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SAN ANGELO ASTRONOMER
www.AngeloAstronomy.com
Starbeams and Heliowinds
Newsletter of the San Angelo Astronomy Association
Est. 1962 -- Over Sixty Years of Sharing Astronomy

Nancy Grace Roman Space Telescope

Named after NASA's first chief astronomer, the 'mother of the Hubble Space Telescope,' the Nancy Grace Roman Space Telescope will have a field of view at least 100 times larger than Hubble's, potentially measuring light from a billion galaxies in its lifetime. This observatory will also be able to block starlight to directly see exoplanets and planet-forming disks, complete a statistical census of planetary systems in our galaxy, and settle essential questions in the areas of dark energy, exoplanets, and infrared astrophysics.

Construction and Timeline Details

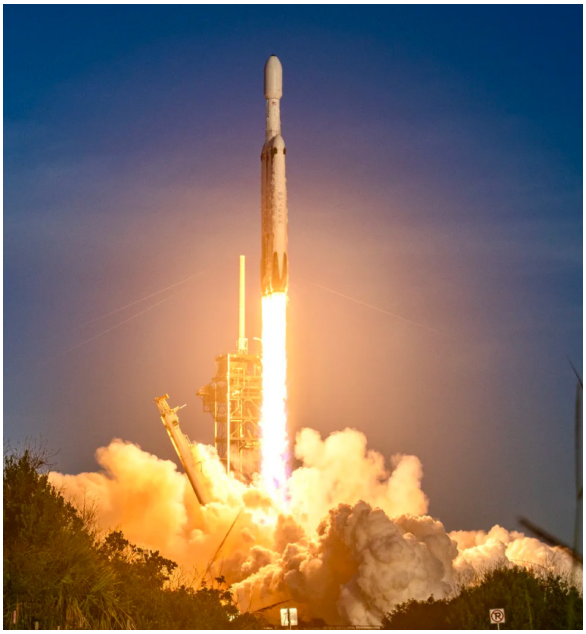
Initial Concept: The mission was first recommended in 2010 as the Wide Field Infrared Survey Telescope (WFIRST).

Formulation Start: NASA formally started mission planning and preliminary design (Phases A and B) in February 2016.

Development Start (Phase C): Hardware manufacturing and official construction began in February 2020.

Assembly Completion: Technicians finished assembling the major segments of the observatory on November 25, 2025

In May 2020, NASA administrator Jim Bridenstine announced that the Wide Field Infrared Survey Telescope would be named the Nancy Grace Roman Space Telescope in recognition of her enduring contributions to astronomy.



SpaceX launched Roman on a Falcon Heavy rocket from NASA's Kennedy Space Center in Florida. Liftoff occurred at 7:26 a.m. EDT on Sunday, Aug. 30. from Launch Complex-39A.

The Nancy Grace Roman Space Telescope will help us solve some of the most profound mysteries in astrophysics, such as how the universe has evolved, its ultimate fate, and whether we are alone.

To make Roman's sensitive measurements possible, the telescope will observe from a vantage point about 930,000 miles (1.5 million km) away from Earth in the direction opposite the Sun. At this special place in space, called the second Sun-Earth Lagrange point, or L2, gravitational forces balance to keep objects in steady orbits with very little assistance.

Roman's barrel-like shape will help block out unwanted light from the Sun, Earth, and Moon, and the spacecraft's distant location will help keep the instruments cool. The thermal stability of an observatory at L2 will provide a ten-fold improvement beyond Hubble in much of the data Roman will gather.

The amount of detail these observations will reveal is directly related to the size of the telescope's mirror, since a larger surface gathers more light. Roman's primary mirror is 7.9 feet (2.4 meters) across. While it's the same size as the Hubble Space Telescope's main mirror, it is less than one-fourth the weight. Roman's mirror weighs only 410 pounds (186 kilograms) thanks to major improvements in technology.

