CHRISTOPHER C. MULLIGAN, PH. D.

Contact

Illinois State University
Department of Chemistry
Campus Box 4160
Normal, IL 61790-4160

mulligan@ilstu.edu
Office: 309.438.2464

Current Position

Illinois State University, Normal, IL
Department of Chemistry
Professor, Analytical Chemistry, *Fall 2019 – Present*
Associate Professor, Analytical Chemistry, *Fall 2014 – Spring 2019*
Assistant Professor, Analytical Chemistry, *Fall 2008 – Spring 2014*

Education

Purdue University, West Lafayette, IN
Post-Doctoral Researcher - Instrumentation, Jan. 2008 – Aug. 2008
- Research Concentration: Applications of Portable Mass Spectrometric Systems
- Research Advisor: Dr. R. Graham Cooks

Ph. D., Analytical Chemistry, February 2008
- Research Concentration: Mass Spectrometric Instrumentation Development, Ambient Ionization Methods
- Research Advisor: Dr. R. Graham Cooks

Northern Illinois University, DeKalb, IL
B. S., Chemistry with Departmental and University Honors, 2003
- Research Concentration: Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES), Acousto-Optic Tunable Filters (AOTFs)
- Undergraduate Research Advisor: Dr. Jon W. Carnahan

Research Interests

Mass Spectrometric (MS) Instrumentation
- Design/construction of portable MS instrumentation capable of traditional atmospheric pressure ionization methods (ESI, APCI) and novel ambient ionization methods (DESI, LTP, PSI, FCSI, DART, etc.)
- Design/construction of custom ionization sources for forensic evidentiary analysis, large surface area analysis, and direct liquid/soil sample analysis
- Validation of fieldable MS systems for on-site screening of high priority chemicals
- Assessment of the Fourth Amendment legality of using portable MS systems in law enforcement and financial viability of broad implementation
- Integration of laser spectroscopic analysis with ambient MS methods for forensic drug confirmation

Method Development for Commercial and Portable MS Instrumentation
- Application of ambient sampling, portable MS systems to routine crime scene investigatory analysis and clandestine drug laboratory remediation
- Direct, trace analysis of drugs of abuse and adulterants from unconventional media (skin, clothing, foodstuffs, etc.) and powder-based forensic evidence
- On-site forensic and veterinary toxicological analysis of biological matrices
- Identification/quantification of gaseous toxic industrial compounds, chemical warfare agents, and accelerants in complex urban matrices
- Novel methodology for direct screening of explosives, agricultural chemicals, and pharmaceuticals and personal care products (PPCPs) from water/soil matrices
- Dynamic preparative methods for ambient mass spectrometry

Application areas: Forensics, Environmental Analysis, Homeland Security, Quality Control

Publications

(32) Brown, H. M.; McDaniel, T. J.; Doppalapudi, K.; **Mulligan, C. C.**; Fedick, P. W. Rapid, In-Situ Detection of Chemical Warfare Agent Simulants and Hydrolysis Products in Bulk Soils by Low-Cost 3D-Printed Cone Spray Ionization Mass Spectrometry. *Analyst,* **2021**, *146*, 3127-3136. ***Cover Article and Analyst "Recent HOT Article."***

(31) Brown, H. M.; McDaniel, T. J.; Fedick, P. W.; **Mulligan, C. C.** The Current Role of Mass Spectrometry in Forensics and Future Prospects. *Anal. Methods,* **2020**, *12*, 3974-3997. ***Cover Article and Invited Critical Review.***

(30) Burr, D. S.; Fatigante, W.; Lartey, J.; Jang, W.; Stelmack, A. R.; McClurg, N.; Standard, J.; Wieland, J. R.; Kim, J.-H.; **Mulligan, C. C.;** Driskell, J. D. Integrating SERS and PSI-MS with Dual Purpose Plasmonic Paper Substrates for On-Site Illicit Drug Confirmation. *Anal. Chem.,* **2020**, *92,* 6676-6683.

(29) Evans-Nguyen, K.; Stelmack, A. R.; Clowser, P. C.; Holtz, J. M.; **Mulligan, C. C.** Fieldable Mass Spectrometry for Forensic Science, Homeland Security and Defense Applications. *Mass Spectrom. Rev.,* **2020**, *DOI: 10.1002/mas.21646.* ***Invited Review for Special Issue Honoring Prof. Robert J. Cotter.***

(28) Fatigante, W. L.; Mukta, S.; Lawton, Z. E.; Bruno, A. M.; Traub, A.; Gasa, A. J.; Stelmack, A. R.; Wilson-Frank, C. R.; **Mulligan, C. C.** Filter Cone Spray Ionization Coupled to a Portable MS System: Application to On-Site Forensic Evidence and Environmental Sample Analysis. *J. Am. Soc. Mass Spectrom.,* **2020**, *31*, 336-346.

(27) Lartey, J. A.; Harms, J. P.; Frimpong, R.; **Mulligan, C. C.**; Driskell, J. D.; Kim, J.-H. Sandwiching Analytes with Structurally Diverse Plasmonic Nanoparticles on Paper Substrates for Surface Enhanced Raman Spectroscopy. *RSC Adv.* **2019**, *9,* 32535-32543.

(26) Kazimi, S. G. T.; Iqbal, M. S.; **Mulligan, C. C.**; Shaw III, C. F.; Fozia, I.; Stelmack, A. R.; Campbell, I. S. Ligand Exchange/Scrambling Study of Gold(I)-Phosphine Complexes in the Solid Phase by DESI-MS Analysis. *J. Am. Soc. Mass Spectrom.,* **2019**, *30,* 2289-2296.

(25) Gizzi, M. C.; Bruno, A. M.; Curtis, R. C.; **Mulligan, C. C.** The Fourth Amendment and the Potential Use of Field-Portable Mass Spectrometry Systems in Law Enforcement. *J. Crime Just.*, **2019**, *42,* 316-330.

