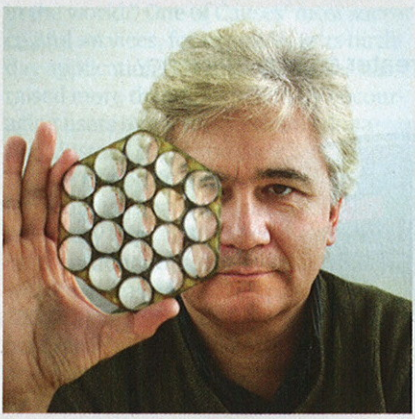
Innovator

Todor Georgiev



With a plenoptic lens and special software, the Adobe researcher can make a blurry photo look crisp even after the shutter's been clicked

The sun sinks to the horizon, the surf crashes, a pelican flies by, and—snap—you catch the perfect moment in a photo. It's only later that you realize it's completely out of focus.

Todor Georgiev's work at Adobe Systems may make such frustrations a thing of the past. As a senior research scientist with the company's Photoshop Group, Georgiev is experimenting with plenoptic lenses. His plenoptic lens is actually an array of thousands of micro-lenses carved into a silicon wafer. With one shutter click, it captures thousands of variations—different exposures or depths of field, for instance—of the same image.

The technology has been around for a few decades, but Georgiev is pushing it further. Working with Andrew Lumsdaine, a computer scientist at Indiana University, he has built specialized software to interpret plenoptic photos and enable after-the-fact alterations. In an online video demonstrating the technology, Georgiev projects a picture of a field with a young girl in the foreground and beehives off in the distance. By adjusting a few values on a computer, Georgiev brings the girl into focus. A few adjustments more, and the beehives become crisp while the girl's image blurs.

It's a stepping-stone on the way to Georgiev's goal of designing a camera that can "capture all available optical data" with a single click of the shutter. Though cameras have become digital, they're still limited by physical hardware, namely lenses, which are expensive and difficult to produce. Plenoptic lenses will eventually be manufactured using techniques similar to those used in the semiconductor industry, says Georgiev, and will benefit from economies of scale once the technology catches on. "Things that were mechanical become digital," says Georgiev. "The abacus became a calculator. It feels like optics are now becoming digital."

Georgiev was born and raised in Bulgaria and went on to study quantum physics at Southern Illinois University. Eventually he realized it was going to be tough to find a job in basic science, and he returned to school for a master's in computer science. As a software engineer at Adobe in the early 2000s, he helped develop Photoshop's "heal" tool, a utility for photographers who need to correct scratches, wrinkles, or other blemishes on their images. He then started tinkering with plenoptic lenses at home in his garage, and eventually persuaded Adobe to let him work on his hobby full-time.

Adobe may decide to license the technology to camera and lens manufacturers, says Kevin Connor, a vice-president for digital imaging, though profits aren't the primary motivation. He believes Adobe will benefit from Georgiev's research indirectly as his insights find their way into new software products. Including, perhaps, a tool that helps fix your not-so-perfect shot of the sunset. B

—Barrett Sheridan

Education ▶ Studied quantum physics before switching to computer science

Success ▶ Helped develop the popular "heal" tool in Adobe's Photoshop

Technology ▶ Plenoptic lenses capture thousands of variations of an image