New Mass Spectrometry Based Technologies for Biophysics and Structural Biology

Native-like ions are generated using electrospray ionization of proteins, nucleic acids, lipids, and other biological molecules in aqueous solutions. These gas-phase ions can retain noncovalent interactions that were present in the original solution, and as a consequence, native ion mobility mass spectrometry (IM-MS) has great potential for answering many questions in biophysics and structural biology that have eluded condensed-phased strategies. However, concerns about the fidelity of structures in solution and structures in the gas phase continue to inhibit the broader adoption of IM-MS technologies and reduce the confidence in structural models that are based on IM-MS measurements. Therefore, an accurate understanding of this fidelity is critical to advancing this field. I will report new technologies that my lab developed to probe the structures and structural evolution of proteins in solution and in the gas phase. I will then discuss how my lab has applied these technologies to answer questions related to regulating protein degradation and protein homeostasis.

Bio

This is from http://depts.washington.edu/bushlab/mattbush/, which includes awards, etc.

Matt Bush pursued his Ph.D. from 2003-2008 with Evan Williams and Richard Saykally at the University of California, Berkeley. During that time he used infrared laser spectroscopy and Fourier-transform ion cyclotron resonance mass spectrometry to investigate zwitterion formation in gas-phase biomolecules and the structural effects of hydration on biomolecular and multiply charged ions. This training in high-performance mass spectrometry and physical chemistry laid the groundwork for his continued pursuits using gas-phase techniques to investigate the structures and interactions of biomolecules. In 2008 he joined the laboratory of Carol Robinson FRS DBE at the University of Cambridge and the University of Oxford, during which time he was a Waters Research Fellow, a Junior Research Fellow of Jesus College, University of Oxford, and developed experimental and analytical frameworks for using ion mobility mass spectrometry experiments to accurately characterize the structures of drug-like molecules, peptides, and protein complexes. He joined the chemistry faculty at the University of Washington in 2011, where he is also a member of the Biological Physics, Structure and Design Program and the Molecular Engineering & Sciences Institute. His research group is focused on developing mass spectrometry based approaches for elucidating the structures, assembly, and dynamics of protein complexes. His group applies these approaches to a wide range of biological systems, including those involved in regulating protein degradation and protein homeostasis.