Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

High-Throughput Light Sheet Microscopy for the Automated Live Imaging of Larval Zebrafish[1] RYAN BAKER, SAVANNAH LOGAN, CHRISTOPHER DUDLEY, RAGHUVEER PARTHASARATHY, Department of Physics, University of Oregon — The zebrafish is a model organism with a variety of useful properties; it is small and optically transparent, it reproduces quickly, it is a vertebrate, and there are a large variety of transgenic animals available. Because of these properties, the zebrafish is well suited to study using a variety of optical technologies including light sheet fluorescence microscopy (LSFM), which provides high-resolution three-dimensional imaging over large fields of view. Research progress, however, is often not limited by optical techniques but instead by the number of samples one can examine over the course of an experiment, which in the case of light sheet imaging has so far been severely limited. Here we present an integrated fluidic circuit and microscope which provides rapid, automated imaging of zebrafish using several imaging modes, including LSFM, Hyperspectral Imaging, and Differential Interference Contrast Microscopy. Using this system, we show that we can increase our imaging throughput by a factor of 10 compared to previous techniques. We also show preliminary results visualizing zebrafish immune response, which is sensitive to gut microbiota composition, and which shows a strong variability between individuals that highlights the utility of high throughput imaging.

[1]National Science Foundation, award no. DBI-1427957

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Date submitted: 10 Nov 2016 Electronic form version 1.4