ANALYTICAL SEMINAR

Professor Lydia Kisley

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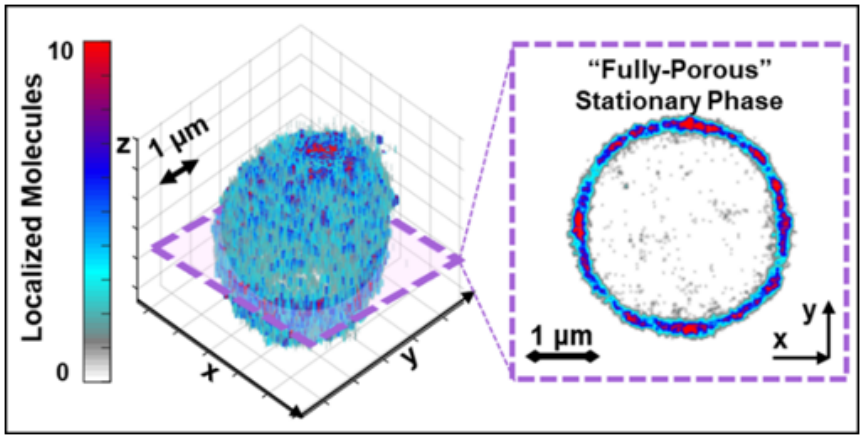
"Super-resolution imaging of complex materials: chromatography and extracellular nutrients"

Super-resolution imaging and other fluorescence techniques have become seminal tools for scientists due to their ability to resolve heterogeneity and features normally obscured in traditional diffraction limited imaging. Super-resolution imaging has been optimized for and enabled important findings in cellular biophysics and catalysis, yet, super-resolution microscopy techniques have had limited use in the study of man-made materials and materials outside of the cell. From a macroscale engineering perspective, many materials are optimized empirically to decide what conditions work "best," resulting in little understanding of the chemistry behind why the selected conditions perform the way they do. On the other hand, super-resolution microscopy of materials has focused on model, fundamental systems: materials simplified to have only a few components so they can be well-described by statistical models, but far from conditions for their intended use. In this talk I will present studying liquid chromatographic separations with super-resolution imaging, along with progress towards studying separation materials that connect fundamental molecular observations to industrial interests including rare earth element (REE) purification. Further, I will share our work developing expansion microscopy using tensile force, a sample-based super-resolution method that physically expands stretchable hydrogels, to image hard-to-sense small molecule nutrients within and surrounding cells. Overall, super-resolution imaging is a powerful tool that can increase our understanding of materials at new spatiotemporal scales to reveal processes at the molecular-level.



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