**DEVICE SMUSHES CANCER TO SEE IF IT’S SQUISHY** [Robert Perkins-USC](http://www.futurity.org/author/robert-perkins/) on May 20, 2015

Tumors come in all shapes, sizes . . . and squishiness—a quality that matters in knowing the best way to treat them.

A new backpack-sized instrument can gently smush a wide range of materials to accurately quantify Young’s modulus—the scientific term for “squishiness.”

Preliminary testing has found that in general, more aggressive tumors are stiffer, but the complex relationship will require more research, engineers say.

“The device leaves the sample completely undamaged, which allows researchers to still perform other tests on it,” says Mark Harrison, a graduate student researcher at the University of Southern California Viterbi School of Engineering and lead author of the study published in[*Applied Physics Letters*](http://scitation.aip.org/content/aip/journal/apl/106/19/10.1063/1.4921243).

### FIBER OPTICS

Previous squishiness detectors required time-consuming alignment and were highly sensitive to environmental vibration. To solve these problems, the new device uses fiber optics, taking a cue from the telecommunications industry.

The system squishes a sample on top of the optical fiber, changing the polarization of the laser inside in a predictable way that allows researchers to calculate the Young’s modulus.

“Instruments able to measure a material’s Young’s modulus already existed, but they’re large and require calibration each time they’re moved,” says Andrea Armani, associate professor and corresponding author of the study. “Our device could be carried from hospital room to hospital room and doesn’t need an engineer to operate it.”

Armani initially was inspired after a conversation with David Agus, professor of medicine and engineering who told her that squishiness had recently been tied to a tumor’s aggressiveness, but he lacked an easy-to-use device for testing that metric.

“This advancement from Dr. Armani is so exciting, as we now have a new dimension of a tumor to measure. We are studying the role of Young’s modulus together with Dr. Armani to help personalize and improve a cancer patient’s care,” says Agus.

### THE PHYSICS OF CANCER

In addition to evaluating the device’s role in a clinical setting, there is also increased interest on a more fundamental level: understanding how different types of tumors are related to their mechanical properties, an emerging research field that is part of a growing interest in physical oncology—the study of the physics of cancer.

Because previous research has placed an emphasis on the chemical makeup of tumors, the majority of current tests probe the nature of a cancerous tumor focus on its chemical makeup—an important feature but not the whole picture.

“Physical oncology represents a completely fresh approach to tackling the problem of cancer,” says Peter Kuhn. “It has the potential to provide huge insights as scientists throughout the world try to understand, treat, and ultimately prevent cancer in humans,” says Peter Kuhn, professor at the Dornsife College of Letters, Arts and Sciences, who helped launch a new peer-reviewed journal on physical oncology last month.

“Given how safe, stable, and accurate this instrument is, it could play a pivotal role in both diagnostic and research efforts, providing a rapid method for screening samples,” Armani says.

Armani and Harrison have applied for a patent and will next work with Agus and the team at the Center for Applied Molecular Medicine to test it in a clinical setting. In the future, they also hope to create a more sensitive version of the device that can map the squishiness across tumors.

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