Abstract Submitted
for the NWS18 Meeting of
The American Physical Society

Robust Microbial Cell Segmentation by Quantitative Phase Imaging. HAMDAH ALANAZI, AMRAH CANUI, ADAM GARMAN, JOSHUA QUIMBY, ANDREAS VASDEKIS, University of Idaho — Cell imaging is an important tool in cell and molecular biology research. This is because such procedures allow us to determine the cellular function-structure relationship. However, the first step to extract cell physiology information from all forms of biological imaging experiments is to segment cells. As such, cell segmentation has attracted considerable attention in computational image processing. Despite such progress however, it remains challenging to identify a global algorithm that pertains to all cellular models ranging from mammalian lines to yeast and bacteria. To address this shortcoming, we undertook a different approach by replacing conventional imaging modalities, such as phase contrast and fluorescence with Quantitative Phase Imaging (QPI). QPI relies on the optical-phase rather than intensity to image cells and localize their contour. In this way, QPI enabled a very high cell segmentation success-rate greater than 99% for yeast and 98% for E. coli bacteria cells without any computationally intensive, post-acquisition processing. We attribute this improved performance to the remarkably uniform background, elimination of cell-to-cell and intracellular optical artifacts, and enhanced signal-to background ratio – all innate properties of imaging in the optical-phase domain.

Hamdah Alanazi
University of Idaho

Date submitted: 23 Apr 2018 Electronic form version 1.4