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A Multi-Gradient Generator in a Single Microfluidic Device for Optical Microscopy and Interferometry[1] MANUEL BEDROSSIAN, JAY NADEAU, Caltech, CHRIS LINDENSMITH, Caltech/JPL — The goal of this work was to create a single microfluidic device capable of establishing multiple types of gradients in a quantifiable manner. Many microbial species are known to exhibit directed motility in the presence of stimuli. This phenomenon, known as taxis, can be used as a bio-signature and a means of identifying microorganisms. Directed microbial motility has been seen as a response to the presence of certain chemicals, light, heat, magnetic fields, and other stimuli. Microbial movement along the gradient vector, that cannot be explained by passive hydrodynamics or Brownian motion, can shed light on whether the sample contains living microbes or not. The ability to create multiple types of gradients in a single microfluidic device allows for high throughput testing of heterogeneous samples to detect taxis. There has been increased interest in the search for life within our solar system where liquid water is known to exist. Induced directional motility can serve as a viable method for detecting *living* organisms that actively respond to their environment. The device developed here includes a chemical, photonic, thermal, and magnetic gradient generator, while maintaining high optical quality in order to be used for microscopy as well as quantitative phase imaging

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