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Yale grad wins world's largest engineering award

CAITLIN WESTERFIELD | FEB 17, 2017
STAFF REPORTER

On Feb. 1, Yale graduate Eric Fossum GRD '84 was awarded the Queen Elizabeth Prize for Engineering, a £1 million award that is the largest engineering prize in the world and focuses on honoring engineers whose innovations have benefitted humanity.

Fossum was selected for the award based on his invention of the "camera-on-a-chip" technology that is now used worldwide across a range of industries, from medical equipment to self-facing cameras on cell phones.

"[Fossum] epitomizes the Yale engineering spirit, having made impactful technological advances while all the while being mindful of the societal implications," said T. Kyle Vanderlick, the dean of the School of Engineering and Applied Science. "Bringing smartphone camera technology to the masses, as he has done, has fundamentally shaped human behaviors in both expected and unexpected ways."

Fossum developed his technology while working in NASA's Jet Propulsion Laboratory in the 1990s. At the time, NASA was using a charge coupled device, or CCD, for imaging on interplanetary spacecraft, but Fossum reformed the device because it was too large and required too much power.

To accomplish this, Fossum integrated aspects of the CCD technology to improve CMOS, a complementary metal-oxide semiconductor on which he had worked while a graduate student at Yale.

"That was the mother of the invention, which was to try to miniaturize these cameras by integrating mainstream microelectronics onto the same chip as the image center," Fossum said.

Fossum is now an engineering professor at Dartmouth College. He also serves on the Yale University School of Engineering & Applied Science Leadership Council.

During his time at Yale, Fossum studied under Richard Barker '50 GRD '55 and Tso-Ping Ma GRD '74 in a group called the "Ma-Barker Gang," a pun based on Kate 'Ma' Barker, the famous mother of several criminals in the Barker Gang. The group worked primarily with CMOS.



“He was very much interested in hands-on, experimental projects,” Ma said. “But later on, when he took my classes, I found out that he also had a very solid theoretical background.”

This sentiment was echoed by Tze-Chiang Chen GRD '85, who was also in the “Ma-Barker Gang” with Fossum and is now the vice president of science and technology at IBM’s Thomas J. Watson Research Center. He said he remembers the way that Fossum would take something theoretically challenging and then integrate it with engineering.

Ma cited Fossum’s thesis as an example, which was focused on the idea of “smart pixels” as simplistic sensors that could receive photons and then produce images. While scientifically correct, the actual hardware did not yet exist at that time to implement his concepts, Ma said.

“Theoretically, from what he did as his thesis, he was on his way to making a camera on a chip,” Ma said.

He said he is now researching ways to create the “next-generation image-sensor technology” by individually counting photons as they hit a chip. With this information, it should be possible to make a map of where the photons hit the sensor chip and then create a high quality digital image, he added.

Fossum’s co-recipients are George Smith, Nobukazu Teranishi and Michael Tompsett, all of whom also contributed to the dawn of digital imaging and to Fossum’s sensor technology, according to a Feb. 1 press release from the Queen Elizabeth Prize for Engineering.

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