

Automated laser-scanning 'hunter drone' seeks out fossils, minerals and biological targets

June 23 2020

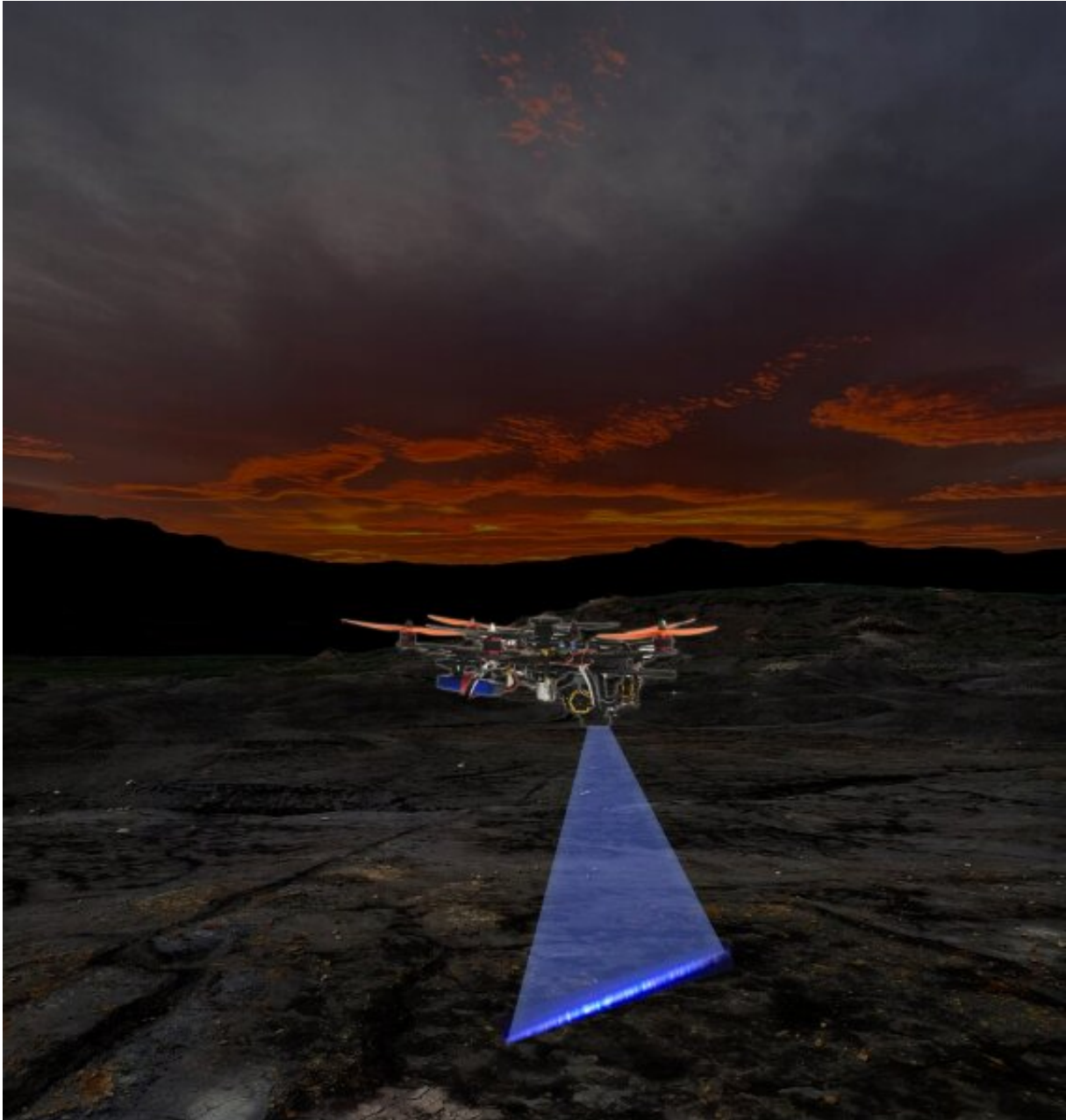


Figure 1. New HKU-codeveloped automated laser-scanning ‘hunter drone’ seeks out fossils, minerals and biological targets at night (artist visualised image).
Credit: Thomas G Kaye & Michael Pittman

Science fiction came up with machine-intelligent hunter drones and they

have now become science fact with a new HKU-codeveloped autonomous 'hunter drone' that seeks out targets at night using a scanning laser.