(24) Fedick, P. W.; Fatigante, W. L.; Lawton, Z. E.; O'Leary, A. E.; Hall, S. E.; Bain, R. M.; Aryton, S. T.; Ludwig, J. A.; **Mulligan, C. C.** A Low-Cost, Simplified Platform of Interchangeable, Ambient Ionization Sources for Rapid, Forensic Evidence Screening on Portable Mass Spectrometric Instrumentation. *Instruments*, **2018**, *2, doi:10.3390/instruments2020005.* ***Invited Submission to the "Mass Spectrometry Based Miniature Instruments for Environmental and Field Studies" Special Issue***

(23) Bruno, A. M.; Cleary, S. R.; O'Leary, A. E.; Gizzi, M. C.; **Mulligan, C. C.** Balancing the Utility and Legality of Implementing Portable Mass Spectrometers Coupled with Ambient Ionization in Routine Law Enforcement Activities. *Anal. Methods*, **2017**, *9*, 5015-5022. ***Invited Submission to the "Ambient Mass Spectrometry" Themed Issue***

(22) Lawton, Z. E.; Traub, A.; Fatigante, W. L.; Mancias, J.; O'Leary, A. E.; Hall, S. E.; Wieland, J. R.; Oberacher, J.; Gizzi, M. C.; **Mulligan, C. C.** Analytical Validation of a Portable Mass Spectrometer Featuring Interchangeable, Ambient Ionization Sources for High Throughput Forensic Evidence Screening. *J. Am. Soc. Mass Spectrom.,* **2017**, *6*, 1048-1059. ***Invited Submission in Special Issue Honoring Prof. R. Graham Cooks' Election to the National Academy of Sciences***

Publications (Continued)

(21) Hall, S. E.; O'Leary, A. E.; Lawton, Z. E.; **Mulligan, C. C**. Trace Level Screening of Chemicals Related to Clandestine Desomorphine Production with Ambient Sampling, Portable Mass Spectrometry. *J. Chem.,* **2017**, *DOI:10.1155/2017/8571928.*

(20) Lawton, Z. E.; Santee, C. J.; Bruno, A. M.; **Mulligan, C. C.**; Kong, J.; Elliott, N.; Kero, F. Biological Samples in Environmental Analysis: Preparation and Cleanup. *Encycl. Anal. Chem.,* **2016**, 1-14.

(19) O'Leary, A. E.; Hall, S. E.; Vircks, K. E.; **Mulligan, C. C.** Monitoring the Clandestine Synthesis of Methamphetamine in Real-time with Ambient Sampling, Portable Mass Spectrometry. *Anal. Methods,* **2015**, *7,* 7156-7163. ***Invited Submission to the "Emerging Investigators" Special Issue***

(18) O'Leary, A. E.; Oberacher, H.; Hall, S. E.; **Mulligan, C. C.** Combining a Portable, Tandem Mass Spectrometer with Automated Library Searching – An Important Step Towards Streamlined, On-Site Identification of Forensic Evidence. *Anal. Methods,* **2015**, *7,* 3331-3339. ***Cover Article***

(17) Buse, J.; Purves, R. W.; Verrall, R. E.; Ildiko, B.; Zhang, H.; **Mulligan, C. C.**; Peru, K. M.; Bailey, J.; Headley, J. V.; El-Aneed. The Development and Assessment of High-Throughput Mass Spectrometry-Based Methods for the Quantification of a Nanoparticle Drug Delivery Agent in Cellular Lysate. *J. Mass Spectrom*, **2014**, *49*, 1171-1180.

(16) Hall, S. E.; **Mulligan, C. C.** Application of Ambient Sampling, Portable Mass Spectrometry Toward On-Site Screening of Clandestine Drug Operations. *LCGC North America*, **2014**, *10*, s8-s13, ***Invited Submission to "Current Trends in Mass Spectrometry" Special Issue***

(15) Wilson, C. R.; **Mulligan, C. C.**; Strueh, K. D.; Stevenson, G. W.; Hooser, S. B. Rapid Detection of Terbufos in Stomach Contents Using Desorption Electrospray Ionization Mass Spectrometry. *J. Vet. Diagn. Invest.*, **2014**, *26*, 428-430.

(14) Nizzia, J. L.; O'Leary, A. E.; Ton, A. T.; **Mulligan. C. C.** Screening of Cosmetic Ingredients from Authentic Formulations and Environmental Samples with Desorption Electrospray Ionization Mass Spectrometry. *Anal. Methods*, **2013**, *5,* 394-401. ***Invited Submission to Special Issue on "Cosmetic Ingredients"***

(13) Dalgleish, J. K.; Wlekinski, M.; Shelley, J. T.; **Mulligan, C. C.**, Ouyang, Z.; Cooks, R. G. Arrays of Low-Temperature Plasma Probes for Ambient Ionization Mass Spectrometry. *Rapid Commun. Mass Spectrom*., **2013**, *27*, 135-142.

(12) Vircks, K. E.; **Mulligan, C. C.** Rapid Screening of Synthetic Cathinones as Trace Residues and in Authentic Seizures Using a Portable Mass Spectrometer Equipped With Desorption Electrospray Ionization. *Rapid Commun. Mass Spectrom*., **2012**, *26*, 2665-2672.

(11) Campbell, I. S.; Ton, A. T.; **Mulligan. C. C.** Direct Detection of Pharmaceuticals and Personal Care Products from Aqueous Samples with Thermally-Assisted Desorption Electrospray Ionization Mass Spectrometry. *J. Am. Soc. Mass Spectrom.*, **2011**, *22*, 1285-1293.

(10) Schwarz, T.; Nanita, Snow, T. A.; Santee, C. J.; **Mulligan, C. C.**; Class, T.; Wadsley, M. P.; Nanita, S. C. QuEChERS Multiresidue Method Validation and Mass Spectrometric Assessment for the Novel Anthranilic Diamide Insecticides Chlorantraniliprole and Cyantraniliprole. *J. Agric. Food Chem.*, **2011**, *59*, 814-821.

(9) Harper, J. D.; Charipar, N.; **Mulligan, C. C.**; Zhang, X.; Cooks, R. G.; Ouyang, Z. Low-Temperature Plasma Probe for Ambient Desorption Ionization. *Anal. Chem.*, **2008**, *80,* 9097-9104.

Publications (Continued)

--- Begins Assistant Professorship at Illinois State University ---

(8) Janfelt, C.; Talaty, N.; **Mulligan, C. C.**; Keil, A.; Ouyang, Z.; Cooks, R. G. Mass Spectra of Proteins and Other Biomolecules Recorded with a Handheld Instrument. *Int. J. Mass Spectrom.,* **2008**, *278*, 164-169.

(7) **Mulligan, C. C.**; Talaty, N.; Justes, D. R.; Jackson, A. U.; Noll, R. J.; Cooks, R. G. Fabric Analysis by Ambient Mass Spectrometry for Explosives and Drugs. *Analyst,* **2008**, *133,* 1532-1540.

(6) **Mulligan, C. C.**; MacMillan, D. K.; Noll, R. G.; Cooks, R. G. Fast Analysis of Ordnance-Related Compounds and Agricultural Chemicals in Water with Desorption Electrospray Ionization Mass Spectrometry. *Rapid Commun. Mass Spectrom.,* **2007**, *21*, 3729-3736.

