [Greenbelt](#), Maryland.

Although Hermann Oberth was no longer alive when Hubble was deployed, he had lived long enough to see a model of it. And Lyman Spitzer - who was actively involved in Hubble's [creation and initial use](#) - was recognized when the new [Spitzer Space Telescope](#) was launched on August 25, 2003. It has [particular sensitivity](#) to infrared light.

So ... how do these space telescopes actually work? And ... is space really as colorful as those pictures we see on the evening news?

<http://www.awesomestories.com/asset/AcademicAlignment/AN-ORBITING-TELESCOPE-Exploring-Space-Images-from-NASA>

See Learning Tasks for this story online at:

<http://www.awesomestories.com/asset/AcademicActivities/AN-ORBITING-TELESCOPE-Exploring-Space-Images-from-NASA>

## Media Stream



### Lyman Spitzer - Namesake of the Spitzer Space Telescope

Image online, courtesy of NASA.

View this asset at:

<http://www.awesomestories.com/asset/view/Lyman-Spitzer-Namesake-of-the-Spitzer-Space-Telescope>



### Hubble Telescope - In Space

Image online courtesy of NASA, via the [phys.org](http://www.phys.org) website.

View this asset at: <http://www.awesomestories.com/asset/view/Hubble-Telescope-In-Space>



### Edwin Hubble - Namesake of the Hubble Orbiting Telescope

Image online, courtesy of NASA.

View this asset at:

<http://www.awesomestories.com/asset/view/Edwin-Hubble-Namesake-of-the-Hubble-Orbiting-Telescope>



### Hubble Telescope - Finalizing for Launch

Image online, courtesy NASA.

View this asset at: <http://www.awesomestories.com/asset/view/Hubble-Telescope-Finalizing-for-Launch>



### Hubble Telescope - Still on Earth

Image online, courtesy NASA.

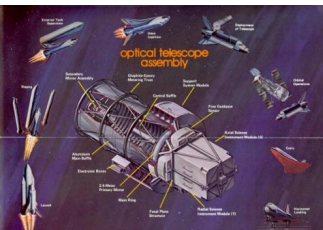
View this asset at: <http://www.awesomestories.com/asset/view/Hubble-Telescope-Still-on-Earth>



### Hubble Telescope - Mirror

Image online, courtesy NASA.

View this asset at: <http://www.awesomestories.com/asset/view/Hubble-Telescope-Mirror>



### Hubble Telescope - Optical Assembly

Image online, courtesy NASA.

View this asset at: <http://www.awesomestories.com/asset/view/Hubble-Telescope-Optical-Assembly>



### Lifting Hubble from Cargo Bay

Image, described above, online courtesy NASA and HubbleSite.

View this asset at: <http://www.awesomestories.com/asset/view/Lifting-Hubble-from-Cargo-Bay>



### Hubble Telescope - Seen from Above

Image online via NASA.

View this asset at: <http://www.awesomestories.com/asset/view/Hubble-Telescope-Seen-from-Above>

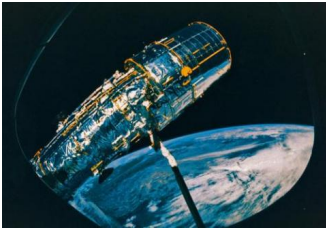


### Hubble Telescope In Shadow

Image online, courtesy NASA.

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View this asset at: <http://www.awesomestories.com/asset/view/Hubble-Telescope-In-Shadow>



### Hubble Telescope - From Discovery's Window

NASA image.

View this asset at:

<http://www.awesomestories.com/asset/view/Hubble-Telescope-From-Discovery-s-Window>

### Hubble Reflecting Sunlight at Time of Release

This NASA image depicts Hubble when astronauts aboard *Discovery* (one of America's Space Shuttle orbiters) released it into space.

Notice how the new orbiting space telescope reflects sunlight.

