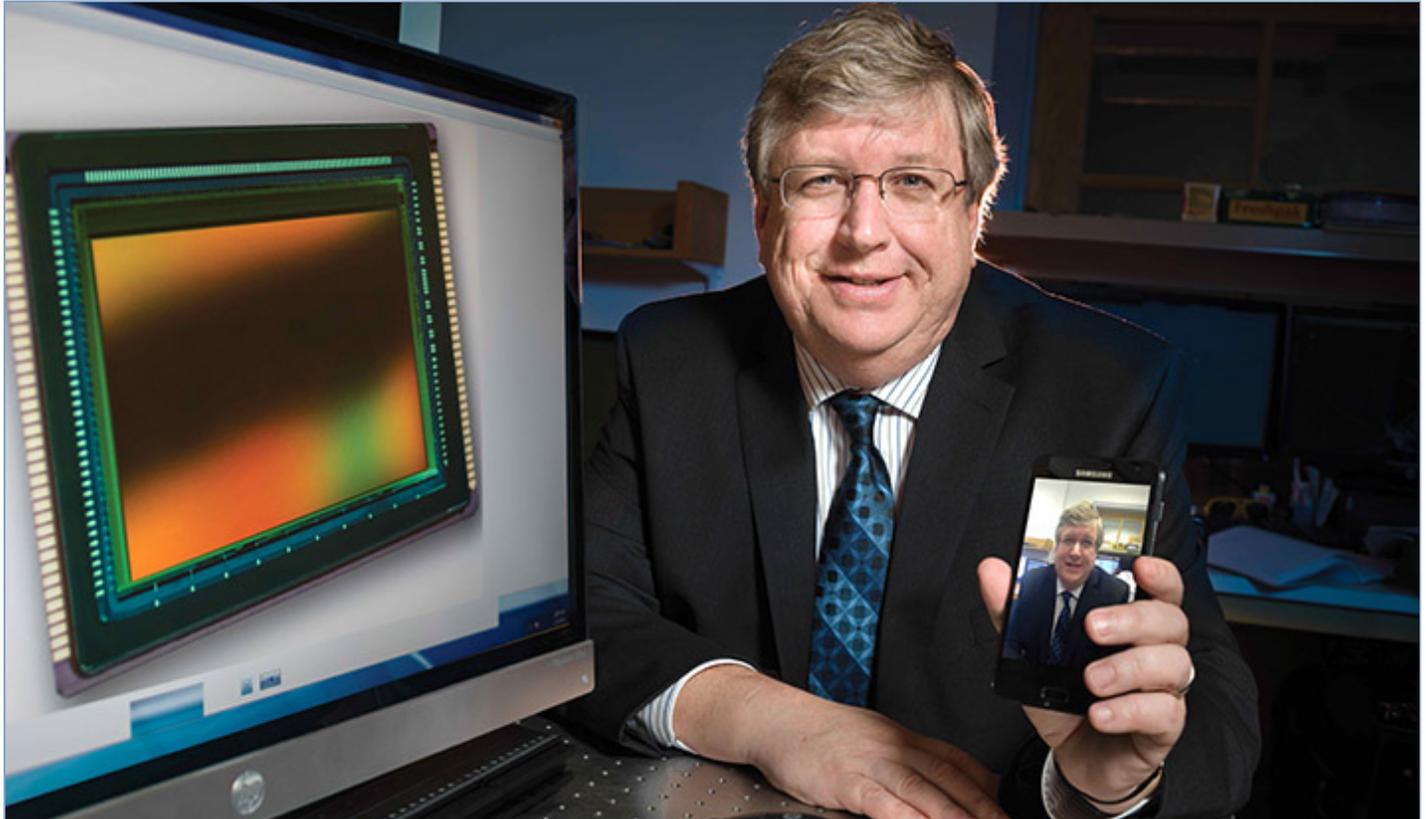


Yale alum wins 'Nobel Prize' of engineering honors (or Ma-Barker gang member makes good)

By William Weir

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Eric Fossum sees people using the technology he developed every day.

