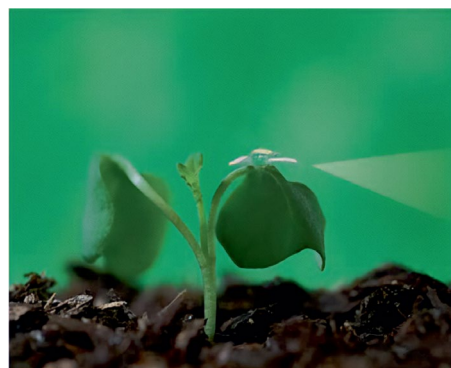


## Colorimetric fliers for remote sensing



Flying microelectronic devices could be of use in applications such as remote environmental monitoring. However, their size limits any on-board power source, and they can be difficult – and costly – to recover after use. Leonardo Chamorro, Yoonseok Park, John Rogers and colleagues now report three-dimensional fliers that are modelled on helicopter-type seeds and are made using entirely biodegradable materials. The fliers contain colorimetric sensors to measure environmental parameters including humidity, temperature, pH level, heavy-metal presence and ultraviolet

exposure. This information can then be wirelessly captured by cameras on drones and analysed using machine learning.

The researchers – who are based at various institutions in the United States and South Korea – use poly(lactide-co-glycolide), a biodegradable polymer, for the body and wings of the fliers, and cellulose thin-films to bind the chemical reagents for different colorimetric measurements. The fliers, which have a typical weight of 1.5 mg, do not need a power source and decay after about 12 weeks due to water exposure and consumption by fungi or bacteria, eliminating the need for recovery. The team show that the system can be used in the field with the help of a drone to release the fliers and capture the images. A convolutional neural network was trained to categorize the colour of the images – since these can vary with the measurement result, but also in different lighting conditions, backgrounds and flier resting orientations – with 88.3% classification accuracy.

**Matthew Parker**

*Nature Electronics*

Original reference: *Sci. Adv.* **8**, eade3201 (2022)