

# Hubble Space Telescope



S e r v i c i n g   M i s s i o n   3 A  
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# Hubble Space Telescope

Servicing Mission 3A  
Media Reference Guide



Prepared for:



By:



## Who Was Edwin P. Hubble?

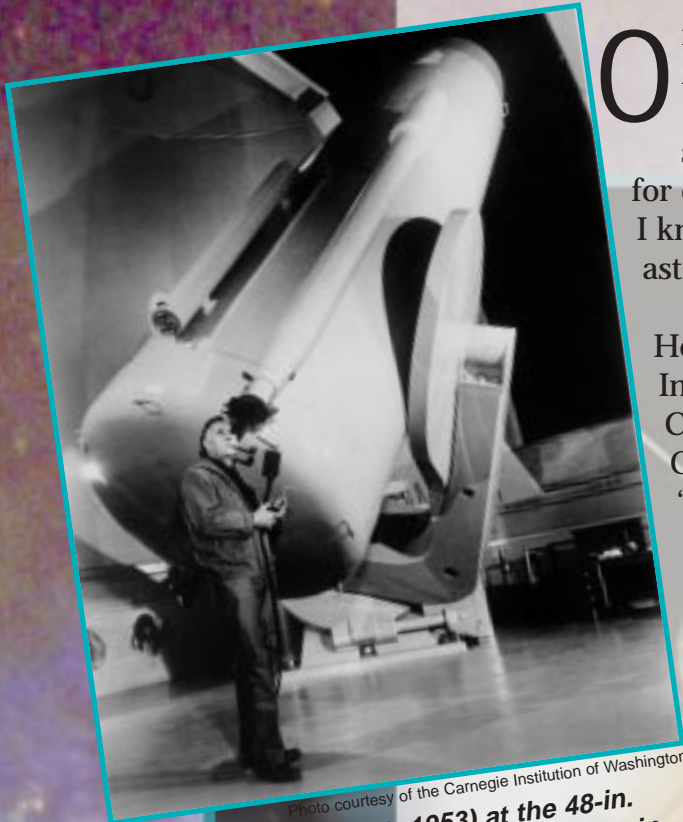


Photo courtesy of the Carnegie Institution of Washington  
**Edwin Hubble (1889–1953) at the 48-in. Schmidt telescope on Palomar Mountain**

One of the great pioneers of modern astronomy, the American astronomer Edwin Powell Hubble (1889–1953), started out by getting a law degree and serving in World War I. However, after practicing law for one year, he decided to “chuck law for astronomy and I knew that, even if I were second rate or third rate, it was astronomy that mattered.”

He completed a Ph.D. thesis on the Photographic Investigation of Faint Nebulae at the University of Chicago and then continued his work at Mount Wilson Observatory, studying the faint patches of luminous “fog” or nebulae in the night sky.

Using the largest telescope of its day, a 2.5-m reflector, he studied Andromeda and a number of other nebulae and proved that they were other star systems (galaxies) similar to our own Milky Way.

He devised the classification scheme for galaxies that is still in use today, and obtained extensive evidence that the laws of physics outside the Galaxy are the same as on Earth – in his own words: “verifying the principle of the uniformity of nature.”

In 1929, Hubble analyzed the speeds of recession of a number of galaxies and showed that the speed at which a galaxy moves away from us is proportional to its distance (Hubble’s Law). This discovery of the expanding universe marked the birth of the “Big Bang Theory” and is one of the greatest triumphs of 20th-century astronomy.

In fact, Hubble’s remarkable discovery could have been predicted some 10 years earlier by none other than Albert Einstein. In 1917, Einstein applied his newly developed General Theory of Relativity to the problem of the universe as a whole. Einstein was very disturbed to discover that his theory predicted that the universe could not be static, but had to either expand or contract. Einstein found this prediction so unbelievable that he went back and modified his original theory in order to avoid this problem. Upon learning of Hubble’s discoveries, Einstein later referred to this as “the biggest blunder of my life.”

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## Another Step in Our Journey to the Stars

**H**umankind has sought to expand its knowledge of the universe by studying the stars. Throughout history, great scientists such as Nicholas Copernicus, Galileo Galilei, Johannes Kepler, Issac Newton, Edwin Hubble, and Albert Einstein have each contributed significantly to our understanding of the universe. The launch of the Hubble Space Telescope in 1990 signified another great step toward unraveling the mysteries of space. Spectacular discoveries such as massive black holes at the center of galaxies, the common existence of precursor planetary systems like our own, and the quantity and distribution of cold dark matter are just a few examples of the Telescope's findings. Now, with NASA's Servicing Mission 3-A, we are equipped to carry the quest for knowledge into the 21st century.

## About the Covers

In a single stunning image of the giant galactic nebula NGC 3603, the crisp resolution of NASA's Hubble Space Telescope captures various stages in the life cycle of stars.

The back cover shows the evolved supergiant star called Sher 25 (upper left center). The star has a unique circumstellar ring of glowing gas that is a galactic twin to the famous ring around the supernova 1987A.

Young, hot Wolf-Rayet stars and early O-type stars dominate a starburst cluster near the center of the image. A torrent of ionizing radiation and fast stellar winds from these massive stars has blown a large cavity around the cluster.

The giant gaseous pillars to the right and below the cluster are the most spectacular evidence for the interaction of ionizing radiation with cold molecular-hydrogen cloud material.

Bok globules, the dark clouds in the upper right, are probably in an earlier stage of star formation.

Two compact, tadpole-shaped emission nebulae appear near the lower left of the cluster. Hubble found similar structures in Orion that have been interpreted as gas and dust evaporation from possible protoplanetary disks.

The life cycle of stars begins with the Bok globules and giant gaseous pillars, followed by circumstellar disks, and progresses to evolved massive stars in the young starburst cluster. The blue supergiant with its ring and bipolar outflow marks the end of the life cycle.

The inside covers show 3-D computer models of some of the tasks to be performed in orbit by the STS-103 crew during Servicing Mission 3A. The computer models enabled engineers to study task feasibility and to confirm that astronauts could safely reach and service components and locations on the spacecraft. They provided dimensionally accurate, visually correct images to help the extravehicular activity servicing team prepare to install new components and upgrade functional systems on the Telescope.