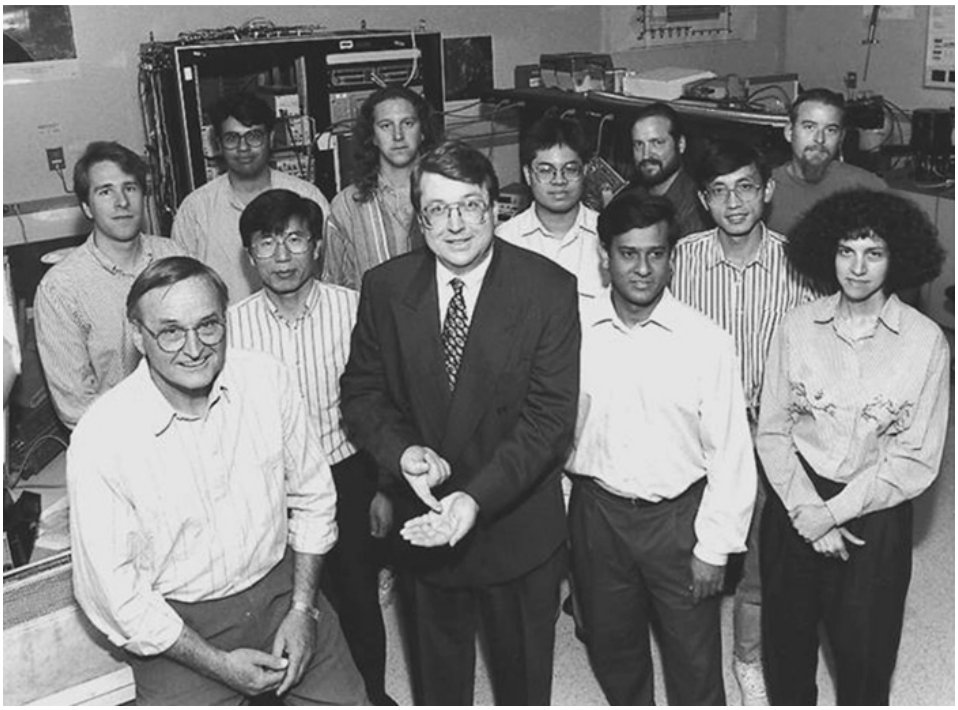
National Inventors Hall of Fame Taps Former JPL Engineer



Eric Fossum (front row, center) and his team at JPL discovered the image sensor chip in the early 1990s while researching ways to drastically reduce the size of cameras on interplanetary spacecraft.

The National Inventors Hall of Fame™ honors the women and men responsible for the great technological advances that make human, social and economic progress possible. Continuing to celebrate its mission of recognizing and fostering invention, the National Inventors Hall of Fame has announced its 2011 Inductees.

Eric Fossum, a professor of engineering at Dartmouth University, has been named a 2011 inductee into the National Inventors Hall of Fame. Fossum, a physicist and engineer, invented the complementary metal-oxide semiconductor (CMOS) active pixel image sensor used in almost all cell phone cameras, webcams, many digital still cameras and in medical imaging, among other applications. He worked at NASA's Jet Propulsion Laboratory and has been the CEO of two successful high tech companies. Fossum will be officially inducted at a ceremony to be held May 4, 2011, in Washington, D.C.

Eric Fossum and the Evolution of the Digital Age

Buzz Aldrin standing on the stark surface of the moon. The towering gas pillars of the Eagle Nebula. The rocky, rust-colored expanses of Mars. Among NASA's successes in space exploration have been the indelible images the agency's efforts have returned to Earth. From the Hubble Space Telescope to the Hasselblad cameras in the hands of Apollo astronauts, many of NASA's missions involve technologies that deliver unprecedented views of our universe, providing fuel for scientific inquiry and the collective imaginations of the world.

Eric Fossum

NASA has had an enormous impact on the era of digital photography on Earth. While the first digital camera was built by Eastman Kodak in 1975, the first to actually develop the concept of the digital camera was NASA's Jet Propulsion Laboratory engineer Eugene Lally, who in the 1960s described the use of mosaic photo sensors to digitize light signals and produce still images.

Then, in the 1990s, a team at JPL led by physicist and engineer Eric Fossum began researching ways to improve complementary metal-oxide semiconductor (CMOS) image sensors to drastically reduce the size of cameras on interplanetary spacecraft, yet maintain scientific image quality. The result was Fossum's invention of the CMOS active-pixel sensor (CMOS-APS), which integrates active amplifiers inside each pixel that boost the electrical output generated by the collected photons.