The primary mirror, in concert with other optics, will send light to Roman's two science instruments: the Wide Field Instrument and Coronagraph.

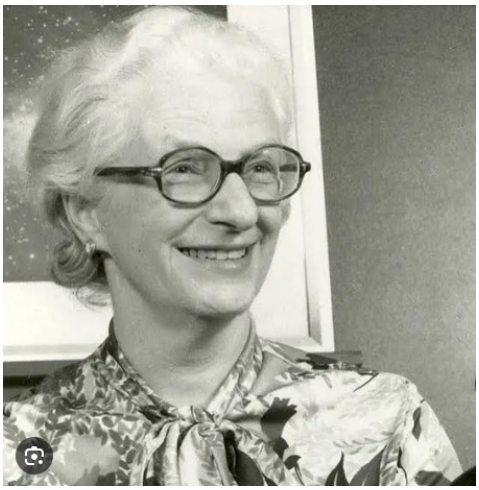
Wide Field Instrument

The Wide Field Instrument is a 300-megapixel infrared camera that will allow scientists to look very far back in time. Seeing the universe in its early stages will help unravel how it has expanded throughout its history, which will hint at how it may continue to evolve.

Coronagraph

The coronagraph demonstrates technology that eliminates the glare of nearby stars and allows astronomers to directly image planets in orbit around them. It will be far more powerful than any other coronagraph ever flown, seeing planets that are almost a billion times fainter than their host star.

Nancy Grace Roman (https://en.wikipedia.org/wiki/Nancy_Roman)



(May 16, 1925 – December 25, 2018) Nancy Grace Roman was an American astronomer who made important contributions to stellar classification and stellar motions. The first female executive at NASA, Roman served as NASA's first Chief of Astronomy throughout the 1960s and 1970s, establishing her as one of the "visionary founders of the US civilian space program".

She was born in Nashville, Tennessee, to music teacher Georgia Frances Smith Roman and physicist/mathematician Irwin Roman. Her father took a job as a geophysicist for an oil company and the family moved to Oklahoma three months after Roman's birth. Roman and her parents later moved to Texas, New Jersey, Michigan, and then Nevada in 1936, when her father joined the Civil Service in geophysical research. Roman considered her parents to be major influences in her interest in science.

When Roman was 11 years old, she formed an astronomy club, gathering with classmates once a week and learning about constellations from books. Although discouraged by those around her, Roman knew by seventh grade that she would dedicate her life to astronomy. She attended Western High School in Baltimore where she participated in an accelerated program, graduating in three years.

Roman then attended Swarthmore College, intending to study astronomy. The dean of women was not encouraging in this. Roman said "if you insisted on majoring in science or engineering, she wouldn't have anything more to do with you". The dean referred her to the astronomy department, then chaired by Peter van de Kamp, who was initially discouraging, but did teach her astronomy. She worked on two defunct student telescopes. Roman says that helped with "getting a feel for instruments and instrumentation and just having the fun of playing around with observing techniques." She graduated in February 1946.

She started graduate school at the University of Chicago in March 1946. Finding the classes easier than at Swarthmore, she approached three professors, Otto Struve, George van Biesbroeck, and William Wilson Morgan, asking each for an observational astronomy project to work on. The first gave her a theory project, the second a data analysis project, and Morgan provided an observational project using a 12-inch telescope, most likely the refractor from the Kenwood Astrophysical Observatory. She received her Ph.D. in astronomy in 1949, having written a dissertation on the Ursa Major Moving Group.

After a two-month break at the Warner and Swasey Observatory, she was invited by Morgan to be his research associate at Yerkes Observatory. She worked at Yerkes for six years, often traveling to the McDonald Observatory in Texas, which at the time was managed by the University of Chicago. The research

position was not permanent, so Roman became an instructor and later, an assistant professor.