(5) Cotte-Rodriguez, I.; **Mulligan, C. C.**; Cooks, R. G. Non-Proximate Detection of Small and Large Molecules by Desorption Electrospray Ionization and Desorption Atmospheric Pressure Chemical Ionization Mass Spectrometry: Instrumentation and Applications in Forensics, Chemistry, and Biology. *Anal. Chem*., **2007**, *79*, 7069-7077.

(4) **Mulligan, C. C.**; Talaty, N.; Cooks, R. G. Desorption Electrospray Ionization with a Portable Mass Spectrometer: In-situ Analysis of Ambient Surfaces. *Chem. Comm.,* **2006**, 1709-1711. ***Cover Article***

(3) Cotte-Rodriguez, I.; Justes, D. R.; Nanita, S. C.; Noll, R. J.; **Mulligan, C. C.**; Sanders, N. L.; Cooks, R. G. Analysis of Gaseous Toxic Industrial Compounds and Chemical Warfare Agent Simulants by Atmospheric Pressure Ionization Mass Spectrometry. *Analyst,* **2006**, *131*, 579-589.

(2) **Mulligan, C. C.**; Justes, D. R.; Noll, R. J.; Sanders, N. L.; Laughlin, B. C.; Cooks, R. G. Direct Monitoring of Gaseous Toxic Compounds in Air Using a Portable Mass Spectrometer. *Analyst,* **2006**, *131*, 556-567.

(1) Laughlin, B. C.; **Mulligan, C. C.**; Cooks, R. G. Atmospheric Pressure Ionization in a Miniature Mass Spectrometer. *Anal. Chem.,* **2005**, *77*, 2928-2939.

Grant Funding (External)

TOTAL EXTERNAL RESEARCH FUNDS AWARDED: $1,438,564 via 5 Grants

(5) **Mulligan, C. C. (PI)**, Driskell, J. D.; Kim, J.-H.; Wieland, J. R. "Coupling Raman Spectroscopy with Ambient Sampling, Portable Mass Spectrometry for On-site, High-Throughput Evidence Confirmation on a Single Instrumental Platform," National Institute of Justice, Award No. 2017-R2-CX-0022, $298,100, **Jan. 2018 - Dec. 2019**.

(4) **Mulligan, C. C. (PI)**, Wieland, J. R.; Gizzi, M. C. "Analytical Validation and Impact Assessment of On-Site Evidence Screening via Ambient Sampling, Portable Mass Spectrometry," National Institute of Justice, Award No. 2015-IJ-CX-K011, $299,753, **Jan. 2016 - Dec. 2017**.

(3) **Mulligan, C. C. (PI)**, Bowden, R. M.; Byrns, M. C.; Mitchell, T. A.; Brennan, B. B. "MRI: Acquisition of a High Resolution LC-MS/MS System for Research and Education," National Science Foundation – Major Research Instrumentation Grant Program, CHE-1337497, $399,981, **Sept. 2013 – Aug. 2016.**

(2) **Mulligan, C. C.** "Assessing the Probative Value of Physical Evidence at Crime Scenes with Ambient Mass Spectrometry and Portable Instrumentation," National Institute of Justice, Award No. 2011-DN-BX-K552, $396,780, **Jan. 2012 - Dec. 2014**.

Grant Funding (External) (Continued)

(1) **Mulligan, C. C.** "On-site Monitoring of Emerging Environmental Contaminants with Ambient Mass Spectrometry," Research Corporation for Scientific Advancement - Cottrell College Science Awards (RCSA-CCSA), $43,950, **Jan. 2010 – Dec. 2011.**

Grant Funding (Internal)

(3) **Mulligan, C. C.** "Anticipating the Impact of Next Generation Technologies on Forensic Evidence Processing," Illinois State University College of Arts and Sciences (CAS) Interdisciplinary Initiative Grant Award, $5,500, **2018**.

(2) **Mulligan, C. C.** "Optimized Detection of Pharmaceuticals and Personal Care Products in Environmental Samples with Mass Spectrometry," Illinois State University Research Grant, Pre-Tenure Initiative Award, $3,500, **2010**.

(1) **Mulligan, C. C.** "Detection of Trace Pharmaceuticals in Groundwater with Mass Spectrometry," Illinois State University Research Grant, Pre-Tenure Initiative Award, $3,500, **2009**.

Patents

(2) **Mulligan, C. C.** High Sensitivity Mass Spectrometry Systems, U.S. Patent 8,716,657. Filed Oct. 16th, 2013. Publication Date: **May 6th, 2014**.

(1) **Mulligan, C. C.** High Sensitivity Mass Spectrometry Systems, U.S. Patent 8,592,754. Filed May 11th, 2012. Publication Date: **Nov. 26th, 2013**.

Technical Reports and Training Manuals

(4) **Mulligan, C. C.**; Driskell, J. D.; Kim, J.-H.; Wieland, J. R. Coupling Raman Spectroscopy With Ambient Sampling, Portable Mass Spectrometry for On-site, High-Throughput Evidence Confirmation on a Single Instrumental Platform, *Technical Summary for NIJ Grant No. 2017-R2-CX-0022*, *Doc. No. 255670*, National Institute of Justice: Washington, D.C., **2020**, pgs. 1-20.

(3) **Mulligan, C. C.**; Wieland, J. R.; Gizzi, M C. Analytical Validation and Impact Assessment of On-Site Evidence Screening via Ambient Sampling, Portable Mass Spectrometry, *Technical Summary for NIJ Grant No. 2015-IJ-CX-K011*, *Doc. No. 251910*, National Institute of Justice: Washington, D.C., **2018**, pgs. 1-10.

(2) **Mulligan, C. C.** FLIR Systems AI-MS 1.2 Training Manual for Grant-Related Methodologies, *Deliverable for NIJ Grant No. 2011-DN-BX-K552*, *Doc. No. 248885*, National Institute of Justice: Washington, D.C., **2015**, pgs. 1-86.

(1) **Mulligan, C. C.**; O'Leary, A. E. Assessing the Probative Value of Physical Evidence at Crime Scenes with Ambient Mass Spectrometry and Portable Instrumentation, *Technical Report for NIJ Grant No. 2011-DN-BX-K552*, *Doc. No. 248884*, National Institute of Justice: Washington, D.C., **2015**, pgs. 1-128.

Textbook Chapters

(1) Smith, S. A.; **Mulligan, C. C.**; Song, Q.; Noll, R. J.; Cooks, R. G.; Ouyang, Z. Chapter 2: Ion Traps for Miniature, Multiplexed and Soft Landing Technologies, In *Practical Aspects of Trapped Ion Mass Spectrometry, Vol. VI: Theory and Instrumentation*, March, R. E.; Todd, J. F. J., Eds.; CRC Press: Boca Raton, FL, **2010**, pp 169-250.

