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Editorial

Editorial: Focus on Ionization Technologies Used in MS: Fundamentals and Applications, Honoring Dr. Sarah Trimpin, Recipient of the 2019 ASMS Biemann Medal

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The Special Focus published in the recent 2021 issues of the *Journal of the American Society for Mass Spectrometry* celebrates the accomplishments of Professor Dr. Sarah Trimpin, the recipient of the 2019 ASMS Biemann Medal for discovery and development of novel ionization processes (Figure 1). Sarah is Professor of Chemistry at Wayne State University and the CEO and a cofounder of MS Solutions, LLC. She obtained a Ph.D. from the Max-Planck-Institute for Polymer Research (Mainz, Germany). After completing a joint postdoctoral position between Oregon State University (Corvallis, OR) and the Oregon Health & Science University (Portland, OR), she was a Senior Research Associate at Indiana University (Bloomington, IN). She joined the faculty at Wayne State University in 2008.

Figure 1. Sarah Trimpin (left) receiving the Biemann Medal from ASMS President Richard Yost (right) at the 2019 ASMS Conference (June 2019, Atlanta, GA).

Dr. Trimpin's unusual observation of highly charged protein ions in an atmospheric pressure MALDI experiment led to her discovery that ionization occurs simply by passing compounds through the inlet of a mass spectrometer. She demonstrated that this simple approach achieves sensitivity comparable with, and frequently better than, electrospray or MALDI. Through fundamental studies, Dr. Trimpin discovered solid matrices that produce highly charged ions upon laser ablation using MALDI ion sources. Even more astonishing is her discovery of matrix compounds that spontaneously produce multiply charged ions when exposed to vacuum (termed matrix-assisted ionization, MAI). No heat, nebulizing gases, laser, or voltage is required, and exceptionally low chemical background is achieved for a variety of compounds, including proteins at least as large as bovine serum albumin (66 kDa). She has now discovered more than 40 matrices that spontaneously produce analyte ions. Her work has been recognized by numerous awards and has led to the development of commercially available products that provide multi-ionization capabilities in manual and automated platforms that operate on Waters, Thermo, and Agilent mass spectrometers with capabilities of ESI, nESI, SAI, MAI, and vSAI (http://mstmsolutions.com).

Because of limitations in space for this Editorial, it is not possible to tell the full story about how Professor Trimpin came to make these discoveries. As with many breakthroughs, Sarah's work met resistance. Mechanisms for explaining the production of large, singly charged ions by MALDI were soundly entrenched in the field, and Sarah's experimental observations were viewed with intense skepticism. Soon after her arrival at Indiana University, Sarah asked for my (D.E.C.) advice about how to respond to some referee comments about a paper she had submitted. The manuscript had already been through several rounds of revisions and resubmissions, so the length and tone of the reviewer commentary was surprising to me. It was not enough to reject her papers—Sarah needed to be reprimanded. Clearly, one sees the value of having a thick skin, a stomach of a goat, and wise editors who give such work a chance. I told her that she should pray for reviewers who

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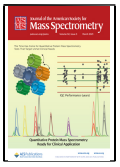

understand her and either change fields or persist. She persisted, using the reviewer feedback to design a series of tremendously creative, insightful, and ingeniously designed studies that led to this award-winning work. In hindsight, this story is one that exemplifies how scientific inquiry and peer review reveal nature's truth.

In the Special Focus honoring the 2019 Biemann awardee, Dr. Trimpin presents fundamental insights on the mechanism(s) of the sublimation processes exploited in vacuum MAI (vMAI) that creates gas-phase ions that can be detected using mass spectrometry in the paper, "Sublimation Driven Ionization for Use in Mass Spectrometry: Mechanistic Implications".[1] She is also coauthor on additional papers describing more recent results on the fundamentals of ionization and novel applications of these approaches. "A Combination MAI and MALDI Vacuum Source Operational from Atmospheric Pressure for Fast, Robust, and Sensitive Analyses" describes a novel source design in which switching between vMAI and vMALDI ionization modes can be accomplished in a few seconds for high-throughput automated measurements.[2] "Resolving Isomers of Star-Branched Poly(Ethylene Glycols) by IMS-MS Using Multiply Charged Ions" details the ability of ion mobility spectrometry-mass spectrometry (IMS-MS) to separate ions of differently branched star-branched poly(ethylene glycol) oligomers (up to 2000 Da) regardless of whether formed by ESI-charged solution droplets or from vMAI-charged solid particles produced directly from a surface.[3] The latter paper highlights the potential of analyses directly from surfaces using vMAI for spatially resolved measurements relative to ESI and other ionization methods.

The remaining papers in the Special Focus from colleagues and friends discuss a variety of applications and developments in ionization technologies, as well as in other areas of mass spectrometry.

On behalf of the *JASMS* Editors and the ASMS community, we extend our warm congratulations to Sarah Trimpin as the recipient of the 2019 Biemann Medal. We look forward to many more exciting developments in novel ionization techniques for mass spectrometry.

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Notes

Views expressed in this editorial are those of the authors and not necessarily the views of the ACS.

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