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# Laser Induced Fluorescence Imaging: Searching for Organics from the Dry Valleys of Queen Maud Land Antarctica to the Regolith and Ices of Mars

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Laser induced fluorescence imaging using excitation in ultraviolet (UV) wavelengths has been proposed as a nondestructive astrobiological rapid survey tool to search for amino and nucleic acids [1], microbial life [2], and polycyclic aromatic hydrocarbons (PAHs) deep in the Mars regolith [3, 4]. However, the technique is easily adapted to search for complex biomolecular targets using longer wavelength sources [5]. Of particular interest is the ability of excitation at 532 nm to detect photosynthetic pigments in cyanobacteria-dominated microbial communities populating the ice of alpine, Arctic, and Antarctic lakes, glaciers, and ice sheets [6-8]. During the months of November and December 2008 we tested the technique as part of an extended international, interdisciplinary field campaign in the Dry Valleys of Schirmacher Oasis and Lake Untersee, Queen Maud Land, Antarctica. In this paper we review our recent laboratory experiments on the use of UV excitation for detection of PAHs doped on Mars analogue soils [9] and chasmo- and epilithic lichen communities within basaltic Iceland lavas. We present for the first time the results of our field experiments conducted during the Tawani 2008 International Antarctic Expedition for in situ detection and quantification of photosynthetic biomass in the ice caps of annual and perennially ice-covered Antarctic lakes. We discuss the advantages of using a nondestructive rapid survey photonic tools such as laser induced fluorescence imaging that can be easily implemented from lander, rover, airborne, or orbital platforms. The techniques presented can be utilized to monitor the microbial potential of large, critical ecosystems on Earth, or to facilitate the remote or manned search for organics and photosynthetic life on any terrestrial planet.

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