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Eric Fossum: A Legacy of Innovation

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National Inventors Hall of Fame® (NIHF) Inductee **Eric R. Fossum**, inventor of the CMOS Active Pixel Image Sensor Camera-on-a-Chip, revolutionized the way people connect with each other.

Born in Simsbury, Connecticut, Fossum developed an interest in science from a young age. When he was in middle school, he fell in love with the subject while spending Saturdays at the **Talcott Mountain Science Center**. This opportunity allowed him to experience science in a tangible way through experiments and hands-on activities.

“That was really eye-opening for me. It inspired me to continue in that area,” Fossum said in an interview with NIHF. “When you do hands-on science, it’s fun, so it’s something you want to keep doing — that carries on for a lifetime.”

He went on to attend Trinity College, where he received a bachelor’s degree in physics and engineering in 1979. He then studied at Yale University, where he earned a Ph.D. in engineering and applied science.

Following his doctoral work, Fossum joined [Columbia University’s](#) electrical engineering faculty, where he and his students researched charge-coupled devices (CCD), focal-plane image processing and high-speed III-V CCDs — all of which eventually evolved into his pioneering CMOS imaging technology.

The Creation of the CMOS Image Sensor

In 1990, Fossum was recruited to NASA’s Jet Propulsion Laboratory (JPL) at the [California Institute of Technology](#) in Pasadena. At the time, NASA was experiencing problems with the CCDs they were building for the [Hubble Space Telescope](#) and needed to improve their reliability and imaging performance.

A few years into Fossum’s tenure at NASA, the agency began an initiative to build smaller rockets that required smaller instrument systems.

“For me at JPL, it meant how do we build cameras that were maybe the size of a bread box or larger and shrink it down to the size of a coffee cup?” Fossum recalled. “And not only reduce the physical size, but we wanted to reduce the amount of energy that it consumed, the power of the device, and improve its immunity from cosmic ray events and other events that affect image sensors in all semiconductors in space.”

Through this challenging task, Fossum discovered that the best way to enable this miniaturization was to develop a new kind of imaging technology — one where the processing of light into a digital signal is all done within a single chip. It was from this desire to create an all-in-one solution that the CMOS image sensor was born.

Bringing CMOS to the World

Because CCD technology had been the standard digital imaging technology for such a long time, the initial reception of a CMOS image sensor was tepid at best.

“There was a lot of resistance initially in the community, that CMOS image sensors would be better than CCDs,” Fossum said. “It was a long, uphill fight to prove that to everybody.”

Realizing the potential of CMOS to improve digital cameras for the consumer market, Fossum licensed the technology from Caltech and started a company called Photobit in 1995. This same year, he was granted a U.S. patent for the active pixel sensor.

Because this technology had many different applications, Fossum’s company grew very quickly. With the popularization of cell phone cameras beginning in the early 2000s, it became clear right away that the CMOS image sensors were a revolutionary piece of technology.

Today, CMOS image sensors are found in most digital cameras and are used in over 90% of camera phones. A staggering 5 billion cameras or more are made every year using CMOS image sensor technology, and billions of pictures are uploaded to the internet each day thanks to the accessibility of digital photography.

“It becomes kind of surreal, that you see practically everybody on the planet using this technology to take pictures and have fun and share images with other people,” Fossum said.

A Legacy of Innovation

In 2011, Fossum was inducted into the National Inventors Hall of Fame. His invention is honored alongside other NIHF Inductees’ work in the [Intellectual Property Power™ exhibition](#) at the [NIHF Museum](#). Fossum also visits NIHF’s [Camp Invention®](#) program and serves as a judge for the [Collegiate Inventors Competition®](#), influencing and inspiring the next generation of innovators.

Today, Fossum holds many positions at Dartmouth College: Associate Provost for the [Office of Entrepreneurship and Technology Transfer](#); Director of the [Ph.D. Innovation Program](#); and the John H. Krehbiel Sr. Professor for Emerging Technologies.

He believes in the importance of giving back and illustrates this by generously donating to NIHF and volunteering at Camp Invention sites across the country.

“I find it very satisfying to develop people, their skills, and help them move up in their career or their success in life. Whether it’s young kids at Camp Invention, or it’s college students, or it’s Ph.D. students or it’s fellow faculty members — it’s all the same process, and it’s equally rewarding at every level,” Fossum said.

To learn more about Eric Fossum, and the story of how he changed digital photography forever, we invite you to [watch this video!](#)

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