60th Annual Conference • 2012 • Vancouver, BC, Canada

2019 History Committee
American Society for Mass Spectrometry

	Fluxomics	Exposomics	Multiomics	Foodomics	Plantomics	Peptidomics	Lipidomics	Phosphoproteomics	Glycomics	Petroleomics	Metabolnomics	Proteomics
ORAL SESSIONS												
2018	0	1	1	1	1	0	2	0	0	0	3	1
2017	0	1	1	1	1	0	2	0	0	0	3	2
2016	0	1	1	1	0	0	1	0	0	0	3	3
2015	0	0	1	0	1	1	0	1	0	0	2	3
2014	0	0	0	0	1	1	1	0	0	0	3	4
2013	0	0	0	0	1	0	1	0	0	0	2	1
2012	0	0	0	0	1	0	0	1	0	0	2	2
2011	0	0	0	0	0	1	1	1	0	0	2	3
2010	0	0	0	0	0	1	0	1	0	0	2	4
2009	0	0	0	0	0	0	0	0	0	0	1	2
2008	0	0	0	0	0	0	0	0	0	0	1	1
2007	0	0	0	0	0	0	0	0	0	0	0	2
2006	0	0	0	0	0	0	0	0	1	0	0	2
2005	0	0	0	0	0	0	1	0	1	0	1	1
2004	0	0	0	0	0	0	1	0	1	1	1	1
2003	0	0	0	0	0	0	0	1	1	1	1	2
2002	0	0	0	0	0	0	0	0	0	0	1	5
2001	0	0	0	0	0	0	0	0	0	0	0	3
2000	0	0	0	0	0	0	0	0	0	0	0	2
1999	0	0	0	0	0	0	0	0	0	0	0	1
1998	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0
POSTER SESSIONS												
2018	1	2	2	2	1	1	0	0	0	0	11	13
2017	1	2	1	1	1	1	0	0	0	0	10	10
2016	0	0	2	2	1	1	0	0	0	0	8	10
2015	0	0	0	1	1	1	2	0	0	0	9	10
2014	0	0	0	1	2	1	0	0	0	0	8	10
2013	0	0	0	1	1	1	0	1	0	0	10	8
2012	0	0	0	1	1	0	0	1	0	0	6	12
2011	0	0	0	0	0	1	0	0	0	0	7	11
2010	0	0	0	0	0	0	0	0	0	0	2	17
2009	0	0	0	0	0	0	0	0	0	0	3	24
2008	0	0	0	0	0	0	0	1	0	0	3	15
2007	0	0	0	0	0	0	0	0	0	0	2	19
2006	0	0	0	0	0	0	0	0	0	0	1	22
2005	0	0	0	0	0	0	0	1	0	0	2	24
2004	0	0	0	0	0	0	0	0	0	0	0	21
2003	0	0	0	0	0	0	0	0	0	0	0	17
2002	0	0	0	0	0	0	0	0	0	0	0	11
2001	0	0	0	0	0	0	0	0	0	0	0	10
2000	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0
POSTERS												
2018	13	9	30	45	27	28	0	0	0	0	252	302
2017	10	7	18	30	22	8	0	0	0	0	195	241
2016	0	0	49	30	26	11	0	0	0	0	168	242
2015	0	0	0	22	13	17	25	0	0	0	187	227
2014	0	0	0	28	27	7	0	0	0	0	162	176
2013	0	0	0	31	18	8	0	27	0	0	136	98
2012	0	0	0	21	19	11	0	34	0	0	150	313
2011	0	0	0	0	0	12	0	0	0	0	128	214
2010	0	0	0	0	0	0	0	0	0	0	55	427
2009	0	0	0	0	0	0	0	0	0	0	36	650
2008	0	0	0	0	0	0	0	33	0	0	80	363
2007	0	0	0	0	0	0	0	0	0	0	36	510
2006	0	0	0	0	0	0	0	0	0	0	55	576
2005	0	0	0	0	0	0	0	0	15	0	28	547
2004	0	0	0	0	0	0	0	0	0	0	4	437
2003	0	0	0	0	0	0	0	0	0	0	3	379
2002	0	0	0	0	0	0	0	0	0	0	0	306
2001	0	0	0	0	0	0	0	0	0	0	0	225
2000	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0