NASA tells us more about this significant moment, in 1990, when Hubble first began its low-Earth orbit to discover what mankind had never-before seen:

*In this photograph, the Hubble Space Telescope (HST) was being deployed on April 25, 1990. The photograph was taken by the IMAX Cargo Bay Camera (ICBC) mounted in a container on the port side of the Space Shuttle orbiter Discovery (STS-31 mission).*

*The purpose of the HST, the most complex and sensitive optical telescope ever made, is to study the cosmos from a low-Earth orbit for 15 years or more. The HST provides fine detail imaging, produces ultraviolet images and spectra, and detects very faint objects.*

*Two months after its deployment in space, scientists detected a 2-micron spherical aberration in the primary mirror of the HST that affected the telescope's ability to focus faint light sources into a precise point. This imperfection was very slight, one-fiftieth of the width of a human hair.*

*A scheduled Space Service servicing mission (STS-61) in 1993 permitted scientists to correct the problem. During four spacewalks, new instruments were installed into the HST that had optical corrections.*

*The Marshall Space Flight Center had responsibility for design, development, and construction of the HST. The Perkin-Elmer Corporation, in Danbury, Connecticut, developed the optical system and guidance sensors.*

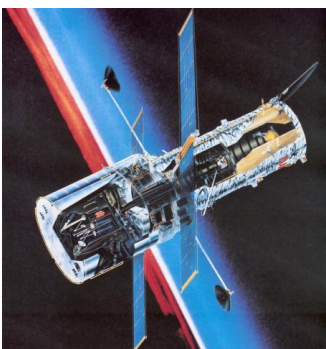
*What no one realized, at the time Hubble was first released, was that the awesome orbiting space telescope had a vision problem. Another shuttle crew, aboard Endeavour, would have to make another trip to cure that problem.*

*Click on the image for a much-better view.*

*Image depicting photo by NASA/Smithsonian Institution/Lockheed Corporation. Online, courtesy NASA.*

View this asset at:

<http://www.awesomestories.com/asset/view/Hubble-Reflecting-Sunlight-at-Time-of-Release>



### NASA Drawing of Hubble in Orbit

NASA illustration; online, courtesy NASA.

View this asset at: <http://www.awesomestories.com/asset/view/NASA-Drawing-of-Hubble-in-Orbit>

## Hubble Mirror with NASA Scientists

Shortly after the Hubble Space Telescope was deployed, in 1990, scientists realized there was something wrong with her mirror. (This image depicts Hubble's mirror before the orbiting telescope began her space journey.)

What was wrong?

The mirror had a slight aberration which caused Hubble's pictures to appear blurred.

A Space Shuttle mission (STS-61) also became Servicing Mission 1 (SM1) as astronauts aboard *Endeavour* corrected Hubble's blurry-vision problem.

What was the exact nature of the problem which Hubble's team (on Earth) and *Endeavour's* team (in space) had to correct? [NASA describes the mirror's flaw](#):

*After Hubble's deployment in 1990, scientist realized that the telescope's primary mirror had a flaw called spherical aberration. The outer edge of the mirror was ground too flat by a depth of 2.2 microns (roughly equal to one-fiftieth the thickness of a human hair).*

*This aberration resulted in images that were fuzzy because some of the light from the objects being studied was being scattered.*

*How did scientists repair the flaw?*

*COSTAR (the Corrective Optics Space Telescope Axial Replacement) was developed as an effective means of countering the effects of the flawed shape of the mirror. COSTAR was a telephone booth-sized instrument which placed 5 pairs of corrective mirrors, some as small as a nickel coin, in front of the Faint Object Camera, the Faint Object Spectrograph and the Goddard High Resolution Spectrograph.*

*In addition, Endeavour's astronauts installed Wide Field Planetary Camera 2 (WFPC2) which significantly helped Hubble's performance:*

