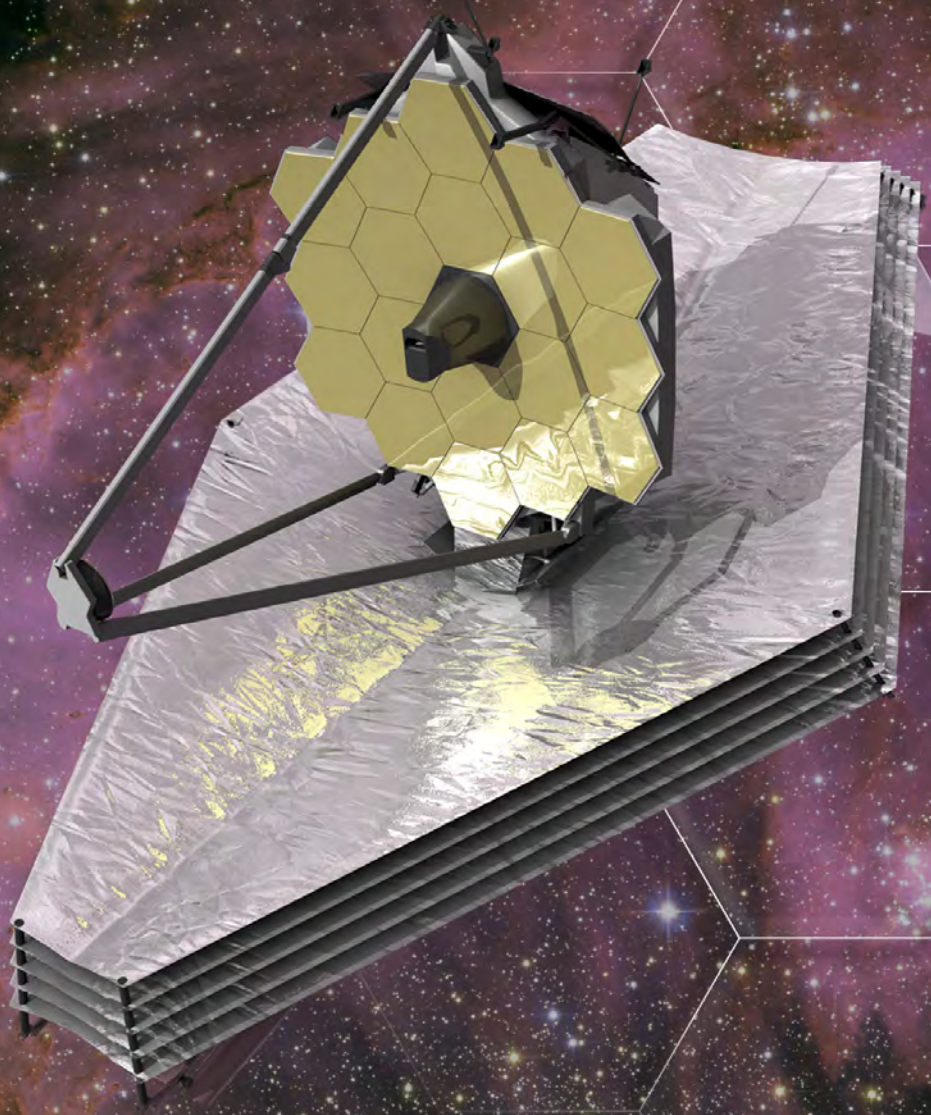
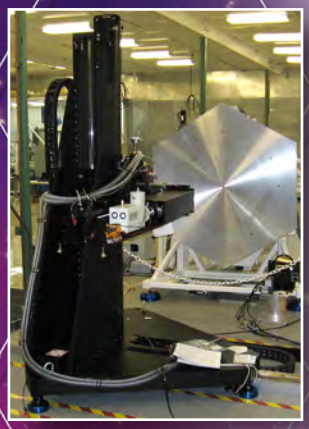
National Aeronautics and Space Administration

