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**Maggie Masetti:** Welcome to Blueshift, the podcast from the Astrophysics Science Division at NASA's Goddard Space Flight Center. I'm Maggie Masetti.

May has come to a rainy close here in Maryland, but folks here at Goddard couldn't be sunnier. The reason? After five grueling spacewalks lasting thirty-six hours and fifty-six minutes, the astronauts of STS-125 completed all planned upgrades and repairs to the Hubble Space Telescope.

Here's Eric Winter with more.

**Eric Winter:** Hubble wasn't the only telescope involved in this mission. Astronauts Mike Massimino and John Grunsfeld tapped into their cultural heritage to give the phrase "space telescope" a novel turn.

Massimino took along a museum-quality replica of one of Galileo's telescopes. According to Giorgio Strano, the collections curator at the Institute and Museum of the History of Science in Florence, Italy, the scope is modeled after one Galileo gave to the Grand Duke of Tuscany, Cosimo II.

Made of wooden strips and leather and richly decorated with gold leaf, the 3-foot-long telescope was one fit for royalty. The scope had a magnifying power of about 20 times -- about half the power of modest binoculars today.

The replica, made in the 1980s, has the same optical characteristics as the original. But the available drawers in the space shuttle cabin can only accommodate an object half the telescope's length. So the museum team cut the tube in the middle and inserted a screw joint. The scope can be assembled in seconds.

**Maggie Masetti:** Astronaut John Grunsfeld brought a different telescope on the flight. This one isn't a replica, but a 200-year-old relic provided by the Adler Planetarium in Chicago. Marvin Bolt, the vice president for collections at Adler, gave us the lowdown.

**Marvin Bolt:** In 1930, the Adler Planetarium was built and designed by architect Ernest Grunsfeld. His grandson, John Grunsfeld, is an astronomer and has had a long association with the Adler Planetarium. He actually came to the Adler as a youngster to learn and to satisfy his curiosity about astronomy. So, when he was selected for the final Hubble service mission, he approached us and asked us if we had something if we would want to have on board this final service mission.

We knew that there was a replica of Galileo's telescope, so we were able to acquire a telescope dating from about 1800. So, there's 200 years

Between Galileo, the telescope we have on board made by Jesse Ramsden, and the Hubble telescope.

Jesse Ramsden was a maker of scientific instruments, especially telescopes and different kinds of gadgets that attach to telescopes. He made them for leading astronomers but also for the more general public, and his workshop was divided so that there was a kind of assembly line. But he kept the workers divided so that they wouldn't learn the secrets of all of the steps that were needed to

make the telescopes. This enabled him to avoid industrial espionage and to keep his secret and not encourage his workers to become his competitors.

I think people recognize the Hubble telescope as one of the most significant technologies that is out there today that is helping us learn about the universe. For us to have a piece of that history is really important. We want to make the technology of the Hubble accessible to people. We want them to understand that it's not just some magical black box that gets us information. We want them to understand the basics of how it works. We also want to make people realize that it is technology designed by people to gain information that ordinary people can in some way understand.

**Maggie Masetti:** So, there you have it: One shuttle mission, and three space telescopes. The astronauts expect to return the telescopes they borrowed to the institutions that loaned them out. Maybe you'll see them on display one day in Chicago or Florence.

And with that, we bring this episode to a close. Check out our brand new website at [universe.nasa.gov/blueshift](http://universe.nasa.gov/blueshift) and tell us what you think. You can also find links and additional information on today's stories.

This is Maggie Masetti, bringing the universe closer to you with Blueshift.

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