Invited Contributions

(4) **Mulligan, C. C.** Ask the Expert: Trends in Portable Analysis. *Lab Manager Magazine*. **2019,** *14,* 44-45.

(3) **Mulligan, C. C.** Plug-and-Play Forensic MS. *The Analytical Scientist Magazine*. **2016,** *37*, 12-13.

(2) **Mulligan, C. C.**; Vircks, K. E. Advances in Field-Portable Mass Spectrometers for On-site Analytics. *International News on Fats, Oils, and Related Materials (inform)*, **2012**, *23,* 613-617.

Invited Contributions (Continued)

(1) **Mulligan, C. C.** Field-Portable Mass Spectrometers for Onsite Analytics: What's Next? *International News on Fats, Oils, and Related Materials (inform)*, **2009**, 20, 625-627.

Invited Presentations

(19) **Mulligan, C. C.**; Wieland, J. R.; Driskell, J. D.; Kim, J.-H.; Fatigante, W.; Burr, D. S.; Lartey, J.; Stelmack, A. R.; McDaniel, T. J. Coupling Raman Spectroscopy with Ambient Sampling, Portable Mass Spectrometry for On-site, High-Throughput Evidence Confirmation on a Single Instrumental Platform. *Invited presentation at the 2021 National Institute of Justice (NIJ) Forensic Science Research and Development Symposium at the 2021 American Academy of Forensic Science (AAFS) Virtual Conference,* **Feb. 16th, 2021.**

(18) **Mulligan, C. C.;** Fatigante, W.; Burr, D. S.; Wieland, J. R.; Driskell, J. D.; Kim, J.-H. Developing a Fieldable SERS-PSI-MS Platform for On-Site, High Throughput Drug Evidence Confirmation. *Invited address at the National Institute of Justice (NIJ)-Sponsored "NIJ Innovations and Trends in Forensic Examination of Seized Drugs and Forensic Toxicology" Symposium at the 71st Pittsburgh Conference on Analytical Chemistry, Chicago, IL.* **March 2020.**

(17) **Mulligan, C. C.;** Fatigante, W.; Stelmack, A. R.; Burr, D. S.; Harms, J. P.; Kim, J.-H.; Driskell, J. D.; Wieland, J. R. Towards On-Site Drug Evidence Confirmation Using Ambient Sampling, Portable Mass Spectrometry. *Invited address at the "Frontiers in Forensic Mass Spectrometry" Symposium at the 257th American Chemical Society (ACS) National Meeting*, *Orlando, FL,* **March 2019.**

(16) **Mulligan, C. C.;** Driskell, J. D.; Kim, J.-H.; Wieland, J. R. Coupling Raman Spectroscopy with Ambient Sampling, Portable Mass Spectrometry for On-Site, High-Throughput Evidence Confirmation. *Invited address for the 2019 "Emerging Forensic Research" Webinar Series by the Forensic Technology Center for Excellence (FTCoE),* **April 2019. (LINK)**

(15) **Mulligan, C. C.;** Fatigante, W.; Mukta, S.; Stelmack, A. R.; Lawton, Z. E.; Evans-Nyugen, K. E. Characterizing a Portable MS System Featuring Interchangeable, Ambient Ionization Sources for Routine Forensic Evidence Screening. *Invited address at the "Ambient Ionization and Forensic Science" Symposium at the 255th American Chemical Society (ACS) National Meeting*, *New Orleans, LA,* **March 2018**.

(14) **Mulligan, C. C.** The Utility of Portable Mass Spectrometers for On-Site Evidence Screening. *Invited address at the University of Tampa, Tampa, FL,* **April 2017**.

(13) **Mulligan, C. C.** The Utility of Portable Mass Spectrometers Towards Novel Psycho-active Substance (NPS) Evidence Screening. *Invited address in the "Innovations in the Analysis of Emerging Psychotropic and Synthetic Designer Drugs" Symposium at the 68th Pittsburgh Conference on Analytical Chemistry*, *Chicago, IL,* **March 2017**.

(12) **Mulligan, C. C.** The Utility of Portable Mass Spectrometers for On-Site Evidence Screening. *Invited address at the Millikin University, Decatur, IL,* **March 2017.**

(11) **Mulligan, C. C.;** Lawton, Z. E.; Wieland, J. R.; Gizzi, M. C**.** Ambient Sampling, Portable Mass Spectrometers for On-Site Forensic Applications. *Invited address for the Forensics and Homeland Security Interest Group Workshop at the 64th ASMS Conference on Mass Spectrometry and Applied Topics*, *San Antonio, TX,* **June 2016.**

(10) **Mulligan, C. C.** Ambient Sampling, Portable Mass Spectrometers for On-Site Crime Scene Analytics. *Invited address at the 2015 National Institute of Justice (NIJ) Grantees Meeting during the 2015 American Academy of Forensic Science (AAFS) Conference, Orlando, FL,* **Feb. 17th, 2015**.

Invited Presentations (Continued)

(9) **Mulligan, C. C.** Towards a Versatile Mass Spectrometric Platform for Comprehensive Field Analytics. *Invited address at Indiana State University, Terre Haute, IN,* **2013**.

(8) **Mulligan, C. C.** *Invited contributor to NSF-sponsored workshop: Science on Location: Forensic Science on the Move, NSF Headquarters, Arlington, VA,* **Dec. 3rd, 2012.**

(7) **Mulligan, C. C.** Chemical Information on Demand: Portable Mass Spectrometers Capable of Ambient Ionization. *Invited seminar at Saint Louis University, St. Louis, MO,* **2011**.

(6) **Mulligan, C. C.** Portable Mass Spectrometers Capable of Ambient Ionization. *Invited seminar for the American Chemical Society Heartland Local Section, Bradley University, Peoria, IL,* **2011**.

(5) **Mulligan, C. C.** Environmental Monitoring with Portable Mass Spectrometry. *Invited Seminar for the Society for Applied Spectroscopy, Chicago, IL,* **2011.**

(4) **Mulligan, C. C.** Pushing the Limits of Mass Spectrometry: Miniaturized Instruments and Ambient Ionization. *Invited Seminar at Northern Illinois University, DeKalb, IL,* **2010**.

(3) **Mulligan, C. C.** Portable Mass Spectrometers with Ambient Sampling Capabilities for On-Site Screening Analytics. *Invited seminar at the 2009 Army National Guard Civil Support Team (CST) Conference, Anaheim, CA,* **2009.**

(2) **Mulligan, C. C.** Portable Mass Spectrometers for On-site Screening Analytics. *Invited seminar for the Micro-Miniaturization Section of the Hot Topic Symposium at the 100th American Oil Chemists Society Meeting*, *Orlando, FL*, **2009**.

