Bryce Bayer, Kodak scientist who created ubiquitous Bayer Filter for color digital imaging, has passed away

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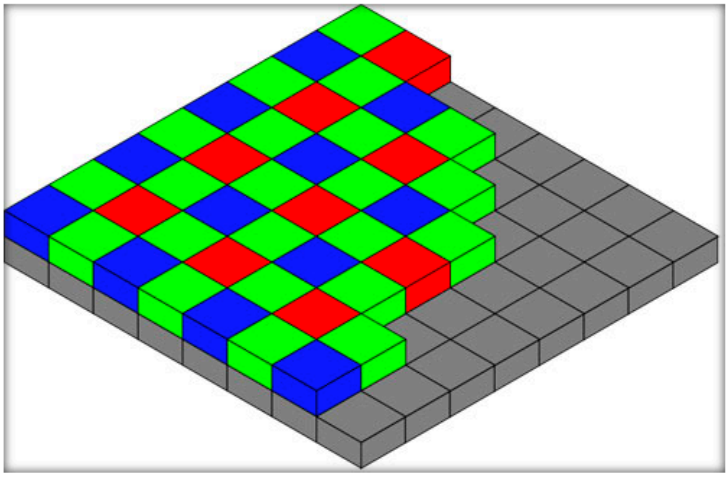
Bryce Bayer, the Eastman Kodak scientist who invented a now ubiquitous color filter for digital photography that bears his name, has passed away. Bayer, 83, died on November 13th in Bath, Maine.

Known as the Bayer Filter, Bayer's invention is still used in nearly every digital camera, video camera and camera phone on the market today. The Bayer Filter array was patented in 1976 (U.S. Patent No. 3,971,065) and features a checkerboard arrangement of red, green, blue filters that enable a single CCD or CMOS imaging sensor to capture color images.

The three color filters in Bayer's array are needed to create color from the greyscale image information that's captured by the imaging chip. Prior to Bayer's invention, three separate sensors attached to a beam splitter were required to capture a color image but that set-up was too large and expensive to find mass appeal.

Bayer's more economical array is designed to mimic how the human eye perceives color, with a filter pattern of 25% red, 50% green, and 25% blue, which is typically known as RGB. (The extra green pixels are because the luminance channel of the human visual system is centered in the green portion of the spectrum, and it's the luminance signal that contributes most to our perception of detail.) The color filters are fabricated directly on top of the light-sensitive pixels in the image sensor as it's manufactured.



The Bayer arrangement of color filters on the pixel array of an image sensor.

An image captured with a Bayer-filter camera is known as a Bayer pattern image. This raw sensor output must then be interpolated using demosaicing algorithms for the sensor to produce an accurate image, with full red, green, and blue image data for every pixel.

Along with his color imaging work, Bayer developed key algorithms for storing, enhancing, and printing digital images.

Bayer retired from Kodak in the 1990s after a long career at the company. We salute Bryce Bayer for his huge contribution to digital imaging; a significant portion of the entire human population benefits from his invention every day. We offer sincere condolences to his family.

Bryce Bayer, Inventor of a Filter to Make Color Digital Pictures, Dies at 83

BY DENNIS HEVESI
NOVEMBER 29, 2012

Bryce Bayer, a retired Eastman Kodak research scientist who invented the checkerboard-like filter that has allowed millions of digital cameras to capture vivid color images, died on Nov. 13 in Bath, Me. He was 83.

The cause was a long illness related to dementia, his son Douglas said.

"Without his invention we'd still be getting only black-and-white pictures from our digital cameras," Larry Scarff, a former chairman of the Camera Phone Image Quality Standards Group, an industry organization, said of Mr. Bayer on Wednesday. "Ninety-nine point nine-nine percent of all digital cameras — cellphones, pocket cameras, webcams and consumer digital video cameras — use the Bayer pattern to produce color pictures."

Mr. Bayer (pronounced BYE-er), who began tinkering with cameras like the Brownie as a boy, had been at Kodak for 23 years when, in 1974, he completed his design for a device that captured detailed color images. It is known throughout the industry as the Bayer filter.

"The pattern is very simple," said Ken Parulski, who was chief scientist for Kodak's digital camera division until he retired in June: a grid of four boxes — each a light-sensitive element formed on a silicon chip — with two diagonally placed green elements, one red element and the fourth one blue. Light passing through the elements is filtered into an array of colors.

"There are twice as many green elements as red or blue because this mimics the way the human eye provides the sharpest overall color image," Mr. Parulski said. And, he added, while dozens of alternative patterns have since been developed — including some by Mr. Parulski himself — "the Bayer pattern has stood the test of time."

In 2009, the Royal Photographic Society of Britain presented Mr. Bayer with its Progress Award. This year, he received the first Camera Origination and Imaging Medal from the Society of Motion Picture and Television Engineers.

The Bayer filter received Patent No. 3,971,065 in 1976. A year later, Steven Sasson and Gareth Lloyd, two other Kodak researchers, received Patent No. 4,131,919 for their design of the first digital camera — a black-and white device that later incorporated the Bayer filter.

"Bryce was thinking about the problem of getting pieces of silicon to capture color images for photography long before the solid-state image sensors that were invented in the late '60s," Mr. Sasson said.

Bryce Edward Bayer was born in Portland, Me., on Aug. 15, 1929, to Alton and Marguerite Willard Bayer. He received a bachelor's degree in engineering physics from the University of Maine in 1951, then moved to Rochester to begin a 35-year career with Eastman Kodak. There he met Joan Fitzgerald, another Kodak researcher; they married in 1954. Mr. Bayer went on to earn a master's degree in industrial statistics from the University of Rochester in 1960.

Besides his wife and his son Douglas, Mr. Bayer is survived by another son, David; a daughter, Janet Bayer; a sister, Margery Parks; and three grandchildren.

At Deering High School in Portland, from which he graduated in 1947, Mr. Bayer spent much of his time in the school darkroom. "He, in fact, processed all of the pictures for his high school yearbook," his son David said. ■