

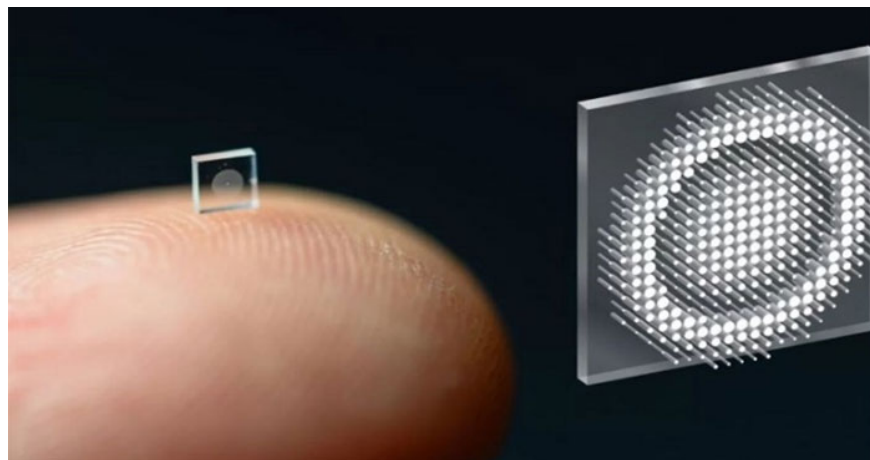
Camera the size of a grain of salt, takes amazingly sharp photos

This camera, the size of a grain of salt, can take amazing pictures.

This tiny camera was developed by researchers from Princeton University and the University of Washington, USA. This camera, which is only the size of a grain of salt, can take amazing pictures.

This new tiny camera can capture close-up objects in stunning detail, sharper and more colorful than conventional lenses 500,000 times larger. To achieve this feat, researchers equipped the new tiny camera with a technology called metasurfaces.

This system promises to be the future of medical diagnosis and treatment, allowing minimally invasive endoscopy with medical robots; while also improving imaging for other microrobots.



While traditional cameras use a curved lens—made of glass or plastic—to bend light rays into focus, the new optical system relies on a technology called a metasurface, which can be manufactured like a computer chip. Just half a millimeter wide, the metasurface is embedded with 1.6 million cylinders, each roughly the size of a human virus.

Each pillar has a unique geometry and acts like an optical antenna. The design of each pillar is essential, as it is used to precisely shape the entire optical wavefront. With the help of machine learning-based algorithms, the interactions of the pillars with light are combined - to produce the highest quality images and the widest field of view of a full-color metasurface camera developed to date.

In the past, there were also micro cameras, but the images captured were blurry, fuzzy and inaccurate.



A key innovation in the camera's creation was the integrated design of the optical surface and the signal processing algorithms that generate the images. " *This increased the camera's performance in natural light conditions, as opposed to previous metasurface cameras that required pure laboratory laser light or other ideal conditions to produce high-quality images* ," said Felix Heide, lead author of the study.

The researchers compared the images produced by their system to those from previous metasurface cameras, and to images captured by a conventional camera with six refractive lenses. Aside from some blurriness at the edges of the frame, the nano-sized camera's images were comparable to those from a traditional lens, which was more than 500,000 times larger.

Currently, researchers continue to look for ways to improve camera image quality, improve object detection technology, and other sensing methods.

The researchers reported their findings in a paper published on November 29, 2021, in the journal Nature Communications. You can read the full paper on the tiny camera here: <https://www.nature.com/articles/s41467-021-26443-0>

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