First Acoustic Superlens

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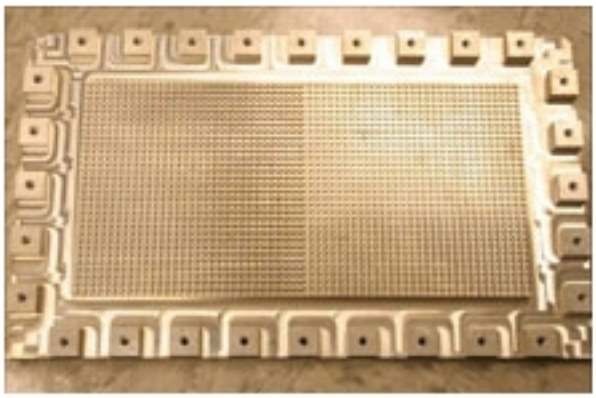
Editor's Note: I wonder if this technology could be used for microscale manipulation of nanoparticles as well.



When filled with water, the holes in this aluminum plate act as resonant cavities that can focus ultrasound waves.
Credit: Nicholas Fang

(Technology Review [1]) - Over the past few years, researchers have developed several materials that bend light in ways that appear to violate the laws of physics, creating so-called superlenses, for ultra-high-resolution optical imaging, as well as invisibility cloaks.

Now researchers have demonstrated that the same kind of images and cloaking devices could be made with sound instead of light. Using the first acoustic metamaterial ever produced, the researchers were able to focus ultrasound waves. This represents a significant step toward creating high-resolution ultrasound images and cloaking devices capable of hiding ships from sonar.

Acoustic lenses can be made to focus sound much as the lens in a microscope focuses light. But physicists' ability to work with both types of waves is limited by scattering effects called diffraction. Using conventional lenses, it's not possible to focus light waves or sound waves to a spot size smaller than half the wavelength of the light. To get around these limitations, a lens must refract, or literally bend light backward.

The same tools used to make materials that can focus light or sound waves beyond the diffraction limit, enabling high-resolution imaging, can also be used to make materials that accomplish the opposite, cloaking an object by directing light or sound around it.

Click Here [2] for the rest of the article.

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