



POP, FOCUS, DESTROY

A new technique developed at Caltech that uses gas-filled microbubbles for focusing light inside tissue could one day provide doctors with a minimally invasive way of destroying tumors with lasers, and lead to improved diagnostic medical imaging.

The primary challenge with focusing light inside the body is that biological tissue is optically opaque. Unlike transparent glass, the cells and proteins that make up tissue scatter and absorb light. “Our tissues behave very much like dense fog as far as light is concerned,” says Changhui Yang, professor of electrical engineering, bioengineering, and medical engineering. “Just like we cannot focus a car’s headlight through fog, scientists have always had difficulty focusing light through tissues.”

To get around this problem, Yang and his team turned to microbubbles, commonly used in medicine to enhance contrast in ultrasound imaging. First, gas-filled microbubbles encapsulated by thin protein shells and injected into tissue are ruptured with ultrasound waves. By measuring the difference in

light transmission before and after such an event, the Caltech researchers can modify the wavefront of a laser beam so that it focuses on the original locations of the microbubbles. The result, Yang explains, “is as if you’re searching for someone in a dark field, and suddenly the person lets off a flare. For a brief moment, the person is illuminated and you can home in on their location.”

If the technique is shown to work effectively inside living tissue—without, for example, any negative effects from the bursting microbubbles—it could enable a range of research and medical applications. For example, by combining the microbubbles with an antibody probe engineered to seek out biomarkers associated with cancer, doctors could target and then destroy tumors deep inside the body or detect malignant growths much sooner.

“Ultrasound and X-ray techniques can only detect cancer after it forms a mass,” Yang says. “But with optical focusing, you could catch cancerous cells while they are undergoing biochemical changes but before they undergo morphological changes.” —KT

DID YOU KNOW

The **2015–16** academic year marks the **50th** anniversary of the Division of the Humanities and Social Sciences. Humanities was one of the Institute’s original divisions, dating back to 1926, but social sciences were not added until the 1965–66 school year. Learn more at hss.caltech.edu.

On the Grounds

Fire once illuminated these bricks, now seen warming in the midday sun. Originally placed on the interior chimney of the Throop Club—a student hangout built in the mid-1920s and dismantled in the early 1960s—the bricks were “sold” by students to raise money, and feature the names of individuals and clubs who donated funds. When the Throop Club was demolished, Caltech kept its promise that the bricks would never leave campus. So where did they end up?

Answer: The south-facing exterior wall of the Winnett Student Center.

