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Everyone's Pocket

Kate Samuelson

Feb 01, 2017



Next time you're photographing your brunch, perhaps you should use the hashtag #Fossum. After all, if it hadn't been for Eric Fossum you wouldn't be able to Instagram that avocado on toast in such crystal clear precision, and your camera phone would likely be the size of a briefcase.

Now U.S. engineer Fossum, along with George Smith (also from the U.S.), Nobukazu Teranishi (Japan) and Michael Tompsett (U.K.) have been recognized for transforming photography from something expensive and exclusive to an activity so simple, inexpensive and accessible that billions of photos are now taken and shared each day.

The four inventors were **today awarded the Queen Elizabeth Prize** – a prestigious award that celebrates ground-breaking innovation in engineering that has been of global benefit to humanity – for revolutionizing the way we capture and analyze visual information via the inventions of the charge coupled device (CCD), the pinned photodiode (PPD) and the complementary metal oxide semiconductor (CMOS) image sensors.

Back in the 1970s, when Smith, Tompsett and Willard Boyle (who is now deceased) invented the CCD image sensor technology, the notion of a high-quality, low-cost and tiny camera, such as the one we have in our smartphones today, was unimaginable.



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pockets? No. What's happened over the last 40 or 50 years is the technology has continued to improve – image sensors are now all over the world."

In 1992, around two decades after the CCD was invented, Fossum developed the CMOS sensor – a digital image sensor that allows cameras to be made smaller, cheaper and with better battery life, as each pixel has its own transistor that transmits information from each cell to the processor (rather than one transistor in the corner of the sensor, which is how the CCD works).

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"The CDD was really one of the foundational building blocks of the CMOS," Fossum tells TIME. "I invented the technology while working at the NASA Jet Propulsion Laboratory (JPL), while trying to improve the performance of cameras in space to make them more resistance to radiation, smaller and reliant on less battery power."

Every second, around 100 cameras are made using CMOS technology, allowing us to share in excess of three billion images a day. "Digital image sensors started out being completely out of the ball park in terms of cost, but technology has got so much cheaper and better that they can now make these devices for a few dollars," says Tompsett.

"I knew [the CMOS image sensor] would be useful for all kinds of things, but everyday I am still astonished by how widespread the technology is and in how many different places it's being

by counting photons one at a time, which could help in a lot of scientific imaging. It's still a research lab kind-of-thing. It's coming along nicely, but you're probably still at least five years away from finding it in the very first camera. If that's successful, it's probably at least five years before it's used in multiple cameras."

But, that doesn't mean quantum image sensors will inevitably enter the consumer world. "The problem with competing with old technology is that old technology is really good," explains Fossum. "In order to replace existing or incumbent technology, you really need to have compelling advantages. So I don't know yet whether or not the quantum image sensor will be compelling for consumer organizations over the CMOS – that can take a time to figure out."

Even NASA will not get excited about new technology. "The space program is very conservative in adopting new technology," says Fossum. "If it's hard for consumer electronics to get a new technology used, it's even harder in space applications. This is mainly because it takes so long and costs so much to build, fund and fly these space instruments that nobody wants to take much risk with the products." "There's no repair man in space," adds Tompsett.

Tompsett and Fossum hope that learning about the prize and their achievements will encourage future STEM students to work hard at their studies and pursue careers as engineers.

"In school, children are often taught to get the right answer – but in engineering and invention you don't often get the right answer at the right time," Fossum says. "It took us several years to get CMOS right and that was just in the research lab – it took even longer to get it right in a commercial and manufacturing sense. You have to repeat and try again. It's really important for students and teachers to learn and understand that lesson."

Kate Samuelson is a reporter at TIME based in London. Follow her on [Twitter](#).

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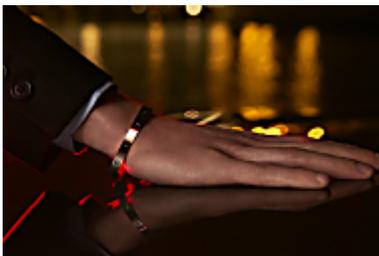
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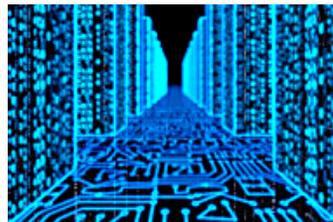
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U.S.

Too Many Tourists Are Spoiling Maui's Most Magical View

Mark Twain described sunrise from Haleakala, Maui as the "sublimest spectacle" he'd ever seen. But more than a thousand visitors now flock to the Hawaiian volcano each morning, resulting in traffic jams, safety hazards and dangers to a delicate habitat, park officials say

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It Looks Like Instagram Is Adding a Powerful New Feature

Instagram users may soon be able to post multiple images in a single post, if a recent discovery in a beta release of the app goes public. The feature works by letting users select up to 10 images,

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Nordic Noir: Fleeing the Darkness in Scandinavia

Sebastien Van Malleghem's photographs can tend to have a darkness to them. In recent years, the Belgium photojournalist has documented his country's prisons and its police force. In

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The Story Behind the 'Rumble in the Jungle' Fight

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The Story Behind the 'Rumble in the Jungle' Fight

It was advertised as “The Rumble in the Jungle.” The 25-year old powerhouse vs. the aging 32-year old. The late Muhammed Ali and George Foreman were preparing to duke it out on the ring

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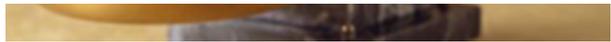
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POLITICS

Trump Vows to Scrutinize 'Dumb' Refugee Deal After a Reportedly Hostile Call with Australia's Leader

Following new public details about a recent phone conversation with Australian leader Malcolm Turnbull, Trump took to Twitter Wednesday to criticize a deal brokered between Australia and the administration of former President Barack Obama to resettle some refugees in the U.S.

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NEWSFEED

Beyoncé's Pregnancy Photo is Reportedly the Most Liked Picture Ever on Instagram

On Wednesday night, Beyoncé Knowles took to Instagram to announce that she was pregnant — not with one child but with twins. Within eight hours, the photo had accrued more than 6.6 million likes, reportedly more than any image ever posted to Instagram

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U.S.

Parole Officials Recommend Release of Charles Manson Follower Bruce Davis

A parole panel recommended the release of Bruce Davis, a former follower of cult leader Charles Manson after California governors blocked four previous parole recommendations. California governor Jerry Brown has the final say over whether he can be released

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POLITICS

Republican Senators Rush Two Trump Cabinet Nominees Through the Finance Committee

Republicans jammed two top Cabinet nominees through the Senate Finance Committee with no Democrats in the room Wednesday. Steve Mnuchin and Tom Price now need to be confirmed to their posts by the full Senate

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POLITICS**Trump Attends the Return of the Remains of the Navy SEAL Who Died in Yemen**

President Donald Trump made an unannounced trip Wednesday to attend the returning remains of William Owens, a U.S. Navy SEAL killed in a weekend raid in Yemen. More than a dozen civilians dead, including an 8-year-old girl, were killed in the raid

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WORLD**Justin Trudeau Just Broke a Major Campaign Promise**

Canada Prime Minister Justin Trudeau broke a significant campaign promise to reform the country's electoral system, in a move an opposition party called a "betrayal." Trudeau on

U.S.

100,000 Pittsburgh Residents Told to Boil Their Tap Water

About 100,000 Pittsburgh residents have been unable to drink tap water without boiling it first because of potential contamination concerns. The Pittsburgh Water and Sewer Authority issued an

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