After leaving the University of Chicago, Roman went to the Naval Research Laboratory and entered the radio astronomy program in 1954. Radio astronomy was then a very young field in the United States, and the NRL had taken an early lead by building the largest accurate radio telescope in 1951. She spent three years there, rising to become head of the microwave spectroscopy section of the radio astronomy program.

While at the NRL, Roman received an invitation to speak on her work with stars in Armenia, then in the Soviet Union, in 1956 for the dedication of the Byurakan Observatory. This cemented her international reputation, including with people at the newly formed National Aeronautics and Space Administration.

At a lecture by Harold Urey at NASA, Roman was approached by Jack Clark, who asked whether she knew someone interested in creating a program for space astronomy at NASA. She interpreted that as an invitation to apply and was the applicant who accepted the position. While the position nominally allowed for 20% of her time to be used for scientific research, she recognized that such a position would effectively mean she was giving up research, but, as she said in 2018, "the chance to start with a clean slate to map out a program that I thought would influence astronomy for fifty years was more than I could resist."

Roman arrived at NASA in late February 1959 as Head of Observational Astronomy. She quickly inherited a broad program which included the Orbiting Solar Observatories and geodesy and relativity. In early 1960, Roman became the first astronomer in the position of Chief of Astronomy in NASA's Office of Space Science, setting up the initial program; she was also the first woman to hold an executive position at the space agency.

During her employment at NASA, Roman developed and prepared the budgets for various programs and she organized their scientific participation. In 1959, Roman proposed, perhaps for the first time, that detecting planets around other stars might be possible using a space-based telescope, and even suggested a technique employing a rotated coronagraphic mask; a similar approach was ultimately used with the Hubble Space Telescope to image the possible exoplanet Fomalhaut B and will be used by the Nancy Grace Roman Space Telescope to image exoplanets similar to the giant planets in the Solar System. She also believed as early as 1980 that the future Hubble would be able to detect Jupiter exoplanets by astrometry; this was successful in 2002 when astronomers characterized a previously discovered planet around the star Gliese 876.

Nancy Grace Roman in her NASA office in the 1960s

Roman's position became Chief of Astronomy and Solar Physics at NASA from 1961 to 1963. During this time, she oversaw the development of the Orbiting Solar Observatory (OSO) program, developing and launching OSO 1 in May 1962 and developing OSO 2, (February 1965) and OSO 3 (March 1967). She held various other positions in NASA, including Chief of Astronomy and Relativity.

She also led, from 1959, the orbiting astronomical observatories (OAO) program, initially a series of optical and ultraviolet telescopes, working with engineer Dixon Ashworth. The first, OAO-1, was slated to be launched in 1962, but technical difficulties resulted in a descoped version launched in 1966, but which failed three days after reaching orbit. Roman explained these problems by analogy in 2018:

"If you contract to have a house built, you are not surprised if it is not finished by the predicted date even though house building is an established art. NASA was trying to learn a completely new process with unexpected problems arising all along. Thus, it is hardly surprising that there were unpredicted delays."

She continued to develop Orbiting Astronomical Observatory 2, launched in December 1968, which became the first successful space telescope. OAO-3, named Copernicus, was a highly successful ultraviolet telescope which operated from 1972 to 1981.

Roman oversaw the development and launch of the three astronomical satellites and four geodetic satellites. She planned for other smaller programs such as the Astronomy Rocket Program, the Scout Probe to measure the relativistic gravity redshift, programs for high energy astronomy observatories, and other experiments on Spacelab, Gemini, Apollo, and Skylab.

Roman worked with Jack Holtz, on the small astronomy satellite and Don Burrowbridge on the space telescope. She set up NASA's scientific ballooning program, inheriting the Stratoscope balloon projects led by Martin Schwarzschild from the ONR and the National Science Foundation. Roman led the develop-

ment of NASA's airborne astronomy program, beginning with a 12-inch telescope in a Learjet in 1968 and followed in 1974 by the Kuiper Airborne Observatory with a 36-inch telescope, opening up the obscured infrared region of the spectrum for astronomical observations to researchers.

