

Goddard Tech 12

Each month the Strategic Partnerships Office will tell the story of renowned innovators at NASA's Goddard Space Flight Center and how their technological breakthroughs are brought from the labs to our lives. During the James Webb Space Telescope's time at Goddard, technicians assembled and tested 18 large mirrors. The teams responsible for this part of the mission developed a system to test each mirror, and this system is now used in LASIK eye surgery.



The James Webb Space Telescope at NASA Goddard's largest clean room on May 4, 2016. Credit: NASA/Francis Reddy (Syneren Technologies)

The Technology

Infrared Scanning Shack Hartmann System

The James Webb Space Telescope (JWST) will be NASA's premier observatory of the next decade. With the infrared capabilities of the telescopes, scientists are hoping to observe the first galaxies that formed in the early universe. JWST will peer over enormous distances, requiring 18 large mirrors to work together. Construction of the mirrors involves the time consuming process of measuring, grinding, polishing and testing to be done over and over again.

To assist with the polishing, contracted WaveFront Sciences Company developed a system for the measurement testing of the mirrors after grinding. The innovation, called the Infrared Scanning Shack Hartmann System, was paramount in saving time and money on the mirror development process. The new technology measured a small part of the mirror and then created an image of the entire surface for analysis. This allowed for immediate testing after grinding, entirely eliminated one polishing step in the process and phased out the need to build giant reference mirrors, which saved resources. With an ability to enable faster and more precise measurements of complex surfaces, this innovative system is being used to improve machines which view the human eyes.

The Partnership

Johnson and Johnson

The mirror measurement technology developed during the JWST mission spun off into one of WaveFront Science's products called the Complete Ophthalmic Analysis System (COAS). This tool is designed to diagnose eye conditions and create a detailed map of the eye. The process of measuring small details of the James Webb Space Telescope mirrors lends itself well to measuring eyes.

After a series of acquisitions, the last being worth more than \$4 billion, and improvements to the original product, Johnson and Johnson now sells the iDESIGN system, an integral part of the iLASIK technology suite. Based off of JWST and COAS technologies, the iDESIGN in its current form is 25 times more precise than traditional glasses or contacts measurements and also saves time by recording five different measurements in just one capture sequence.



This laser vision product can map the human eye more quickly and accurately for Lasik vision correction. Credit: Abbott Medical Optics



Cleanroom workers at NASA Goddard pose with the James Webb Space Telescope mirrors. Credit: NASA/Chris Gunn

The Innovators

The James Webb Space Telescope Team

- Development efforts managed by the NASA Goddard Space Flight Center
- Team members from 14 countries
- John Mather — Senior Project Scientist
- 3 space agencies - NASA, ESA and CSA
- Bill Ochs — Project Manager
- Over 3,000 engineers, scientists and technicians