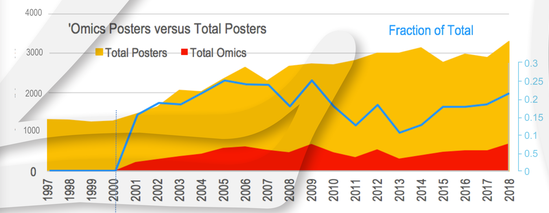
The Annual Conference in the Era of 'Omics

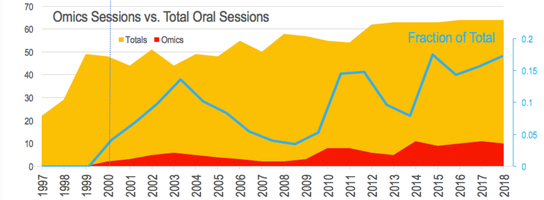
The Human Genome project was declared complete in April 2003, two years after the rough and working drafts were initially published. This project was based on the idea that full genomic sequencing would aid in improving clinical outcomes, assisting forensic analyses, and developing applications in many as demonstrated in other systems (bacterial, plant, etc.) that had been sequenced since the human centered initiative's start in 1990.

Related research, such as annotation and characterization of proteins (gene products) and metabolites (gene product-products) also emerged around this time with the goal of generating a more phenotypic understanding of organisms. These emerging areas provided a perfect opportunity for mass spectrometric analyses. They included comprehensive and systemic data collection, as well as the identification and characterization workflows related thereto, and came to be described as "'omics". The term "'omics" soon became a suffix attached to even non-biological systems (e.g., petroleum, food, etc.).

By analyzing annual conference abstracts and proceedings (see left), we can see gradual changes in the focus of the Society, both in the presentation subjects and language used to transmit such materials. Below, we can see the rise and fall of the applications of MS to various 'omics over this decade, from numbers of related oral sessions (top left), poster sessions (center left), and individual posters (bottom left), taking into account the level of growth of ASMS during the decade of interest plus the 6 years prior and following.

The extension of the timeline before and after the decade of focus indicates that initial reports in each, as well as extensions to broader applicability, generally appear first in the oral sessions. Overall, despite a near 3-fold increase in the total number of posters between the 1990's and 2018, the fraction of posters focused on 'omics has gone from 0 to more regularly 1 in 5, having peaked at over 1 in 4 in 2009. This trend can be seen in the plot below. It also echoes in the number of presentations in oral sessions, though those values are closer to 1 in 6.





Biemann Medals for Early Career Achievements

2003 - **Robinson** for Protein MS and Structural Biology
2004 - **Yates** for Protein Sequence Analysis by Tandem MS
2005 - **Van Berkel** for Electrochemical Aspects of ESI
2006 - **Clemmer** for MS-Integrated Ion Mobility Separations
2007 - **Zubarev** for ECD for MS/MS
2008 - **Laskin** for SID fundamentals
2009 - **Kelleher** for Top-Down Proteomics
2010 - **Muddiman** for Biological MS w/ Hydrophobic tags & Ion Sources
2011 - **Paizs** for Gas Phase Peptide MS/MS Chemistry
2012 - **Coon** for ETD/Orbitrap work essential for protein sequencing

John B. Fenn Awards for Distinguished Contributions

2003 - **McLafferty** for interpretive frameworks for MS fragment analysis.
2004 - **Bowers** for Ion-Neutral Collision Theory
2005 - **McCloskey** for Analysis of Nucleic Acids
2006 - **Cooks** for Kinetic Methods for Ion/Molecule Studies
2007 - **Beauchamp** for ICR for Ion-Molecule Reactions
2008 - **Makarov** for ORBital Electrostatic TRAP development
2009 - **Gaskell** and **Wysocki** for Mobile proton models
2010 - **Vestal** for work with MALDI-TOF/TOF-TOF
2011 - **Cotter** for TOF/TOF MS with CID
2012 - **Fenselau** for work in MS applications to Microbiology