Roman was instrumental in NASA's acceptance of partnership in the International Ultraviolet Explorer, which she felt was her greatest success, saying, "IUE was an uphill fight. I don't mean I didn't have some support, but I think I carried it on almost single handedly."

The last program in which Roman was highly involved was the Hubble Space Telescope, then referred to as the Large Space Telescope (LST). While a large telescope in space had been proposed by Lyman Spitzer in 1946, and astronomers became interested in a 3m-class space telescope in the early 1960s as the Saturn V rocket was being developed, Roman chose to focus on developing smaller-scale OAO telescopes first in order to demonstrate the necessary technologies.

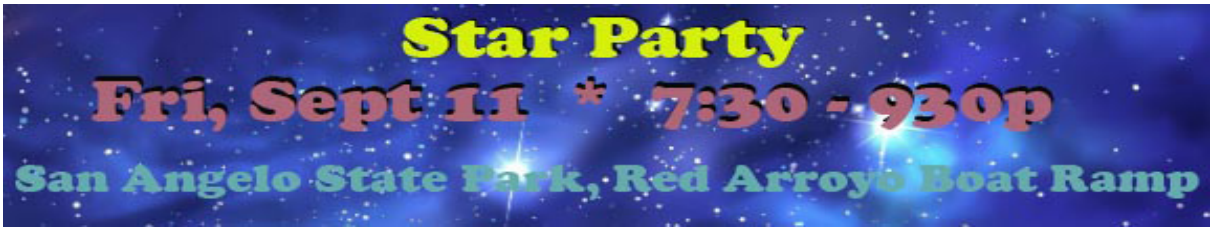
After the success of OAO-2, Roman began to entertain beginning the Large Space Telescope, and started giving public lectures touting the scientific value of such a facility. NASA asked the National Academy of Sciences in 1969 to study the science of a 3m-class telescope in space, resulting in an endorsement for NASA to proceed. In 1971 Roman set up the Science Steering Group for the Large Space Telescope, and appointed both NASA engineers and astronomers from all over the country to serve on it, for the express purpose of designing a free-floating space observatory that could meet the community's needs but would be feasible for NASA to implement.

Roman was very involved with the early planning and specifically, the setting up of the program structure. According to Robert Zimmerman, "Roman had been the driving force for an LST from its earliest days" and that she, along with astronomer Charles Robert O'Dell, hired in 1972 to be the Project Scientist under Roman as the Program Scientist, "were the primary advocates and overseers of the LST within NASA, and their efforts working with the astronomical community produced a detailed paradigm for NASA operation of a large scientific project that now serves as a standard for large astronomical facilities."

Roman sits at the control console for the Orbiting Astronomical Observatory satellite, launched in 1972 and nicknamed Copernicus. This is a publicity picture; she never actually worked in the Goddard control room.

This included creating and devolving responsibility for mission science operations to the Space Telescope Science Institute. With both the astronomical community and the NASA hierarchy convinced of the feasibility and value of the LST, Roman then spoke to politically connected men in a series of dinners hosted by NASA Administrator James Webb in order to build support for the LST project, and then wrote testimony for Congress throughout the 1970s to continue to justify the telescope. She invested in detector technology, resulting in the Hubble being the first major observatory to use charge-coupled device detectors, although these had been flown in space in 1976 in the KH-11 Kennen reconnaissance satellites. Roman's final role in the development of Hubble was to serve on the selection board for its science operations.

Because of her contribution, she often is called the "Mother of Hubble". Later in life she started being uncomfortable with that appellation given the many contributions made by others. NASA's then-Chief Astronomer, Edward J. Weiler, who worked with Roman at the agency, called her 'the mother of the Hubble Space Telescope'. He said, "which is often forgotten by our younger generation of astronomers who make their careers by using Hubble Space Telescope". Weiler added, "Regretfully, history has forgotten a lot in today's Internet age, but it was Nancy in the old days before the Internet and before Google and e-mail and all that stuff, who really helped to sell the Hubble Space Telescope, organize the astronomers, who eventually convinced Congress to fund it." Williams recalls Roman as someone "whose vision in a NASA leadership position shaped U.S. space astronomy for decades".



