

## **A Novel Remote Sensing Technology for Frontier Exploration**

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An airborne technology is proposed to detect in flight over wide areas with a high spatial resolution the presence of trace hydrocarbons and microseeps on the ground. It makes use of genetically engineered but environmentally safe soil bacteria which function as sensitive and specific fluorescent biosensors for traces of light hydrocarbons (C1-C4) on the ground. Biosensors are spread using conventional crop duster planes equipped with precision flight management systems. Biosensors in contact with traces of light hydrocarbons react with the production of fluorescent proteins in their cell envelopes. These proteins - if excited with light of the correct wavelength - are capable to emit fluorescent light. As the fluorescent light is of a longer wavelength (stokes shift fluorescence) it is easily distinguishable from the excitation light. An airborne scanning Laser is used to excite, detect and georeference fluorescent light from biosensors. The sequence of excitation, detection and georeferencing is happening instantaneously and is done in a single pass of a search aircraft over wide areas of interest. Simultaneously a digital elevation model (DEM) of the surveyed area with a spatial resolution of 1 meter is produced. Any finds of fluorescent light from biosensors are recorded and integrated in the digital elevation model together with color coded intensities for the detected fluorescent light. They are expected to be easily visually interpretable by geologists without further handling or manipulation of the data. Hot spots or extended areas with fluorescent light are proof of seeps of trace hydrocarbons indicating potentially commercial deposits of oil or gas. As an airborne technology the possibility to search large areas of unexplored land for even the slightest signs of hydrocarbon microseepages exists. This makes it an ideal tool for "first time ever" frontier exploration. As there is no need to put a foot on the ground the technology is well suited to explore remote, rugged or dangerous environments. The concept of exploring for oil and gas using biosensors and an airborne scanning laser is based on unpublished results of an ongoing security research project in Germany dealing with the airborne detection of trace explosives and landmines.