(1) **Mulligan, C. C.**; Gao, L.; Ouyang, Z.; Cooks, R. G. Design and Application of Miniature Mass Spectrometers with Ambient Sampling Capabilities. *Invited seminar for the Ion Trap Special Interest Group at the 56th ASMS Conference on Mass Spectrometry and Applied Topics*, *Denver, CO*, **2008**.

Presentations

(103) Fedick, P.; Brown, H.; McDaniel, T. J.; Doppalapudi, K.; **Mulligan, C. C.** Rapid In-Situ Detection of Chemical Warfare Agent Simulants in Bulk Soil by Low-Cost 3D-Printed Cone Spray Ionization Mass Spectrometry. *261st ACS National Meeting and Exposition, Virtual Conference due to COVID-19.* **Spring 2021.**

(102) Stelmack, A. R.; Fatigante, W.; Burr, D. S.; Harms, J. P.; Driskell, J. D.; Kim, J.-H.; Wieland, J. R.; **Mulligan, C. C.** Towards On-Site Drug Evidence Confirmation via Surface-Enhanced Raman Spectroscopy and Paper Spray Ionization Employed on Portable Instrumentation. *Address at the "Homeland Security, Defense, and Extreme Environments: Developments and Applications" Session at the 68th ASMS Conference on Mass Spectrometry and Applied Topics, Virtual Conference due to COVID-19.* **2020**.

(101) McDaniel, T. J.; Holtz, J. M.; Overfelt, M. R.; **Mulligan, C. C.** Rapid Screening of High Priority N-Nitrosamines in Pharmaceutical, Forensic, and Environmental Samples with FCSI-MS and PSI-MS. *68th ASMS Conference on Mass Spectrometry and Applied Topics, Online Conference due to COVID-19.* **2020**.

(100) Holtz, J. M.; McDaniel, T. J.; Swiontek, A.; **Mulligan, C. C.** Examining Transfer Efficiency of Paper Substrates Utilized as Physical Transfer Swabs *68th ASMS Conference on Mass Spectrometry and Applied Topics, Online Conference due to COVID-19.* **2020**.

Presentations (Continued)

(99) Overfelt, M. R.; Mukta, S.; Gasa, A.; **Mulligan, C. C.** On-Demand Screening of Agrochemicals and Priority Pollutants in Soil Using Filter Cone Spray Ionization – Mass Spectrometry (FCSI-MS). *68th ASMS Conference on Mass Spectrometry and Applied Topics, Online Conference due to COVID-19.* **2020**.

(98) Lartey, J.; Harms, J.; Frimpong, R.; Burr, D.; Fatigante, W. L.; **Mulligan, C. C.;** Driskell, J. D.; Kim, J.-H. Sandwiching Target Analytes with Structurally Diverse Plasmonic Nanoparticles for Surface Enhanced Raman Spectroscopy Sensing. *Invited Presentation in the National Institute of Justice (NIJ)-Sponsored Poster Session at the 71th Pittsburgh Conference on Analytical Chemistry, Chicago, IL.* **2020.**

(97) Clowser, P. C.; Holtz, J. M.; Stelmack, A. R.; Mukta, S.; Fatigante, W. L.; **Mulligan, C. C.** Environmental Ruggedness of a Portable MS System Coupled with Paper Spray Ionization During Field Operation. *4th Annual ACS East Illinois Section Research Conference, Champaign, IL.* **2019**.

(96) Overfelt, M. R.; Mukta, S.; **Mulligan, C. C.** Ambient Mass Spectrometry of Agrochemicals in Soil Utilizing Paper Cone Spray Ionization Mass Spectrometry. *4th Annual ACS East Illinois Section Research Conference, Champaign, IL.* **2019**.

(95) Driskell, J. D.; **Mulligan, C. C.**; Kim, J.-H.; Fatigante, W.; Burr, D. S.; Lartey, J. Integrated SERS-PSI-MS Platform Using Gold Nanoparticle-embedded Paper for Trace Detection of Illegal Drugs. *SciX 2019 – The Great Scientific Exchange for the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Palm Springs, CA,* **2019.**

(94) Fatigante, W.; Stelmack, A. R.; Burr, D. S.; Harms, J. P.; Driskell, J. D.; Kim, J.-H.; Wieland, J. R.; **Mulligan, C. C.** Towards On-Site Drug Evidence Confirmation via Surface-Enhanced Raman Spectroscopy and Paper Spray Ionization Employed on Portable Instrumentation. *Address at the "Forensics: Innovations and Applications" Session at the 67th ASMS Conference on Mass Spectrometry and Applied Topics, Atlanta, GA.* **2019**.

(93) McDaniel, T. J.; McClurg, N. W.; Fatigante, W.; Kim, J.-H.; Driskell, J. D.; **Mulligan, C. C.** The Performance of Nanoparticle-Modified Paper Substrates Employed as Surface Transfer Swabs for Combined SERS and PSI-MS Investigation. *67th ASMS Conference on Mass Spectrometry and Applied Topics, Atlanta, GA.* **2019**.

(92) Stelmack, A. R.; Fatigante, W. L.; Mukta, S.; **Mulligan, C. C.** Rapid Profiling of Authentic Forensic Evidence via Paper Cone Spray Ionization Employed on Portable MS Instrumentation. *67th ASMS Conference on Mass Spectrometry and Applied Topics, Atlanta, GA.* **2019**.

(91) Poehls, A. M.; Mukta, S.; **Mulligan, C. C.** Analysis of Cosmetic Products for Evidentiary Value via Paper Spray and Paper Cone Spray Ionization-Mass Spectrometry. *67th ASMS Conference on Mass Spectrometry and Applied Topics, Atlanta, GA.* **2019**.

(90) Gasa, A. J.; Overfelt, M. R.; **Mulligan, C. C.** Profiling Agrochemical Residues in Produce via Paper Cone Spray Ionization and Portable Instrumentation. *67th ASMS Conference on Mass Spectrometry and Applied Topics, Atlanta, GA.* **2019**.

(89) Harms, J. P.; Burr, D. S.; Fatigante, W.; **Mulligan, C. C**.; Driskell, J. D.; Kim, J.-H. Sandwich Structure of Plasmonic Paper for Surface Enhanced Raman Spectroscopy. *257th American Chemical Society (ACS) National Meeting*, *Orlando, FL,* **2019**.

