

Samuel Achilefu, WUSTL scientists develop high-tech glasses that detect cancer cells during surgery

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A team of scientists at Washington University School of Medicine in St. Louis (WUSTL) and the University of Arizona (UA) in Tucson led by SPIE Fellow **Samuel Achilefu** have created a pair of high-tech glasses that help surgeons visualize cancer cells during surgeries, which glow blue when viewed through the glasses.

Achilefu, a professor of radiology and of biomedical engineering at WUSTL and co-leader of the Oncologic Imaging Program at Siteman Cancer Center, and his team developed the technology that incorporates custom video, a head-mounted display, and a targeted molecular agent injected into a patient that attaches to cancer cells, making them glow.

Viktor Gruev, SPIE Member and assistant professor of engineering at WUSTL, and **Rongguang Liang**, SPIE Fellow and professor of optical engineering at UA, assisted with development of the glasses. WUSTL graduate students **Suman Mondal**, **Shengkui Gao**, and **Yang Liu** and UA postdoctoral fellow **Nan Zhu** also played key roles. Mondal and Gao are members of SPIE

Achilefu, along with SPIE Member **Ramesh Raghavachari** of the U.S. Food and Drug Administration, has chaired the conference at [SPIE Photonics West](#) [1] on Reporters, Markers, Dyes, Nanoparticles, and Molecular Probes for Biomedical Applications since its introduction in 2009.

Achilefu has also published extensively in SPIE publications such as the *Journal of Biomedical Optics*, including the 2013 study he coauthored as part of a special section on fluorescence molecular imaging that details the [development of the high-tech glasses \(available via open access\)](#) [2].

The wearable technology was used during surgery for the first time on 10 February.

"This technology has great potential improve patient outcome and enhance decision making for health-care professionals," Achilefu said. "Our goal is to make sure no cancer is left behind."

Cancer cells are difficult to see, even under high-powered magnification. The high-tech glasses are designed to make it easier for surgeons to distinguish cancer cells from healthy cells, helping to ensure no stray tumor cells are left behind during surgery.

Currently, surgeons are required to remove the tumor as well as neighboring tissue that may or may not include cancer cells. The samples are sent to a lab, and if cancer cells are found in neighboring tissue, a second surgery often is recommended to remove additional tissue.

"We're in the early stages of this technology, and more development and testing will be done, but we're certainly encouraged by the potential benefits to patients," said breast surgeon and WUSTL associate professor of surgery Julie Margenthaler, who performed the procedure in February, in a [press release issued by WUSTL](#) [3]. "Imagine what it would mean if these glasses eliminated the need for follow-up surgery and the associated pain, inconvenience and anxiety."

The glasses could reduce the need for additional surgical procedures and continued stress on patients, as well as time and expenses. Margenthaler said about 20-25 percent of breast cancer patients who have lumps removed require a second surgery.

Achilefu worked with Washington University's Office of Technology Management and has a patent pending for the technology. He also is seeking FDA approval for a different molecular agent he's helping to develop for use with the glasses, which specifically targets and stays longer in cancer cells.

The research is funded by the National Cancer Institute at the National Institutes of Health.

Achilefu will present a keynote paper on nanotechnology-based devices for use in cancer imaging including challenges of using nanomedicine in clinical settings at SPIE DSS in Baltimore, Maryland, on 8 May. The presentation is titled "[The era of nanomedicine: perspectives and potential applications in oncology](#) [4]."

Original release: <http://spie.org/x106588.xml> [5]

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[1] <http://spie.org/photonics-west.xml>

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