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Abstract for an Invited Paper  
for the MAR06 Meeting of  
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**Mapping Protein Transport in Living Cells with Quantum Dots and Spatio-Temporal Image Correlation Spectroscopy**

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We will present recent advances in image correlation methods and recent use of this technique in combination with luminescent quantum dots for measurements of protein transport in living cells. The talk will focus on the development of image correlation spectroscopy (ICS) as an imaging extension of fluorescence correlation spectroscopy (FCS). The ICS technique is ideally suited to measure transport and clustering of fluorescently tagged proteins in cellular membranes where transport is slow and static proteins abound. The image correlation methods are based on the measurement of fluorescence intensity fluctuations as a function of space and time collected as image time series using a laser scanning microscope (either confocal or two-photon). Spatial and temporal variants of the basic ICS method will be introduced and the power of these approaches to measure both aggregation and transport of cell surface proteins will be demonstrated. The use of luminescent quantum dots as labels for image correlation studies will be discussed including the effects of quantum dot blinking on the fluctuation based image correlation measurements. We will discuss appropriate models and image correlation analysis approaches for dealing with the quantum dot blinking including a new reciprocal space image correlation technique. Finally we will present experimental results from image correlation experiments using quantum dots for mapping protein transport fluid flows in living migrating cells.