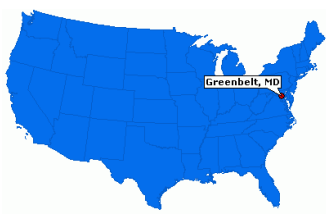
*WFPC2 significantly improved ultraviolet performance over WFPC1, the original instrument. In addition to having more advanced detectors and more stringent contamination control, it also incorporated built-in corrective optics.*

*Click on the image for a better view of Hubble's mirror.*

*NASA image; online, courtesy NASA.*

*All quoted passages from "The Hubble Space Telescope," a NASA website, specifically the [page on SM1](#), the first Hubble-repair mission.*

*View this asset at: <http://www.awesomestories.com/asset/view/Hubble-Mirror-with-NASA-Scientists>*



## Hubble - Command Center for Orbiting Telescope

Image online, courtesy Wikimedia Commons.

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View this asset at:

<http://www.awesomestories.com/asset/view/Hubble-Command-Center-for-Orbiting-Telescope>

## Greenbelt, Maryland - Map Locator

Image online, courtesy the epodunk.com website.

View this asset at: <http://www.awesomestories.com/asset/view/Greenbelt-Maryland-Map-Locator>

## Hubble - Optical Telescope Assembly

The Hubble Space Telescope, really an orbiting space observatory, has been an amazing source of stunning pictures for many years.

What is it, about Hubble, which helps it to capture such incredible images of space?

This NASA illustration, depicting the Hubble Space Telescope Optical Telescope Assembly, helps us to understand more about the technical workings of this unique observatory:

*This image illustrates the Hubble Space Telescope's (HST's) Optical Telescope Assembly (OTA). One of the three major elements of the HST, the OTA consists of two mirrors (a primary mirror and a secondary mirror), support trusses, and the focal plane structure.*

*The mirrors collect and focus light from selected celestial objects and are housed near the center of the telescope. The primary mirror captures light from objects in space and focuses it toward the secondary mirror. The secondary mirror redirects the light to a focal plane where the Scientific Instruments are located.*

*The primary mirror is 94.5 inches (2.4 meters) in diameter and the secondary mirror is 12.2 inches (0.3 meters) in diameter.*

*The purpose of the HST, the most complex and sensitive optical telescope ever made, is to study the cosmos from a low-Earth Orbit. By placing the telescope in space, astronomers are able to collect data that is free of the Earth's atmosphere.*

*The HST detects objects 25 times fainter than the dimmest objects seen from the Earth and provides astronomers with an observable universe 250 times larger than visible from ground-based telescopes, perhaps as far away as 14 billion light-years.*

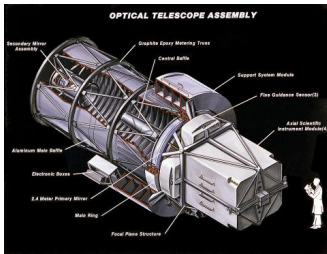
*The HST views galaxies, stars, planets, comets, possibly other solar systems, and even unusual phenomena such as quasars, with 10 times the clarity of ground-based telescopes.*

*The spacecraft is 42.5 feet (13 meters) long and weighs 25,000 pounds (11,600 kilograms). The HST was deployed from the Space Shuttle Discovery (STS-31 mission) into Earth orbit in April 1990.*

*The Marshall Space Flight Center had responsibility for design, development, and construction of the HST. The Perkin-Elmer Corporation, in Danbury, Connecticut, developed the optical system and guidance sensors. The Lockheed Missile and Space Company of Sunnyvale, California produced the protective outer shroud and spacecraft systems, and assembled and tested the finished telescope. Click on the image for a much-better view.*

*NASA illustration and descriptions at Marshall Space Flight Center, MiX (Marshall Image Exchange), describing "Hubble Space Telescope Optical Telescope Assembly." Online, courtesy NASA. Public Domain.*

[View this asset at: http://www.awesomestories.com/asset/view/Hubble-Optical-Telescope-Assembly](http://www.awesomestories.com/asset/view/Hubble-Optical-Telescope-Assembly)



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