**Tiny 3D-printed camera lens could give drones vision like ours**

By **Matt Reynolds**

One lens is good, four lenses are better. A tiny camera combines four [3D-printed](https://www.newscientist.com/article/mg21628952-100-fabricated-future-the-sceptics-guide-to-3d-printing/) lenses to mimic natural vision – with super-sharp focus in a central area and wider peripheral vision.

The miniaturised camera could be used in insect-sized surveillance drones, to hone in on details without losing track of what’s happening elsewhere.

A spot at the back of our eyes called the fovea is crammed with a higher concentration of light-sensitive cells than the surrounding regions, giving us sharp vision in the center of our field of view while objects closer to the edges of our vision are less well-defined.

[Harald Giessen](http://www.pi4.uni-stuttgart.de/home/members/group_members/1025) and his team at the University of Stuttgart, Germany, recreated this kind of vision by 3D printing four plastic lenses of different focal lengths onto a single image sensor. The lenses with longer focal lengths capture high detail over a narrow field of view, while the lenses with short focal lengths capture low detail over a wider field of view.

By using software to stitch together the images captured by each lens, Giessen created a circular photo that was highly detailed in the center of the image, but got less detailed towards its edges. The entire system measures less than 300 micrometers square – about as wide as three human hairs lined up side by side. Without 3D printing, Giessen says, it would have been impossible to create such a small camera.“There is no chance you can manufacture imaging systems of this quality by any other means,” he says.Because only the center of the image would require intensive processing, a camera using such a lens would require less power and processing time than conventional cameras while potentially producing more useful images, says David J Brady of Duke University, North Carolina. Future versions of the camera could be used to look [inside the human body](https://www.newscientist.com/article/mg21729095-800-worlds-thinnest-endoscope-is-width-of-a-human-hair/), or as sensors on a [driverless car](https://www.newscientist.com/article/mg23331050-300-how-to-make-a-moral-car/), but Brady says that truly high-performance lenses must be made out of more than just one type of plastic.

Using different materials in the same lens balances out chromatic aberrations that can distort images, he says, but it’s not currently possible to 3D print such tiny lenses using more than one material. Until then, truly eagle-eyed vision will have to wait.