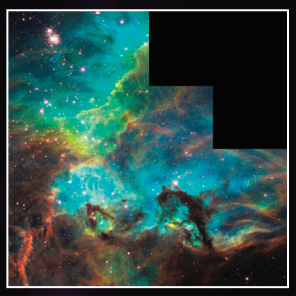
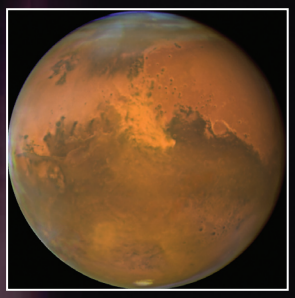
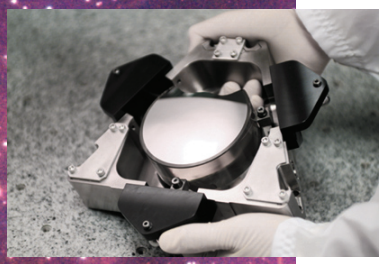
National Aeronautics and Space Administration

Hubble Spinoffs





Since its launch in 1990, NASA's Hubble Space Telescope (HST) has transformed our understanding of the universe with its clear, deep, and stunning imagery—including unprecedented views of our own solar system and remote fledgling galaxies formed not long after the Big Bang 13.7 billion years ago. Servicing missions have kept the large, space-based observatory in orbit and have greatly increased its capabilities, maintaining its role as one of the world's most scientifically valuable resources. With this final servicing mission, NASA reflects on some of the lesser-celebrated accomplishments of the orbiting observatory—commercial products that benefit us in ways as varied as semiconductor manufacturing, faster speed skating at the Olympics, and less painful medical procedures.



Mirror Technology Increases Semiconductor Productivity, Performance

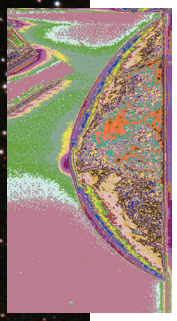
The semiconductor industry has benefitted from the ultra-precise mirror technology that gives the HST its full optical vision and telescopic power. This technological contribution helped improve optics manufacturing in microlithography—a method for printing tiny circuitry, such as in computer chips. The system uses molecular films that absorb and scatter incoming light, enabling superior precision and, consequently, higher productivity and better performance. This translates into better-made and potentially less costly computer circuitry and semiconductors.

Optics Tool Sharpens Record-Breaking Ice Skates

Current Olympic record-holding speed skater Chris Witty raced her way to a gold medal in the 1,000-meter at the 2002 Salt Lake City Winter Olympics. Witty and other American short- and long-track speed skaters used a blade-sharpening tool designed with the help of NASA Goddard Space Flight Center and technology from HST. NASA had met with the U.S. Olympic Committee and helped to develop a new tool for sharpening speed skates, inspired by principles used to create optics for the HST. Speed skates sharpened with this new instrument demonstrated a marked improvement over conventionally sharpened skates.

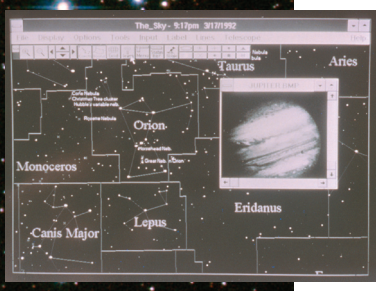
Micro-Endoscope Refines Medical Diagnosis

In 2004, the cutting-edge technology that enhances HST's images began helping physicians perform micro-invasive arthroscopic surgery with more accurate diagnoses. Through a Space Act Agreement with Glenn Research Center, a NASA partner refined its micro-endoscope, a tool that enables surgeons to view what is happening inside the body on a screen, eliminating the need for a more invasive diagnostic procedure that could add time, money, and discomfort to a patient's treatment.



CCDs Enable Clearer, More Efficient Biopsies

Charge coupled devices (CCDs) used on the HST to convert light into electronic files—such as a distant star's light directly into digital images—have been adapted to improve imaging and optics here on Earth. When NASA scientists realized that existing CCD technology could not meet scientific requirements for the Hubble's needs, the Agency worked with an industry partner to develop a new, more advanced CCD. The industry partner then applied many of the NASA-driven enhancements to the manufacture of CCDs for digital mammography biopsy techniques, using CCDs to image breast tissue more clearly and efficiently. This allows doctors to analyze the tissue by stereotactic biopsy, which requires a needle rather than surgery.



Hubble Software Powers Terrestrial Observatories

With the help of a software suite created by a NASA industry partner in 1995, students and astronomers were able to operate a telescope at the Mount Wilson Observatory Institute via the Internet. The software is still widely in use for various astronomy applications; using the CCD technology, the software locates, identifies, and acquires images of deep sky objects, allowing a user to control computer-driven telescopes and CCD cameras.