

# Single-molecule Dynamics in Complex Chemical and Biological Systems

Durham Arts Council

Duke Rehearsal Hall

Cosponsored by ANYL, BIOL, BIOT and PHYS

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**Session Abstract:** Single-molecule studies have the power to extract molecular sub-populations and dynamics that are obscured by ensemble measurements. Physical chemists, as the “jack of all trades” of the “central science”, have played a critical role in the development and application of single-molecule methods to a range of critical research questions in materials science, chemistry, and biology. In many cases, the data created by these methods and the models used to explain these data have transformed our understanding of molecular processes in complex, heterogeneous environments. This symposium will focus on advances in single-molecule methods, loosely defined, including single-molecule spectroscopy, super-resolution microscopy, single-particle tracking, and many more, as well as on advances in single-molecule data analysis and modeling approaches. The goal is to bring together experimentalists and theorists whose work will benefit from overcoming the barriers of ensemble measurements!

**Note:** Times highlighted in yellow are deviations from the published SERMACS schedule

## Thursday Afternoon

Time	Title	Presenter
1:00	Introductory Remarks	
1:05	Placing molecules in context with correlative single molecule imaging and lattice light sheet microscopy	W. Legant
1:25	High-speed 3D tracking and imaging microscopy captures early events of the virus-cell interaction	C. Johnson
1:45	Hour-long, kilohertz sampling rate 3D single-virus tracking in live cells via StayGold fluorescent protein labelling	Y. Lin
<b>2:00</b>	<b>Break</b>	
2:10	Single-molecule fluorescence spectral heterogeneity: The probe or the environment?	Y. Zhang
2:30	Blink-based multiplexing: Rapid classification of spectrally-overlapped single emitters using their blinking	K.L. Wustholz
2:50	Distinct complexes containing the cytosolic type III secretion system ATPase SCTN resolved by 3D single-molecule tracking in live yersinia enterocolitica	O.I. de Cuba
3:05	Single-molecule tracking to determine the abundances and stoichiometries of freely-diffusing protein complexes in living cells	J.R. Prindle

**Friday Morning**

<b>Time</b>	<b>Title</b>	<b>Presenter</b>
8:30	Introductory Remarks	
8:35	Single-molecule dynamics of membrane-proximal actin in live B cells	J. Flanagan-Natoli
8:55	High-confidence single-molecule detection of nucleic acid biomarkers	S. Dhakal
9:15	Integrating light sheet illumination and microfluidics for 3D single-molecule super-resolution mammalian cell imaging	A. Gustavsson
9:35	Long axial range double-helix point spread functions for 3D single-molecule super-resolution imaging in mammalian cells	Y. Nakatani
9:50	Tracking of specific genomic loci in three dimensions with high spatiotemporal resolution	A. Raterink
<b>10:05</b>	<b>Break</b>	
10:15	Single-fluorogen imaging reveals the nanoscale structure of beta-sheet assemblies and biomolecular condensates	M.D. Lew
10:35.	Guiding proteins through conformational landscapes using anharmonic low-frequency vibrations	M. Heyden
10:55	Investigating the conductance distributions of single-molecule junctions using ab initio molecular dynamics	M. Curry
11:10	Developing a bright and solvatochromic BODIPY fluorescent probe for functional super-resolution imaging of cell membrane	Y. Liu

**Friday Afternoon**

<b>Time</b>	<b>Title</b>	<b>Presenter</b>
1:00	Introductory Remarks	
1:05	Structural dynamics during telomere loop formation studied by smFRET in vitro	H. Lee
1:25	ABEL-PIE: Pulsed interleaved excitation in the ABEL trap to measure single-molecule dynamics	A. Squires
1:45	Real-time 3D single-particle tracking in an electric field: From mobility to active control	A. Johnson
<b>2:00</b>	<b>Break</b>	
2:10	Monitoring the phosphorylation cycles of single molecules in solution	Q. Wang
2:30	Multi-parameter super-resolution optical imaging of single nanoparticles	K.A. Willets
2:50	Concluding Remarks	