An image sensor contains an array of photo detectors called pixels that collect single particles of light, or photons. (The word "pixel"-short for picture element-was first published in 1965 by JPL engineer Frederic Billingsley.) The photons entering the

pixel are converted to electrons, forming an electrical signal, which a processor then assembles into a picture. CMOS sensors represented a number of appealing qualities for NASA compared to the charge-coupled device (CCD), the prevalent image sensor at the time.

CMOS sensors have more in common with a computer chip than with a conventional CCD. Since a CMOS sensor is made on standard semiconductor production lines, it taps into enormous economies of scale and costs much less than CCDs. One chip can incorporate all manner of electronic controls that are usually on multiple chips, from timing circuits to zoom. By consolidating many functions and reading images in a more efficient way, it requires one-hundredth the power of a CCD-based system. And the chip does its own conversion from analog to digital for output on computer monitors or disk storage. About all it needs are a power source and a lens to focus light on it.

Fossum realized the CMOS-APS technology would be useful not only for imaging in space, but on Earth as well. In 1995, he, his colleague and then-wife Sabrina Kemeny, and three other JPL engineers founded Photobit, based in Pasadena, Calif. Photobit exclusively licensed the CMOS-APS technology from JPL, becoming the first company to commercialize CMOS image sensors.

CMOS active-pixel sensor, "camera on-a-chip"

Smaller, faster, and cheaper works well for industry, which by June 2000 had shipped 1 million sensors for use in popular Web cameras, machine vision solutions, dental radiography, pill cameras, motion-capture and automotive applications. The low power needs of the APS allow doctors to track the onset of osteoporosis, or the dentist to perform dental imaging (x-rays) using less than one-hundredth the radiation dosage to the patient.

In 2001, the company was acquired by semiconductor memory producer Micron Technology, of Boise, Idaho, and became a division of Micron Imaging Group. With the exploding popularity of the camera phone in the mid-2000s, the CMOS-APS proved ideal for crafting cameras that fit into slim cell phones and produce good photos without draining batteries. Riding the wave of camera phone demand, in 2006 the group became the world's leading supplier of CMOS image sensors. In 2008, Micron Imaging Group was spun off from Micron to form Aptina Imaging Corporation, based in San Jose, California. That same year, it shipped its one-billionth sensor.

Aptina has continued to improve on the original, NASA-developed CMOS-APS. The company has invented the smallest pixel architectures, as well as a process for optimizing the amount of light that hits a pixel, boosting sensitivity and image quality while allowing the company's customers to design smaller and smaller camera systems.

Aptina has grown from its NASA roots into a leader of the CMOS image sensor industry. Its sensors are currently integrated into one of every three cell phone cameras and are contained in every major brand of personal computer camera worldwide, as well as many embedded cameras for notebook computers. This NASA-developed technology remains one of the most important spin-offs to private industry in the agency's history, and continues to push the boundaries of its benefits to the public every day.

Each year, the selection committee of the National Inventors Hall of Fame Foundation selects inventors for induction from a field of people nominated by peers and the public. The Selection Committee includes representatives from the leading national scientific and technical organizations.

The May 4 induction ceremony for this year's honorees will be held at the historic Patent Office Building, now the Smithsonian American Art Museum and the National Portrait Gallery, in Washington, D.C. The location is particularly appropriate because this year's class of inductees includes a group of 29 historical inventors who will be recognized posthumously, most of whom would have submitted patent applications to the same building where they will be honored.

About the Hall of Fame

The National Inventors Hall of Fame is the premier non-profit organization in America dedicated to honoring legendary inventors whose innovations and entrepreneurial endeavors have changed the world. Founded in 1973 by the United States Patent and Trademark Office and the National Council of Intellectual Property Law Association, the Hall of Fame will have 460 Inductees with its 2011 Induction. The National Inventors Hall of Fame and Museum is located in the atrium of the Madison Building on the campus of the United States Patent and Trademark Office, at 600 Dulany Street, Alexandria, Va. Hall of Fame hours are Monday through Friday from 9 a.m. to 5 p.m., and Saturday from noon to 5 p.m. (closed Sundays and federal holidays). Admission is free. For more information on the National Inventors Hall of Fame, including Inductee nomination forms, and a full listing of inductees, please visit http://www.invent.org.

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