Presentations (Continued)

(88) Fatigante, W.; Mukta, S.; Stelmack, A. R.; Lawton, Z. E.; Wieland, J. R.; Gizzi, M. C.; **Mulligan, C. C.** Optimization of Plasmonic Paper for Two-Tiered Drug Analysis on a Portable SERS-PSI-MS Platform. *Invited address in the National Institute of Justice (NIJ)-Sponsored "Innovations and Trends in Forensic Examination of Seized Drugs and Forensic Toxicology" session at the 70th Pittsburgh Conference on Analytical Chemistry, Philadelphia, PA,* **2019.**

(87) Burr, D. S.; Fatigante, W.; Harms, J. P.; Kim, J.-H.; Driskell, J. D.; **Mulligan, C. C.** Optimization of Plasmonic Paper for Two-Tiered Drug Analysis on a Portable SERS-PSI-MS Platform. *Invited poster presentation at the 70th Pittsburgh Conference on Analytical Chemistry NIJ Poster Session, Philadelphia, PA,* **2019.**

(86) Driskell, J. D.; **Mulligan, C. C.**; Kim, J.-H.; Fatigante, W.; Burr, D. S. Coupling SERS and Ambient Ionization Mass Spectrometry with Plasmonic Paper for On-Site, Trace Analysis of Illicit Drugs. *SciX 2018 – The Great Scientific Exchange for the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Atlanta, GA,* **2018.**

(85) Fedick, P. W.; Bain, R. M.; Fatigante, W. L.; **Mulligan, C. C.**; Cooks. R. G. Swab Touch Spray Ionization Mass Spectrometry for Rapid Analysis of Trace Residues of Forensic Relevance. *256th American Chemical Society (ACS) National Meeting, Boston, MA,* **2018**.

(84) Fatigante, W.; Burr, D. S.; Harms, J. P.; Driskell, J. D.; Kim, J.-H.; Wieland, J. R.; **Mulligan, C. C.** Coupling Raman Spectroscopy with Ambient Sampling, Portable Mass Spectrometry for On-site, High-Throughput Evidence Confirmation on a Single Instrumental Platform. *47th Annual Meeting of the Midwestern Association of Forensic Scientists (MAFS), Indianapolis, IN,* **2018**.

(83) Stelmack, A. R.; Mukta, S.; Fatigante, W.; **Mulligan, C. C.** Assessing the Ruggedness Characterization of an Open-Air Paper Spray Ionization Source Operated Under Field Conditions on a Portable MS System. *47th Annual Meeting of the Midwestern Association of Forensic Scientists (MAFS), Indianapolis, IN,* **2018**.

(82) Burr, D. S.; Fatigante, W.; Harms, J. P.; Kim, J.-H.; **Mulligan, C. C.**; Driskell, J. D. Illegal Drug Analysis on an Integrated Raman-PSI-MS Platform Using Gold Nanoparticle-Embedded Paper. *47th Annual Meeting of the Midwestern Association of Forensic Scientists (MAFS), Indianapolis, IN,* **2018**.

(81) Harms, J. P.; Burr, D. S.; Fatigante, W.; **Mulligan, C. C.;** Driskell, J. D.; Kim, J.-H. Sandwich Structure of Plasmonic Metal Nanoparticles for Surface Enhanced Raman Spectroscopy. *47th Annual Meeting of the Midwestern Association of Forensic Scientists (MAFS), Indianapolis, IN,* **2018**.

(80) Wieland, J. R.; **Mulligan, C. C.**; Gizzi, M. C. Ambient Sampling, Portable Mass Spectrometers for On-Site Crime Scene Analytics. *Invited address at the 2018 National Institute of Justice (NIJ) Forensic Science Research and Development Symposium at the 2018 American Academy of Forensic Science (AAFS) Conference, Seattle, WA,* **Feb. 20th, 2018.**

(79) Fatigante, W.; Wieland, J. R.; **Mulligan, C. C.**; Gizzi, M. C. Analytical Validation and Impact Assessment of On-Site Evidence Screening via Ambient Sampling, Portable Mass Spectrometry. *Invited poster presentation at the 69th Pittsburgh Conference on Analytical Chemistry NIJ Forensic Science Research and Development Poster Session, Orlando, FL,* **2018.**

Presentations (Continued)

(78) Fatigante, W.; Evans-Nyugen, K. E.; **Mulligan, C. C.** Towards an Inter-Source Comparison of DART-MS and PSI-MS for Drug Evidence Processing on Commercial and Portable Systems. *66th ASMS Conference on Mass Spectrometry and Applied Topics, San Diego, CA.* **2018**.

(77) Mukta, S.; **Mulligan, C. C.** A Novel Approach for Rapid, On-Site Agrochemical Screening of Neat Soil Samples Utilizing Paper Cone Spray Ionization-Mass Spectrometry. *66th ASMS Conference on Mass Spectrometry and Applied Topics, San Diego, CA.* **2018**.

(76) Stelmack, A. R.; Mukta, S.; Fatigante, W.; **Mulligan, C. C.** Ruggedness Characterization of an Open-Air Paper Spray Ionization Source Operated Under Field Conditions on a Portable MS System. *66th ASMS Conference on Mass Spectrometry and Applied Topics, San Diego, CA.* **2018**.

(75) Bell, S.; Mukta, S.; Deberry, C.; **Mulligan, C. C.** Spray Solvent Dependence Observed During the Analysis of Synthetic Cannabinoids via Paper Spray Ionization-Mass Spectrometry. *66th ASMS Conference on Mass Spectrometry and Applied Topics, San Diego, CA.* **2018**.

(74) Deberry, C.; Bell, S.; Traub, A.; Bernardi, D.; **Mulligan, C. C.** Anticipating the Admissibility of Forensic Evidence Screened On-Site via Ambient Sampling, Portable Mass Spectrometry. *66th ASMS Conference on Mass Spectrometry and Applied Topics, San Diego, CA.* **2018**.

(73) Cleary. S. C.; Deberry, C.; Bell, S.; Ruiz. Y.; Wieland, J. R.; **Mulligan, C. C.** Assessing the Financial Impact of Implementing Portable MS Systems for On-Site Processing of Drug Evidence. *66th ASMS Conference on Mass Spectrometry and Applied Topics, San Diego, CA.* **2018**.

(72) Fatigante, W. L.; Lawton, Z. E.; Traub. A.; Wieland, J. R.; Gizzi, M. C.; Oberacher, H.; **Mulligan, C. C.** Analytical Validation of a Portable Mass Spectrometer Coupled with Ambient Ionization Sources for Forensics Applications. *68th Pittsburgh Conference on Analytical Chemistry*, *Chicago, IL*. **2017**.

