



**Wednesday**

**November 1**

**4:00 P.M.**

**Rm 118 NSH**

## Probing the energetics of protein aggregation with two-dimensional infrared spectroscopy and development of wide-field nonlinear IR microscopy

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Ultrafast (femtosecond) infrared methods provide a window into the dynamics of molecular vibrations. I will introduce one such method, two dimensional infrared spectroscopy (2DIR), by describing recent results tracking amyloid formation in real time for amylin, a protein associated with type II diabetes. Transient oligomers, the species hypothesized to cause toxicity in amyloid diseases, are directly observed, facilitating new insight into the energetics governing protein aggregation. Additionally, I will discuss the development of the first wide-field, coherent 2DIR/FTIR microscope. Images are sub-diffraction limited, as verified with scalar wave simulations. We find that 2DIR images have enhanced contrast compared to IR absorption alone because of nonlinear scaling of the 2DIR signal. We show that the additional observables available in 2DIR images can improve molecular discrimination, promising a technique capable of using ultrafast dynamics as a contrast agent in complex environments.