********** Upcoming Events, SAAA Activities and Dates of Interest *********

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Sep 10 -- New Moon

Sep11 (Fri) - Star Party at San Angelo State Park, 730-930p
(tell the gate attendant you are with the club)

Sep 12 (Sat) - Girl Scout Star Party at Grape Creek School (dark)
-- behind the school on the playground

Sept 22 -- September equinox.

Sep 26 -- Full Moon

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Oct 4-10
World Space Week.

The world's largest annual space event, World Space Week is the United Nations' official celebration of space and the use of technology to help humanity.

This year's theme is "Rocket Revolution."

Editorial Information

San Angelo Astronomer (*formerly* Starbeams & Heliowinds) is the monthly newsletter of the San Angelo Astronomy Association.

Publication date is the last day of each month. Deadline for the submission of articles is the Tuesday before that day. Please submit articles via e-mail or on disk (.pdf, .rtf, .doc, or .txt files). Preferred image files are .JPG.

Address all newsletter correspondence to:
stars@AngeloAstronomy.com

The San Angelo Astronomy Association was founded in 1962. Membership is open to anyone. For membership information contact any of the officers or visit our regular meetings at the ASU Planetarium.

New Club Mailing Address:
130 Bluegrass Dr, San Angelo, TX 76903

Got any news items or articles to contribute? Anything to buy, sell or trade? Email us!

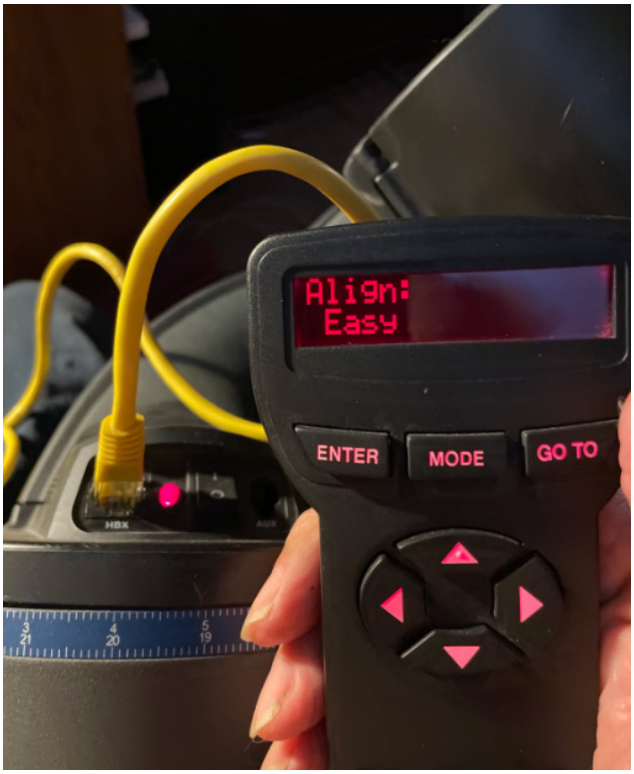
Deadline for next newsletter is Tuesday, Sept 29th.

Club Dues

$5 Regular

** *Due Each February* **
Payable Online at
www.AngeloAstronomy.com

Ralph sent in some photos of a project he was working on...



AutoStar 494 handset cable replacement

"OK. I always like to see what others are doing in the club.

"The old coiled one was coming apart. Cut off the end of the RJ45 connector and figured out the wiring,

"This was quite an undertaking. Those connections consisted of both wires tinned and a small hook on each. Then after soldering a small coating of hot glue, then tape on each of the 8 wires. A recheck of continuity before applying power.