(71) Traub. A.; Lawton, Z. E.; Wieland, J. R.; Gizzi, M. C.; **Mulligan, C. C.** Implications of the Daubert Standard on Field-Based, Forensic Applications of Portable Mass Spectrometers. *68th Pittsburgh Conference on Analytical Chemistry*, *Chicago, IL*. **2017.**

(70) Mukta, S.; Lawton, Z. E.; Fatigante, W. L.; Oberacher, H.; **Mulligan, C. C.** Analytical Validation of a Portable MS System Featuring Interchangeable, Ambient Ionization Sources during Field Operation. *65th ASMS Conference on Mass Spectrometry and Applied Topics, Indianapolis, IN.* **2017**.

(69) Fatigante, W. L.; Lawton, Z. E.; Bruno, A. M.; Mukta, S.; Gizzi, M. C.; **Mulligan, C. C.** Paper Cone Spray Ionization Sources Featuring Integrated Extraction and Filtration for On-Site Forensic Applications**.** *65th ASMS Conference on Mass Spectrometry and Applied Topics, Indianapolis, IN.* **2017**.

(68) Bruno, A. M.; Cleary, S.; Gizzi, M. C.; **Mulligan, C. C.** The Utility and Legality of Using Portable, Ambient Sampling Mass Spectrometers in Traffic Stops. *65th ASMS Conference on Mass Spectrometry and Applied Topics, Indianapolis, IN.* **2017**.

(67) Fatigante, W. L.; Stelmack, A.; Lawton, Z. E.; **Mulligan, C. C.** Validation and Characterization of an Ambient Sampling, Portable Mass Spectrometer for Field Screening of Forensic Evidence. *43rd Annual Meeting of the Northeastern Association of Forensic Scientists (NEAFS), Pocono Manor, PA.* **2017.**

Presentations (Continued)

(66) Mukta, S.; Deberry, C.; Bell, S.; **Mulligan, C. C.** Spray Solvent Dependence Observed During the Analysis of Synthetic Cannabinoids via Paper Spray Ionization-Mass Spectrometry. *43rd Annual Meeting of the Northeastern Association of Forensic Scientists (NEAFS), Pocono Manor, PA.* **2017.**

(65) Cleary, S.; Bruno, A. M.; Gizzi, M. C.; **Mulligan, C. C.** Balancing the Utility and Legality of Employing Portable MS-Based Screening Methods in Traffic Stops. *43rd Annual Meeting of the Northeastern Association of Forensic Scientists (NEAFS), Pocono Manor, PA.* **2017.**

(64) Bell, S.; Deberry, C.; Traub, A.; **Mulligan, C. C.** Anticipating the Admissibility of Forensic Evidence Screened On-Site via Ambient Sampling, Portable Mass Spectrometry. *43rd Annual Meeting of the Northeastern Association of Forensic Scientists (NEAFS), Pocono Manor, PA.* **2017.**

(63) Botch-Jones, S. A.; Lawton, Z. E.; Bruno, A. M.; Barajas, D. A.; Wieland, J. R.; Gizzi, M. C.; **Mulligan, C. C.** Rapid Screening of Emerging Novel Psychoactive Substance (NPS) Using a Portable, Ambient Sampling Mass Spectrometer (MS). *69th Meeting of The American Academy of Forensic Sciences (AAFS), New Orleans, LA.* **2017**.

(62) Gizzi, M. C.; Bruno, A. M.; Corpolongo, N.; **Mulligan, C. C.**; Wieland, J. R. Policy Implications of On-Site Forensic Screening of Contraband: An Overview of the Fourth Amendment Issues. *72nd Annual Meeting of the American Society of Criminology, New Orleans, LA.* **2016.**

(61) Gizzi, M. C.; Bruno, A. M.; Corpolongo, N.; **Mulligan, C. C.**; Wieland, J. R. The Reliability of Narcotics Dog Sniffs After Florida v. Harris: A Judicial Impact Study. *72nd Annual Meeting of the Midwestern Criminal Justice Association, Chicago, IL.* **2016.**

(60) Lawton, Z. E.; Fatigante, W. L.; Wieland, J. R.; Gizzi, M. C.; Oberacher, H.; **Mulligan, C. C.** Analytical Validation of a Portable, Ambient Sampling Mass Spectrometer for High Throughput, Forensic Evidence Screening. *64th ASMS Conference on Mass Spectrometry and Applied Topics, San Antonio, TX.* **2016**.

(59) Traub, A.; Wieland, J. R.; Gizzi, M. C.; **Mulligan, C. C.** Portable MS Systems vs. the Daubert Standard: Anticipating the Admissibility of a New Technology for Forensic Investigation. *64th ASMS Conference on Mass Spectrometry and Applied Topics, San Antonio, TX.* **2016**.

(58) Bruno, A. M.; Gizzi, M. C.; Wieland, J. R.; **Mulligan, C. C.** Examining the Legality of Using Ambient Sampling, Portable Mass Spectrometers in Criminal Justice Applications. *64th ASMS Conference on Mass Spectrometry and Applied Topics, San Antonio, TX.* **2016**.

(57) Lawton, Z. E.; Wieland, J. R.; Gizzi, M. C.; **Mulligan, C. C.** Ambient Sampling, Portable Mass Spectrometers for On-Site Forensic Applications. *Invited address at the 2016 Chicago Mass Spec Day Forum, Chicago, IL.* **2016**.

(56) Lawton, Z. E.; **Mulligan, C. C.** Viability and Utility of Ambient Sampling, Portable Mass Spectrometers for On-Site Crime Scene Analysis. *Invited Address to the Chicago Mass Spectrometry Discussion Group*, *Chicago, IL*. **2015**.

(55) Wieland, J. R.; Lawton, Z. E.; **Mulligan, C. C.** Viability and Utility of Ambient Sampling, Portable Mass Spectrometers for On-Site Crime Scene Analytics and Law Enforcement. *44th Annual Meeting of the Midwestern Association of Forensic Scientists (MAFS), Mackinac Island, MI.* **2015**.

Presentations (Continued)

(54) Kero, F.; Gallaspy, A.; Padera, F.; Elliot, N.; Weisenseel, J.; Qian, C.; Bogdanov, B.; Young, C.; Lawton, Z. E.; Bruno, A. M.; **Mulligan, C. C.** Demonstration of Scalable Analytical Methods for the Screening of Emerging Designer/Synthetic Drugs of Abuse by UHPLC-TOF-MS Equipped with a Novel and Automated Analyte Search Algorithm. *44th Annual Meeting of the Midwestern Association of Forensic Scientists (MAFS), Mackinac Island, MI.* **2015**.

(53) Traub, A.; **Mulligan, C. C.** Utilizing Ambient Mass Spectrometry in Veterinary and Clinical Toxicological Applications. *63rd ASMS Conference on Mass Spectrometry and Applied Topics*, *St. Louis, MO.* **2015**.