This technique—laser-stimulated fluorescence (LSF)—was codeveloped at HKU and has been highly successful in paleontology, making fossil bones glow and revealing otherwise invisible details like skin and cartilage. The application of LSF to an [aerial system](#) is possible because of the laser's ability to project over great distances with little loss in power.

HKU Research Assistant Professor Dr. Michael Pittman (Vertebrate Paleontology Laboratory, Division of Earth & Planetary Science and Department of Earth Sciences) and his colleague Thomas G Kaye of the Foundation for Scientific Advancement made this a reality by developing a fully autonomous LSF drone system. "Nicknamed 'Laser Raptor,' this system is designed to more efficiently seek out fossils exposed on the surface in the field," said Dr. Pittman.

Loaded with pre-programmed flight paths during the day, this prototype was launched at night in the badlands of Arizona and Wyoming, U.S. to search for fossils. Laser Raptor flies rapidly to search locations using its on-board navigation and then descends and maintains an altitude of 4 meters above ground so it can 'mow the lawn' in search of glowing targets as small as a thumbnail. After each "mission" is complete, a video of the laser scan is processed to find hot spots that are investigated the next day, leading to the recovery of new fossil specimens.

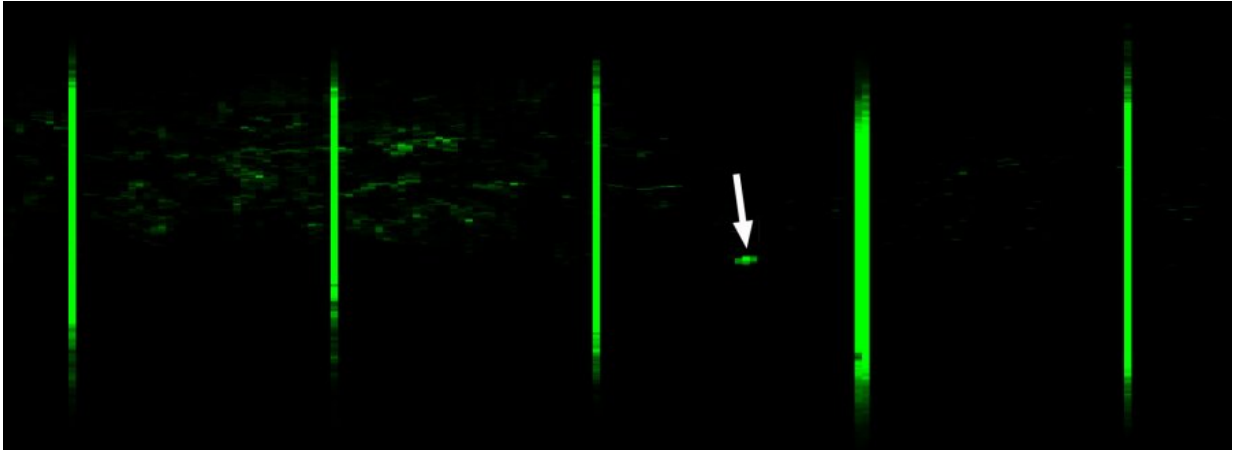


Figure 2. Hot spot on laser ‘scan strip’ produced by the Laser Raptor drone system is ~2cm wide fragment of a fossil mammal tooth. Credit: Thomas G Kaye & Michael Pittman.

Fluorescence is extremely sensitive to differences in mineral composition. Although Laser Raptor was designed to locate fossils, it is ready to seek out a whole range of fluorescent targets including minerals e.g. to study rare and unusual geology or in search of mining materials like gemstones, certain organisms like scorpions, shellfish and cyanobacteria, and even archaeological artifacts and structures.

Asked about future plans, Thomas Kaye replied, "As members of HKU's Laboratory of Space Research, Dr. Pittman and I are currently working to develop LSF applications for the study of geologic landscapes beyond Earth."



Figure 3. ~2cm wide fragment of a fossil mammal tooth found using the Laser Raptor drone system. The tooth belongs to a brontothere which lived in ancient Wyoming, USA ~35 million years ago. Scale is 5mm. Credit: Thomas G Kaye & Michael Pittman

More information: Thomas G. Kaye et al. Fluorescence-based detection of field targets using an autonomous unmanned aerial vehicle system, *Methods in Ecology and Evolution* (2020). [DOI: 10.1111/2041-210X.13402](https://doi.org/10.1111/2041-210X.13402)

Provided by The University of Hong Kong

Citation: Automated laser-scanning 'hunter drone' seeks out fossils, minerals and biological targets (2020, June 23) retrieved 27 April 2024 from <https://phys.org/news/2020-06-automated-laser-scanning-hunter-drone-fossils.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.