Ron Hites Awards (for an exemplary *JASMS* publication (2-year look back))

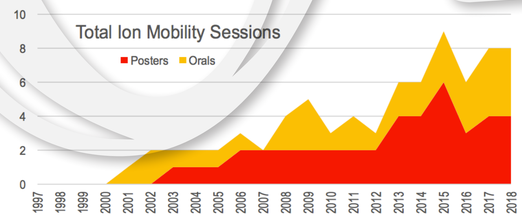
Ashcroft, Smith, Giles, Bateman, Radford. *"Monitoring Copopulated Conformational States during Protein Folding Events Using ESI-Ion Mobility Spectrometry-MS" (2007)*
Fernandez, Nyadong, Late, Green, Banga. *"Direct Quantitation of Active Ingredients in Solid Artesunate Antimalarials by Noncovalent Complex Forming Reactive DESI MS" (2008)*
McLuckey, Huang, Liu. *"Top-Down Tandem Mass Spectrometry of tRNA via Ion Trap Collision-induced Dissociation" (2010)*
Chen, Wu, Miao. *"The Study of Protein Conformation in Solution via Direct Sampling by DESI Mass Spectrometry" (2010)*
Hieftje, Graham, Ray, Enke, Barinaga, Koppenaal. *"First Distance-of-Flight Instrument: Opening a New Paradigm in Mass Spectrometry" (2011)*
Williams, Sterling, Kintzer, Feld, Cassou, Krantz. *"Supercharging Protein Complexes from Aqueous Solution Disrupts their Native Conformations" (2012)*

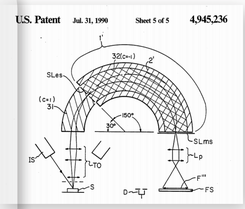
Structural Biology and Clinical Applications

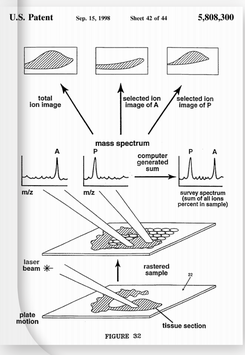
During this decade, the ability of mass spectrometry to interrogate systems to answer questions about macromolecular structure and dynamics was central to many studies at the interface of the characterization of biological systems, e.g., 'omics, and the determination of the spatial distribution of large and small molecular species, e.g., imaging technologies. These types of studies were not only prevalent at conference session topics and posters, but highlighted in the awards listed above, that recognize both long-term and recent contributions to the fields.

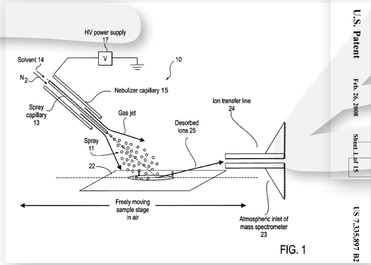
While FTICR and other high-resolution instrumentation had enabled some studies in the decade prior, the development of relatively easier to maintain bench-top instrumentation to effectively look at fragmentation data, combined with differential chemical modification, such as H/D exchange, enabled the probing of individual peptides, proteins, and complexes for information about their folding and assembly to answer biological questions. The development of techniques such as "supercharging" allow for more effective leveraging of the mass/charge ratio ranges of instruments.

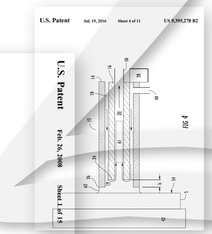
Ion Mobility measurements and separations also began to be focused on ways to facilitate the virtual pre-separation and fractionation of samples for more comprehensive analysis and detection as illustrated in the graph below.









