

Digital Image Sensor

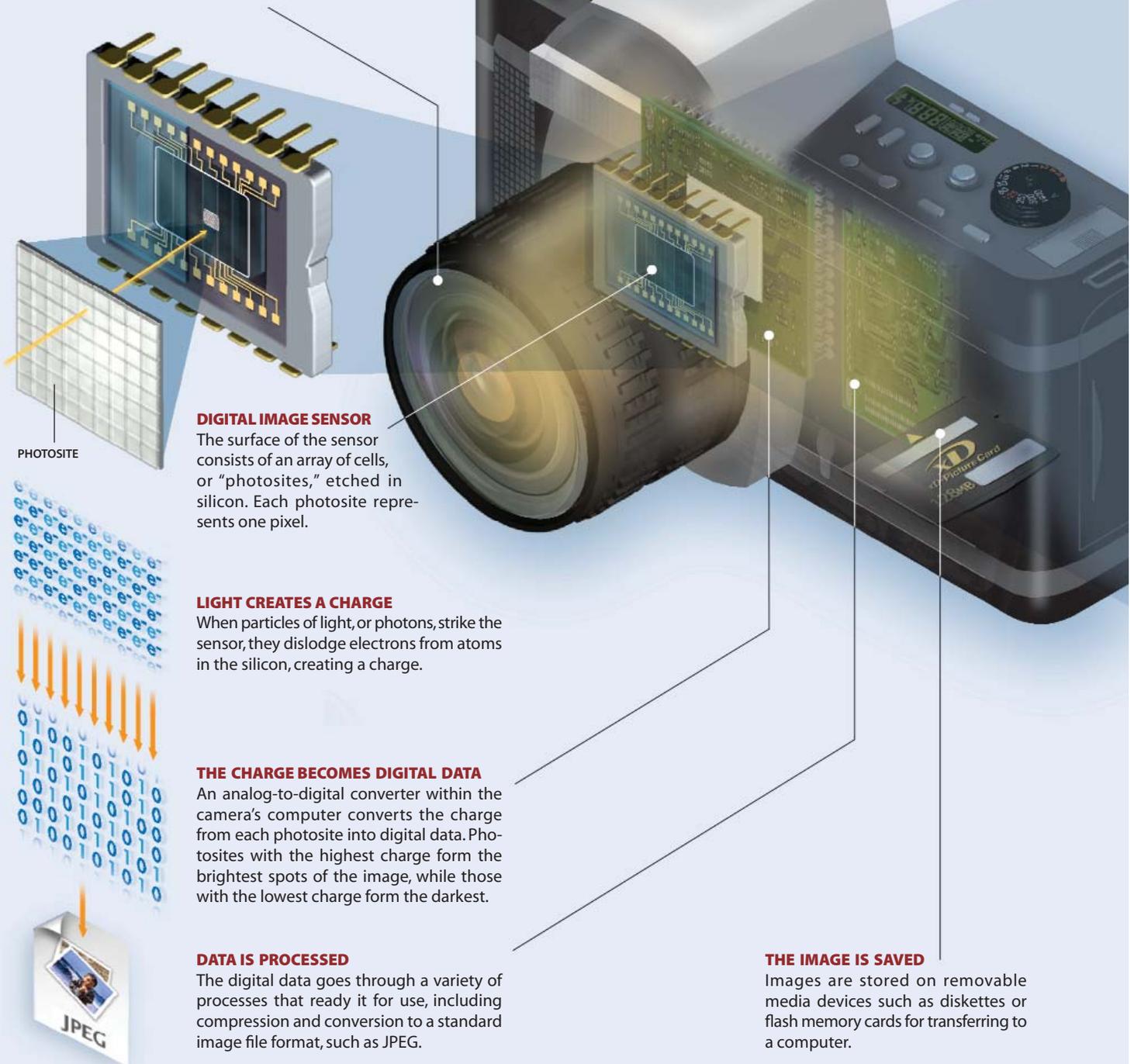
In North America, digital cameras may nearly replace film cameras by 2008, according to InfoTrends/CAP Ventures, a digital-imaging market research firm in Weymouth, MA. The trend is being fueled partly by improvements in the digital sensors that capture images in lieu of

film. The latest sensor is the X3 from Santa Clara, CA-based Foveon. It has three layers of silicon, as opposed to one in conventional sensors, which produce sharper, truer-colored photos. Until now the X3 was used only in professional-grade cameras, but Foveon partnered with Polaroid and this summer released an X3-based camera that retails for about \$400. Here's how it works, and how it compares to conventional digital technology and to film. **TEXT AND ART BY 5W INFOGRAPHIC**

INSIDE A DIGITAL CAMERA

LIGHT ENTERS

When the shutter of the camera opens, a series of lenses focuses light onto the digital image sensor.



