

Ultrathin digital camera inspired by *Xenos peckii* eyes

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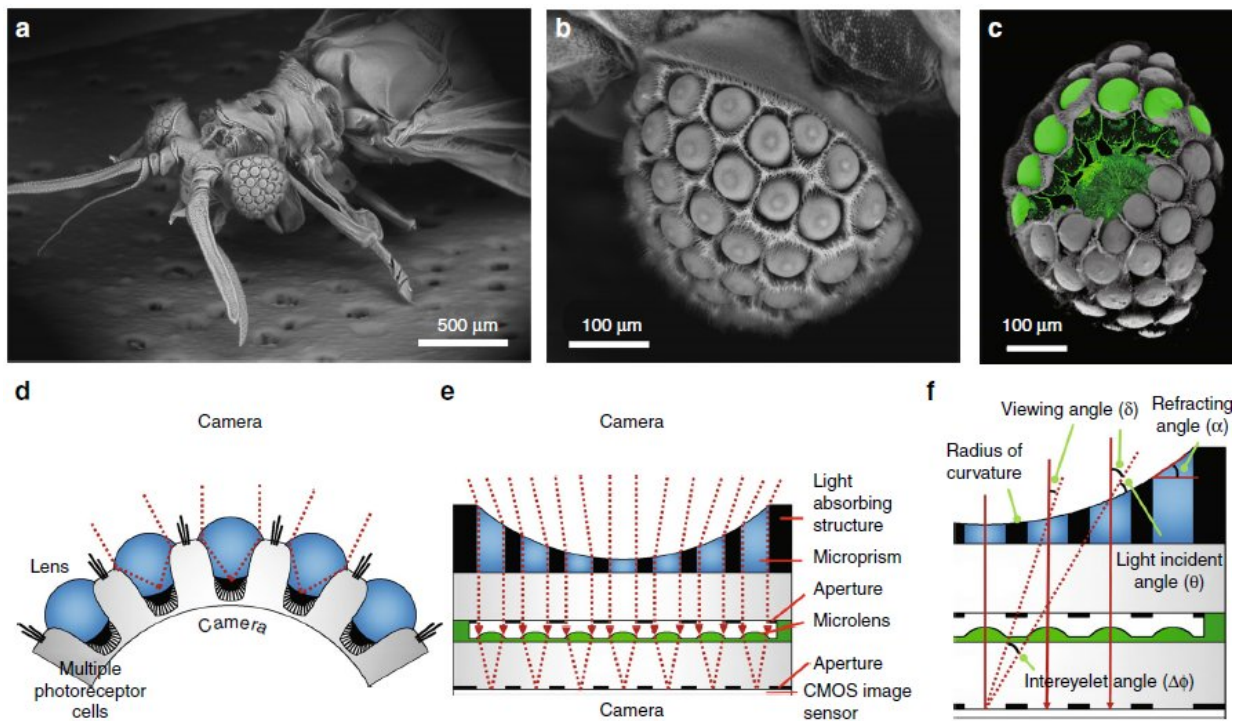


Figure 1. Natural *Xenos peckii* eye and the biological inspiration for the ultrathin digital camera. Credit: Light: Science

The visual system of *Xenos peckii*, an endoparasite of paper wasps, demonstrates distinct benefits for high sensitivity and high resolution, differing from the compound eyes of most insects. Inspired by their unique features, a KAIST team developed an ultrathin digital camera

that emulates the unique eyes of *Xenos peckii*.

The ultrathin digital [camera](#) offers a wide field of view and [high resolution](#) in a slimmer body compared to existing imaging systems. It is expected to support various applications, such as monitoring equipment, medical imaging devices, and mobile imaging systems.

Professor Ki-Hun Jeong from the Department of Bio and Brain Engineering and his team are known for mimicking biological visual organs. The team's past research includes an LED lens based on the abdominal segments of fireflies and biologically inspired anti-reflective structures.

Recently, the demand for ultrathin digital cameras has increased, due to the miniaturization of electronic and [optical devices](#). However, most camera modules use multiple lenses along the optical axis to compensate for optical aberrations, resulting in a larger volume as well as a thicker total track length of digital cameras. Resolution and sensitivity would be compromised if these modules were to be simply reduced in size and thickness.

To address this issue, the team have developed micro-optical components, inspired from the visual system of *Xenos peckii*, and combined them with a CMOS (complementary metal oxide semiconductor) [image sensor](#) to achieve an ultrathin [digital camera](#).

