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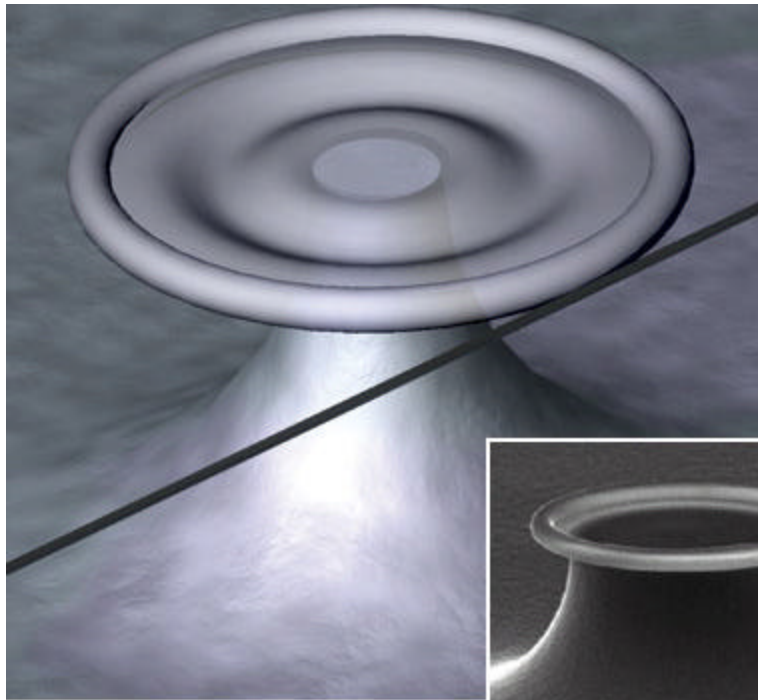
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Light Sets Tiny Objects Aquiver

Much as a kid might make a soda bottle shake by blowing across its top and filling it with sound waves, physicists have set a tiny disk of glass vibrating by "whistling" light through it. Researchers may be able to harness the effect to create optically controlled micromachines and other novel technologies.



Hum along. Light pressure sets a tiny glass disk vibrating, as exaggerated in the drawing above.

CREDIT: Deniz Armani/Caltech, (INSET) Tobias Kippenberg/Caltech

with sound, and a cousin of the microcavities that currently narrow the laser beams in CD and DVD players.

Physicists have long known that light exerts pressure. In the new study, Kerry Vahala and colleagues at the California Institute of Technology in Pasadena have found that light pressure can excite mechanical vibration in a tiny silica disk. The disk is an "optical microcavity," a device that resonates with light much as a soda bottle will resonate

The researchers strung an optical fiber along side the edge of the tens-of-micrometers-wide microcavity, and light from the fiber bled into the disk and raced around its rim. The circulating light pushed outward against the lip of the disk. When the pressure from the accumulating light was strong enough, it caused the disk to vibrate. The vibrations stretched the disk ever –so slightly, but enough to alter the frequency of the light in telltale ways, the researchers report online 11 July in *Optics Express*. Although theorists had predicted light pressure might cause an optical cavity to vibrate, the rattling still caught the experimenters off guard. "This one really came out of the blue," Vahala says.

"These are novel and beautiful observations," says Erich Ippen, an electrical engineer at the Massachusetts Institute of Technology in Cambridge. "The Vahala group has done a superb job of investigating and analyzing what they have observed." The effect could prove useful, says Ming Wu, an electrical engineer at the University of California, Berkeley. For example, researchers are already developing micrometer-sized mechanical oscillators that interact with microwaves. So, Wu says, the light-to-vibrations connection might make it possible to control microwaves with light.

--ADRIAN CHO

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