PHOTOSITE

DIGITAL IMAGE SENSOR

The surface of the sensor consists of an array of cells, or "photosites," etched in silicon. Each photosite represents one pixel.

LIGHT CREATES A CHARGE

When particles of light, or photons, strike the sensor, they dislodge electrons from atoms in the silicon, creating a charge.

THE CHARGE BECOMES DIGITAL DATA

An analog-to-digital converter within the camera's computer converts the charge from each photosite into digital data. Photosites with the highest charge form the brightest spots of the image, while those with the lowest charge form the darkest.

DATA IS PROCESSED

The digital data goes through a variety of processes that ready it for use, including compression and conversion to a standard image file format, such as JPEG.

THE IMAGE IS SAVED

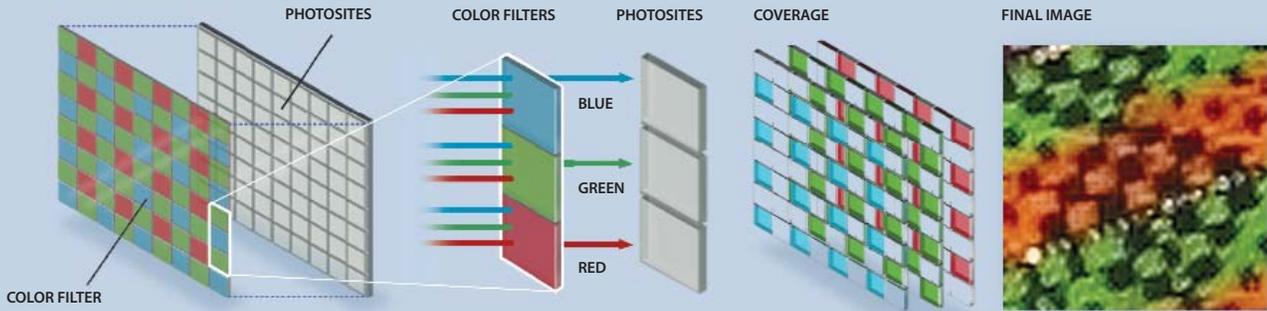
Images are stored on removable media devices such as diskettes or flash memory cards for transferring to a computer.

SENSING COLOR: THE DIFFERENT WAYS

Conventional digital sensors use color filters in red, green, and blue, because while photosites can record the intensity of light, they cannot detect color. But the Foveon X3 does not use filters; rather, it employs

three layers of photosites that absorb red, green, and blue wavelengths of light, respectively. The technology is similar to film, which has three layers of chemical emulsion sensitive to color.

Conventional Digital Image Sensor

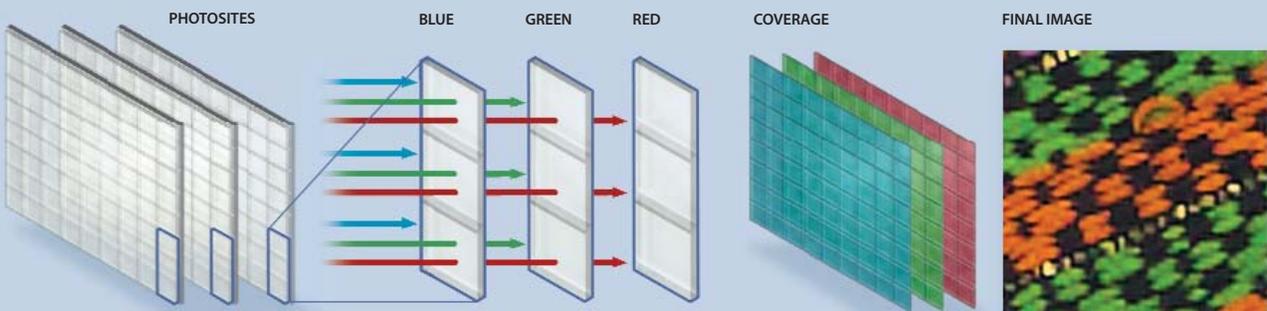


Color filters are applied to a single layer of photosites in a mosaic pattern that uses two green filters for every red or blue filter because the human eye is more receptive to green.

Each filter lets only one color of light pass through to the photosite underneath. The photosite records the intensity of that color at that spot.

Because the sensor captures only 25 percent of the red and blue light and 50 percent of the green, an image processor must fill in the undetected colors using mathematical interpolation. The resulting image can be blurred and discolored.

Foveon's X3 Sensor



Three layers of light-sensitive photosites embedded in silicon collect light.

Each layer captures a different wavelength of light.

Every pixel in the final image contains color data gathered by one photosite in each of the three layers, resulting in sharper images with more color details.

Film

Color film has three layers of chemical emulsion composed of millions of light-sensitive silver-salt crystals. Each layer is sensitive to a different color of light, enabling the film to record red, green, and blue light at every point in the image.

