



A Celebration of the Scientific and Personal Contributions of Michael T. Bowers

This volume of the *International Journal of Mass Spectrometry* is dedicated to the scientific achievements of Michael T. Bowers, on the occasion of his 70th birthday. As friends and colleagues of Mike, it is a pleasure to have assembled this information and to share it with his many students, collaborators, and associates. Mike's career has touched a broad range of chemistry, evolving from very fundamental studies in chemical physics to investigations of degenerative diseases, all utilizing innovative mass spectrometric techniques and the applications and development of rigorous theory. We are pleased that so many could join us in celebrating this happy occasion and recognizing his contributions to science.

Mike is presently Professor at the University of California at Santa Barbara, where his academic career began 41 years ago. He started his education at Gonzaga University, graduating with a Bachelor of Science degree in 1962. He continues to be an avid supporter of the Zags. He then went on to obtain his Ph.D. in Physical Chemistry in 1966 from the University of Illinois, where he worked with Bill Flygare as a National Science Foundation Predoctoral Fellow. After graduation, Mike became a First Lieutenant in the Army and was assigned to the Physics Section, Space Sciences Division of the Jet Propulsion Laboratory in Pasadena, CA. Fortunately for all of us, a new ion cyclotron resonance (ICR) mass spectrometry laboratory was being established by Jim King and Don Elleman and they needed a chemist to help them figure out what to study. Although Mike knew nothing about mass spectrometry, he heartily dug in, soon established a collaboration with an Instructor from Caltech by the name of Jack Beauchamp (who had done his thesis work on ICR), and shortly realized that his future career lay in ion chemistry. Discharged from the Army, Mike was appointed an Assistant Professor at UCSB in 1968.

Mike rapidly established himself as an expert in the use of ICR mass spectrometry to study a wide range of ion-molecule reactions. Before long, Mike became interested in predicting the rates of these reactions and in 1973 he published the first of many papers in two key areas. First, he developed ADO (average dipole orientation) theory (with Tim Su), which accounted for the polar nature of many reactants being studied, and then also began to apply "quasiequilibrium theory", which uses statistical methods, to analyze the behavior of ion-molecule reactions. Both of these advances were further developed over subsequent years, with the latter turning into the powerful "statistical phase space theory" (with Walt Chesnavich) that Mike graciously shares with other research groups. A new type of experiment for the Bowers' laboratory appeared in 1981 in which "kinetic energy release distributions" of ionic products were measured and again exquisitely analyzed using statistical methods (along with Petra van Koppen). About this time, he also began examining photodissociation dynamics and chemistry using a crossed ion beam/laser instrument. Having focused largely on small atmospheric and organic molecules, Mike began to turn his attention to organometallic chemistry using some of the new techniques he had pioneered in 1984. In 1990, Mike introduced yet another powerful technique to organometallic chemistry and in the process created a new field (although this wasn't obvious for about another

decade). Mike (with Paul Kemper) showed that using ion mobility, he could separate electronic states of atomic transition metal ions, a technique he dubbed "electronic state chromatography" and now recognized as "ion mobility". About this same time, Mike also became interested in studying transition metal and carbon clusters. Soon the carbon cluster and ion mobility studies were combined, and in 1991 (with Gert von Helden), Mike showed that isomers of the carbon clusters could be separated using ion mobility techniques. Although Mike's fundamental studies continued, the applications of ion mobility gradually seeped throughout his laboratory, until in 1996 (with Thomas Wyttenbach and Gert von Helden), Mike used ion mobility to measure the gas-phase conformation of the hormone bradykinin. The size of the systems being studied rapidly progressed and included a variety of polymers, many of which were biological. In 2004 (with Summer Bernstein, Thomas Wyttenbach, and Erin Baker among others), Mike first began to study the aggregation of proteins and, one year later, included the amyloid β -protein involved with Alzheimer's disease. Today, Mike's laboratory is as busy as ever, with his research focused on biological molecules as well as atomic clusters of both semiconductor and metallic elements. He continues his innovative use of ion mobility to study synthetic polymers and biopolymers in the gas phase, protein misfolding and aggregation diseases, as well as the formation and stabilization of the poly nucleotide G-quadruplex. Overall, Mike's scientific acumen is nicely illustrated by his publication record of 375 papers (and counting), 36 Ph.D. students graduated, 36 postdoctoral fellows mentored, and a thriving research program with generous funding from the National Science Foundation, the Air Force Office of Scientific Research, the Department of Energy, and the National Institutes of Health.

Mike's achievements have been recognized widely. Early on (1987), Mike was recognized as a Fellow of the American Physical Society "For outstanding contributions both theoretically and experimentally on the dynamics of ion molecule reactions." Notably, in 1989, Mike received the ACS Nobel Laureate Signature Award along with his student Nick Kirchner. In 1996, he was awarded the Frank H. Field and Joe L. Franklin Award for Outstanding Achievement in Mass Spectrometry by the American Chemical Society ("For his development of novel experimental approaches and theoretical models for studying the properties, structures and dynamics of ions in the gas phase, including the technique of ion chromatography with applications ranging from the study of state selected transition metal ions to elucidation of the shapes of biological molecules"). This was rapidly followed by the Thomson Gold Medal awarded by the International Mass Spectrometry Society in 1997 "For his work on ionic equilibria, the theory of ion/molecule reactions and his recent development of high resolution ion mobility measurements and their applications to characterize ionic clusters and biological compounds". Most recently, he has received the Award for a Distinguished Contribution in Mass Spectrometry by the American Society of Mass Spectrometry in 2004 ("For his fundamental contribution to ion-neutral collision theory").

Mike has also been a devoted contributor to scientific societies, most notably as editor of the *International Journal of Mass*

Spectrometry from 1986 to this day. Several years back, he decided that he could best serve the community by becoming the Special Issues Editor for IJMS, a role he still relishes. Likewise, he has been Associate Editor for the *Journal of the American Chemical Society* from 1989 to the present. He helped co-found two Gordon Research Conferences: Structure and Energetics of Gas Phase Ions in 1991 (with Jack Beauchamp and Cheuk-Yiu Ng) and Biological Molecules in the Gas Phase in 2001 (with Martin F. Jarrold).

A 70th birthday is an opportunity to recognize and thank a deserving scientist, mentor, and friend. Mike continues his scientific investigations at full tilt and his zest for life remains infectious. Mike, we wish you many more years of joy and scientific fulfillment.

Mary T. Rodgers, *Guest Editor*

Peter B. Armentrout, *Guest Editor*