

Field-based 3D microscopy for biological and biomedical applications

Over the past decades powerful optical microscopy techniques for probing and imaging biological cells and tissues have been developed. Advances have been made to improve spatial and temporal resolution, chemical and molecular specificities, and depth range of imaging. However, most of these developments are based on measuring the intensity of light. We have developed phase microscopy techniques for quantifying not only the intensity but also the phase of the light, which we term as a field-based technique in comparison with conventional intensity-based technique. In this talk, I will describe a new field-based 3D microscope which can map the distribution of refractive index as well as absorption in live cells and tissues. Experimental results such as tomographic imaging of cells and multicellular organisms will be presented together with interesting biological applications such as detecting malaria-infected red blood cells and quantifying the thickness of cholesterol ribbons.