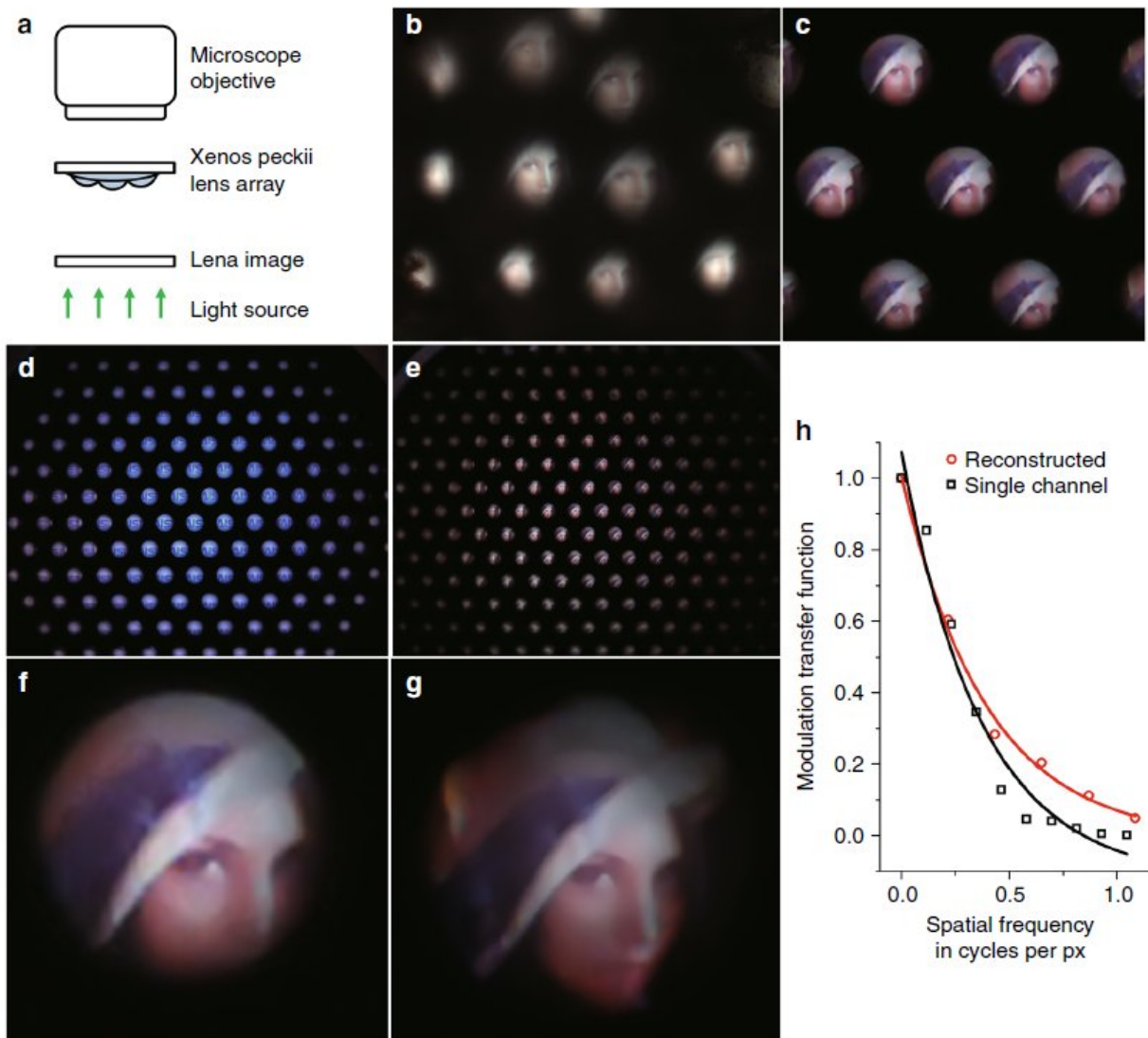


Figure 2. Optical images captured by the bioinspired ultrathin digital camera. Credit: Light: Science

This new camera, measuring less than 2mm in thickness, emulates the eyes of *Xenos peckii* by using dozens of microprism arrays and microlens arrays. A microprism and microlens pair form a channel and the light-absorbing medium between the channels reduces optical crosstalk. Each channel captures the partial image at slightly different

orientation, and the retrieved partial images are combined into a single image, thereby ensuring a wide field of view and high resolution.

Professor Jeong said, "We have proposed a novel method of fabricating an ultrathin camera. As the first insect-inspired, ultrathin camera that integrates a microcamera on a conventional CMOS image sensor array, our study will have a significant impact in optics and related fields."

This research, led by Ph.D. candidates Dongmin Keum and Kyung-Won Jang, was published in *Light: Science & Applications* on October 24, 2018.

More information: Dongmin Keum et al. Xenos peckii vision inspires an ultrathin digital camera, *Light: Science & Applications* (2018). [DOI: 10.1038/s41377-018-0081-2](https://doi.org/10.1038/s41377-018-0081-2)

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