208　単一細胞における細胞状態の光学的計測法の高感度化	Smith Nicholas

This project is based on the development of new, and extension of existing label-free single-cell analysis methods. There are important trade-offs between sensitivity and invasiveness of single-cell profiling methods available to researchers. The current work aims to develop enhanced classification methods, and evaluate optical spectroscopic techniques for non-invasive and label-free cell profiling, including the use of nanoparticle enhancement to boost the robustness of cell profiling. This report highlights some of the findings of the project that relate to cell discrimination, classification, and dynamics over time, as well as the creation of nanoparticle-enhanced substrates for challenging cell types such as lymphocytes. When conducting single-cell analysis, one feature that stands out is the large amount of inherent biological diversity at the single-cell level. Our laboratory has worked on methods to more accurately characterize cells in terms of their morphology, cellular content, or both, using fully-label free methods. We found that by mapping regions of cell targets, rather than full imaging or single point, we could improve both throughput and classification accuracy. With fully label-free methods, however, especially when using label-free Raman scattering, one limitation is the amount of signal provided, meaning that throughput is still limited compared to label-based methods. At alternative approach is to use nanoparticle enhancement, but the presence of cells on an enhancing substrate can lead to highly random signals, as shown in the figure. One aspect of this project was then to develop spatially averaged nanoparticle-enhanced Raman single-cell analysis.

Surface-enhanced Raman scattering image-based spectroscopy showing inherent variability in spectra of adherent MEF cells on 50 nm AuNP/PLL substrate excited by 785 nm