Webb Spinoffs



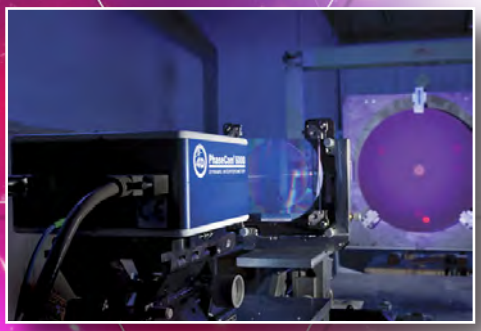
The James Webb Space Telescope is a large, infrared optimized space telescope and is the scientific successor to Hubble. Webb will find the first galaxies that formed in the early Universe, connecting the Big Bang to our own Milky Way Galaxy. Webb will peer through dusty clouds to see stars and planetary systems forming, connecting the Milky Way to our own Solar System. Webb's instruments will work primarily in the infrared range of the electromagnetic spectrum, with some capability in the visible range.

Webb will have a mirror that is 6.5 meters (21.3 feet) in diameter and a sunshield the size of a tennis court. The mirror and sunshield are larger than the width of the rocket used to launch them, so they will be folded up for launch and will deploy once Webb is in space.



Measuring Eyes: New Wavefront Optical Measurement Devices Lead to Medical Spinoffs

To accurately measure the shape of Webb's mirrors during manufacturing, significant new improvements have been made in the area of wavefront sensing technology. The measurement device is called a Scanning Shack-Hartmann Sensor. "The Webb telescope program has enabled a number of improvements in measurement technology for measurement of human eyes, diagnosis of ocular diseases and potentially improved surgery," said Dr. Dan Neal of Abbott Medical Optics Inc. in Albuquerque, NM. The Webb improvements have enabled eye doctors to get much more detailed information about the shape of your eye in seconds rather than hours. Four patents have been issued as a result of innovations driven by the Webb telescope program.

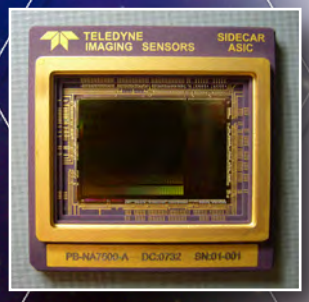


Laser Interferometers: High Speed Optical Sensors Lead to Commercial Applications

One of the toughest challenges for Webb engineers was to find a way to test mirrors and composite structures at the incredibly cold -450 degrees F temperature they will operate in space. With desired precisions of nanometers, vibration is a constant problem. To solve that problem, 4D Technology Corporation of Tucson, Arizona has developed several new types of high-speed test devices that utilize pulsed lasers that essentially "freeze out" the effects of vibration. According to 4D Technology CEO James Millerd, "The JWST program has been a tremendous benefit to creation of new technology and jobs beyond its direct funding...4D has gone on to generate over $30 million in revenue from a wide range of applications within the astronomy, aerospace, semiconductor and medical industries based on the technologies developed for JWST."

Restoring Hubble: Integrated Circuits Used in Camera Repair

Webb investments in cryogenic Application-Specific Integrated Circuits (ASICs) led to the development of the ASICs that are now flying on the Hubble Space Telescope. This is a unique example of "future heritage": a program in development (Webb) invented a technology for a program well into the operations phase (Hubble). ASICs are small, specialized integrated circuits that enable an entire circuit board's worth of electronics to be condensed into a very small package. Webb's investments into this technology allowed the ASICs to be programmable, which was important in the repair of Hubble's Advanced Camera for Surveys that has produced stunning views of our universe.



Astronomical Detectors: Webb Detector Technology is the Universal Choice

The benefits of the near-infrared detectors developed for Webb's instruments have already spread far and wide in the world of science. "Infrared sensors based on the technology developed for Webb are now the universal choice for astronomical observations, both from space and the ground," said Dr. James Beletic, Senior Director at Teledyne. This technology is also being used for Earth science and national security missions. An early pathfinder version of Webb's HAWAII-2RG 4 Megapixel array has been used in several NASA missions including Hubble, Deep Impact/EPOXI, WISE, and the Orbiting Carbon Observatory, and the HAWAII-2RG is already in use at dozens of ground-based observatories around the world. The availability of these high-performance detectors developed for Webb has been critical to a breathtaking collection of missions, both present and future.