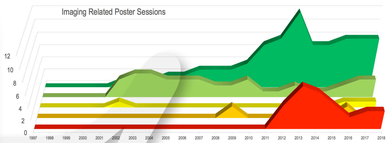


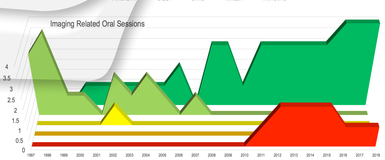
The Rise (and Rise) of Imaging MS Technologies

A major part of the surge in MS applications in pharmaceutical research in the previous decade, was focused on developing tools to facilitate front-end sample processing to increase throughput. Sample heterogeneity was perceived primarily as an obstacle to the rapid determination of ensemble averages of compounds; i.e., bulk sample homogenates were diluted and run through chromatographic separations in order to maximize identifications by MS, and secondary techniques such as autoradiography were used for spatial characterization when necessary. In this decade, heterogeneity—reframed as *significantly differentially-distributed compounds*—began to be treated as an opportunity for MS users to find highly concentrated and/or phenotypically correlated species of interest. Results from these types of studies have provided potentially critical information, not just for drug determination, but also in the worlds of toxicology, forensics, pathology, and industrial and medical research. Where previously supplemental techniques like autoradiography could indicate where radiolabeled compounds were located, the ionization and detection of these species can differentiate between tagged incipient drugs and tag-retaining metabolites, which may be distributed and excreted differently within animal models in ways critical to function. The fact that these labels could now be avoided (though they can be used for signal enhancement) was a potential boon to the overall development workflows as it bypassed expensive synthesis of labels and analogs. This provided a driving force to further develop techniques to use extant ionization sources, as well as to generate new commercialized ionization sources.

While Secondary Ion Mass Spectrometry (SIMS, upper left,) and Matrix Assisted Laser Desorption and Ionization (MALDI, middle left) had previously been used for surface analyses in vacuo, a variety of atmospheric or ambient pressure techniques such as Desorption ElectroSpray Ionization (DESI, lower left) and Liquid MicroJunction Surface Sample Probing (LMJSSP, inset) were developed during this time, taking advantage of MS sensitivity to enable imaging of localized sub-samplings through focused ballistic, radiative, or extractive disassociation of compound from surfaces for ionization and analysis. The results can be correlated with temporal information to rebuild spatial distributions of signals.

Iterations and improvements of these imaging techniques through increases in efficiency of ion transfer via geometric modifications or selectivity with chemistry (e.g. Reactive-DESI) or secondary ionizations (e.g. LAESI) or resolution at the surface sampling /spot size level, etc, led to a variety of new applications. The plots below show over the decade and beyond the increasing numbers of keyword-specific sessions (both oral and poster) inclusive of advances and developments in instrumentation and emerging imaging techniques.





MASS SPECTROMETRY	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
	Commercially available Direct Analysis in Real Time (DART) source.	Initial DESI paper published.	Commercial release of the first LTQ Orbitrap Mass Spectrometer.	Commercial release of Synapt integrated Ion Mobility/ToF MS.	Commercial release of HCD. First commercial DESI source.	Commercial release of ETD.	Commercial release of the TLC-MS interface and first presentation of LESA-MS (both based on LMJSSP.	ASMS Annual Conference Workshops expanded to 3 nights.	Commercial release of tandem Q Exactive systems.	Commercial release of a LAESI source.
HISTORY	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
	Last signal from Pioneer 10 spacecraft received. Space Shuttle Columbia disintegrates on re-entry. SARS surges to WHO global alert levels.	A Magnetar burst yields the strongest flux of γ radiation measured on earth. "The Facebook" launched among University students.	The first YouTube video is uploaded. North Korea announces Nuclear Weapons program. Hurricane Katrina hits US Gulf Coast.	Pluto demoted to dwarf planet. UN Human Rights Council established. Human Genome Project publishes last chromosome sequence.	The era of the iPhones begins. Cyclone Sidr in Bangladesh kills 15000. Queen Elizabeth II becomes oldest ever British monarch.	First proton beam circulated at LHC. Global financial crisis hits world markets. SpaceX Falcon 1 completes 1st orbit.	"Bitcoin" cryptocurrency established. Obama inaugurated US president. H1N1 flu declared global pandemic.	Deepwater Horizon Oil drilling platform explodes, yielding a spill which prompts international debate on offshore drilling practices.	(International Year of Chemistry) Global human population reaches 7x10E9. Occupy Wall Street protests begin in US.	Vladimir Putin elected president of Russia. Encyclopædia Britannica discontinues print edition. Curiosity (the rover) lands on Mars.