# Molecular-targeted optical coherent microscopy as an optical biopsy tool for early detection of cancer

Optical coherent tomography (OCT) is a powerful tool for assessing tissue architectural morphology. It enables 3D imaging with the resolution comparable to traditional histopathology (a few microns), but it can be performed *in vivo* and in real-time without tissue removal and specimen processing. Optical coherent microscopy (OCM) combines coherence-gated detection with confocal microscopy in order to achieve high transverse resolutions, thus enabling 3D visualization of cellular features. However, current OCT/OCM imaging technologies have not been able to leverage the recent advances in molecular-targeted contrast agents that are revolutionizing biomedicine. The new techniques enable molecular contrast for 3D-OCT/OCM have been developed and validated in this research. Both the structural and pathological information of tissue has been imaged with our OCT/OCM in 3D, *in vivo*, and in real time with micron-level spatial resolution at multiple scales. This work will lay the foundation for a wide range of fundamental research, small animal imaging, and future clinical applications in humans. This work will also serve as a starting point for the OCT/OCM studies of other pathologies associated with abnormal protein expression levels, such as neurodegenerative and cardiovascular diseases.