Title: Molecular Spectroscopy: From Small Molecules to Conjugated Polymers to Archaeology

Abstract: As a visiting scientist resident here through June, I will give an overview of different research areas with the hope of encouraging interactions with Queens faculty and students. Two projects in small molecule spectroscopy derive from high-resolution infrared spectroscopy. Methanol will be the example used to introduce the concept of vibrational adiabaticity and vibrational conical intersections, building on analogous concepts in electronic spectroscopy. This work predicts ultrafast vibrational energy transfer that is localized in the large-amplitude coordinate space. The second project presents the detailed pathways for intramolecular vibrational relaxation and phase space exploration in acetylene. The work on polymers shows how large-amplitude torsional motion is key to understanding important properties of prospective photovoltaic materials for solar energy conversion. Finally, subsurface soil spectroscopy (S4) will be presented as a means for prospecting archaeological sites.