



The Role of Symmetry in Chemically Selective Microscopy of Biological Assemblies

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Oriental ordering often defines practical function within biological systems, including molecular packing within bilayer structures that define cell membranes and protein assemblies providing structural integrity within tissues. The impact of ordering is particularly interesting in chiral assemblies, in which orientational order and local symmetry can dramatically increase the magnitude of chiral-specific spectroscopy and microscopy measurements of ordered systems through mechanisms not present in isotropic assemblies. Not only do these effects create opportunities for new interpretations of existing measurements, they suggest possibilities for envisioning new experimental approaches for interrogating molecular ordering at biological interfaces and within ordered biological assemblies leveraging the inherent chirality within living systems. Coherent nonlinear optical interactions such as second harmonic and sum-frequency spectroscopy are now well established probes of chirality within ordered assemblies. Building on this prior framework as a launchpad, novel tools specifically leveraging incoherence in light-matter interactions for chiral-specific spectroscopy will be described and assessed. These novel spectroscopic approaches have the potential to uniquely inform on structure/function relationships in biological assemblies.

ABOUT the SPEAKER

Garth J. Simpson is a Professor of Chemistry and is currently serving as the Research Director of Purdue's Young Institute for Advanced Manufacturing of Pharmaceuticals, and as the Purdue Director of the NSF Center for Bioanalytic Metrology. Prof. Simpson's research centers on quantitative nonlinear optical microscopy, with an emphasis on the role of molecular chirality in driving unique observables in nonlinear optics. The research program of Prof. Simpson has been recognized by the American Chemical Society (ACS) Division of Analytical Chemistry Spectrochemical Analysis Award (2022), a Purdue College of Science Research Award (2014), the Innovation Award from the Federation of Analytical Chemistry and Spectroscopy Societies (2014), an ACS Findeis Award (2007), a Sloan Research Fellowship (2005), a Cottrell Teacher-Scholar Award (2004), a Beckman Foundation Young Investigator Award (2004), and a Dreyfus New Faculty Award (2001).

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