You may not know what complementary metal-oxide semiconductor (CMOS) active pixel image sensors are, but chances are you use them a lot. The “camera-on-a-chip” technology makes possible everything from selfies to dental x-ray cameras.

Its inventor, Eric Fossum, who received his Ph.D. in engineering and applied sciences at Yale in 1984, has been named a co-recipient of the Queen Elizabeth Prize for Engineering. Fossum will receive the award — often referred to as the equivalent of the Nobel Prize for the field of engineering — at Buckingham Palace. The £1 million prize is awarded for groundbreaking innovations that have benefitted humanity. Fossum’s co-winners, George Smith, Nobukazu Teranishi and Michael Tompsett, have also contributed to digital sensor technology.

While at Yale, Fossum spent most of his time with the “Ma-Barker gang,” so named for the group’s advisers, Tso-Ping Ma, the Raymond John Wean Professor of Electrical Engineering & Applied Physics, and Richard C. Barker, now professor emeritus of electrical engineering & applied physics.

“I look back at my grad student days as some of the best days in my professional career,” Fossum said. “It was a great group that they had assembled. We would dig into the work and try to answer questions that could take days, weeks, or months. We’d come in at morning and stay until late at night.”

Now a professor at the Thayer School of Engineering at Dartmouth College, Fossum developed the CMOS technology during the 1990s when he was at NASA's Jet Propulsion Laboratory (JPL), and was charged with finding a way to miniaturize the interplanetary spacecrafts' cameras. There was a particular emphasis at the time on going "faster, better, cheaper," and lessening the payload was critical to that goal.

"The charge-coupled device cameras on the spacecrafts were physically large and consumed a lot of power and energy and a fair amount of mass," Fossum said.

Fossum's CMOS technology not only succeeded in enabling smaller cameras on spacecraft, it would go on to make many other things possible on Earth. In 1995, Fossum co-founded Photobit Corp. to commercialize the camera-on-a-chip technology. It's now used in nearly all camera phones and webcams, digital-still cameras, high-speed motion capture cameras, and automotive cameras. Some of the potential applications were immediately apparent, Fossum says. Others, like the swallowable pill camera — often used by gastroenterologists to take images from within the intestines — took him by surprise.

The technology didn't truly take off until cameras became a regular feature of cell phones. Now, of course, Fossum can't leave the house without encountering the technology he made possible.

"Every now and then it strikes me," he said. "I was in London yesterday for the announcement of the prize with another recipient, and a mother was taking a picture of her daughter in front of a landmark. We said 'Should we stop and tell her that two of the key inventors are right here?'"

A Connecticut native, Fossum grew up in Simsbury. He developed his interest in applied science early on, thanks in part to his father, an engineer and entrepreneur. He also spent his Saturdays at the Talcott Mountain Science Center in Avon, where he learned about computers and programming. He received his B.S. in physics and engineering at Trinity College in Hartford.

He still keeps in touch with members of the Ma-Barker Gang, including his former office mate, Tze-Chiang (T.C.) Chen, now a vice president of science and technology at IBM. Another member of the group, C.C. Wei, is now the co-CEO and president of Taiwan Semiconductor Manufacturing Company Limited, which also happens to be one of the biggest manufacturers of CMOS image sensors.

Fossum currently serves on the Yale University School of Engineering & Applied Science Leadership Council, led by T. Kyle Vanderlick, dean of the School and the Thomas E. Golden Jr. Professor of Engineering. He was also the 2011 Victor M. Tyler Distinguished Lecturer in Engineering in 2011.

"It's was all a positive experience at Yale, so it makes it very easy to want to give back," he said.

As for ongoing research, Fossum is working on the Quanta image sensor, which counts individual photons on a sensor chip at room temperature — technology that could have applications in very low-light imaging for security and aerospace purposes.

His many other honors include the 1996 NASA Exceptional Achievement Medal; induction into the U.S. Space Foundation Technology Hall of Fame in 1999 and the National Inventors Hall of Fame in 2011; and the Wilbur Cross Medal from Yale in 2014.

In past years, the Queen Elizabeth Prize has gone to innovations to the Internet and controlled drug delivery. In addition to highlighting the importance of engineering, the prize is intended to inspire young people to get involved in the field.



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