(52) Lawton, Z. E.; Bruno, A. M.; **Mulligan, C. C.** Characterization of 2C-Phenethylamine Designer drugs with an Ambient Sampling, Portable Mass Spectrometer. *63rd ASMS Conference on Mass Spectrometry and Applied Topics*, *St. Louis, MO.* **2015**.

(51) **Mulligan, C. C.;** O'Leary, A. E.; Hall, S. E.; Wieland, J. R.; Gizzi, M. C. Portable MS Systems for Rapid Screening of Forensic Evidence at Clandestine Drug Operations. *62nd ASMS Conference on Mass Spectrometry and Applied Topics*, *Baltimore, MD.* **2014**.

(50) O'Leary, A. E.; Hall, S. E.; Oberacher, H.; **Mulligan, C. C.** Comparison of Forensic Tandem Mass Spectral Data Obtained on Portable Instrumentation to an Established Reference Library. *62nd ASMS Conference on Mass Spectrometry and Applied Topics*, *Baltimore, MD.* **2014**.

(49) Swiontek, A. I.; Hall, S. E.; O'Leary, A. E.; **Mulligan, C. C.** Establishing a Surface Swabbing Protocol Compatible with Ambient Sampling Mass Spectrometers for On-Site Forensic Evidence Screening. *62nd ASMS Conference on Mass Spectrometry and Applied Topics*, *Baltimore, MD.* **2014**.

(48) Hall, S. E.; O'Leary, A. E.; Traub, A.; **Mulligan, C. C.** Using an Ambient Sampling, Portable Mass Spectrometer for the Direct Analysis of Species Related to Desomorphine ("Krokodil") Synthesis. *62nd ASMS Conference on Mass Spectrometry and Applied Topics*, *Baltimore, MD.* **2014**.

(47) Person, J. R.; **Mulligan, C. C.** Quantitative Assessment of Amino Acid Profiles in Foodstuffs with Microwave Hydrolysis and Desorption Electrospray Ionization Mass Spectrometry. *62nd ASMS Conference on Mass Spectrometry and Applied Topics*, *Baltimore, MD.* **2014**.

(46) **Mulligan, C. C.**; Hall, S. E.; O'Leary, A. E.; Vircks, K. E.; Wieland, J. R. Towards a Versatile Mass Spectrometric Platform for Comprehensive Crime Scene Analytics. *61st ASMS Conference on Mass Spectrometry and Applied Topics*, *Minneapolis, MN,* **2013**.

(45) Hall, S. E.; O'Leary, A. E.; Vircks, K. E.; **Mulligan, C. C.** Using a Portable Mass Spectrometer for Direct Screening of Arson and Clandestine Drug Laboratory Evidence. *61st ASMS Conference on Mass Spectrometry and Applied Topics*, *Minneapolis, MN,* **2013**.

(44) Nizzia, J. L.; Hamaker, C. G.; **Mulligan, C. C.** Rapid Detection of Metal Contaminants Using Ambient Mass Spectrometry. *61st ASMS Conference on Mass Spectrometry and Applied Topics*, *Minneapolis, MN,* **2013**.

(43) Person, J. R.; **Mulligan, C. C.** Rapid Amino Acid Content Analysis in Soybeans and Other Foodstuffs Utilizing Microwave Hydrolysis Coupled with Desorption Electrospray Ionization Mass Spectrometry. *61st ASMS Conference on Mass Spectrometry and Applied Topics*, *Minneapolis, MN,* **2013**.

Presentations (Continued)

(42) **Mulligan, C. C.**; Vircks, K. E.; O'Leary, A. E.; Accessing the Probative Value of Forensic Evidence with a Ruggedized, Portable Mass Spectrometer Capable of Ambient Ionization. *39th Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies, Kansas City, MO,* **2012.**

(41) Nizzia, J. L.; O'Leary, A. E.; **Mulligan, C. C.** Analysis of Cosmetic-Related Chemicals Using Desorption Electrospray Ionization Mass Spectrometry. *39th Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies, Kansas City, MO,* **2012.**

(40) Ton, A. T.; **Mulligan, C. C.** Characterization of Thermally-Assisted Desorption Electrospray Ionization Mass Spectrometry for Water Contaminant Analysis. *39th Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies, Kansas City, MO,* **2012.**

(39) Vircks, K. E.; O'Leary, A. E.; **Mulligan, C. C.** Forensic Applications of a Portable Mass Spectrometer. *39th Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies, Kansas City, MO,* **2012.**

(38) Person, J. R.; **Mulligan, C. C.** Probing Amino Acid Content of Foodstuffs Using Microwave Hydrolysis Coupling with Desorption Electrospray Ionization Mass Spectrometry. *39th Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies, Kansas City, MO,* **2012**.

(37) Vircks, K. E.; Wieland, J. R.; **Mulligan. C. C.** Portable Mass Spectrometers Capable of Direct Sample Analysis: Characterization and Implication of Usage in Forensic Science. *41st Annual Meeting of the Midwestern Association of Forensic Scientists, Milwaukee, WI*, **2012.**

(36) Buse, J.; **Mulligan, C. C.**; Verrall, R. E.; El-Aneed, A. An Assessment of Desorption Electrospray Ionization (DESI) and Liquid Chromatography (LC) Tandem Mass Spectrometric Methods for the Quantification of Bisquaternary Ammonium Gemini Surfactants utilized as Gene Delivery Agents. *Western Canadian Medicinal Chemistry Workshop (WCMCW), Saskatoon, CA,* **2012**.

(35) Dalgleish, J. K.; Wlekinski, M.; Shelley, J.; **Mulligan, C. C.**; Ouyang, Z.; Cooks, R. G. Development and Characterization of Bundled Arrays of Low-Temperature Plasma Probes for Use as Improved Ambient Ionization Sources. *60th ASMS Conference on Mass Spectrometry and Applied Topics*, *Vancouver, BC, CA,* **2012**.

(34) Dalgleish, J. K.; Wlekinski, M.; **Mulligan, C. C.**; Cooks, R. G. Improving the Sensitivity and Effective Sampling Area of Low-Temperature Plasma (LTP) Mass Spectrometry Through the Use of Capillary Probes and Bundled Probe Arrays. *41st Annual Turkey Run Analytical Chemistry Conference*, *Turkey Run State Park, Marshall, IN*, **2011**.

(33) Vircks, K. E.; **Mulligan, C. C.** High Throughput Forensic Analysis of Biological Matrices with Desorption Electrospray Ionization Mass Spectrometry. *40th Annual Meeting of the Midwestern Association of Forensic Scientists, Lombard, IL,* **2011**.

(32) Elledge, A.; Vircks, K. E.; Flesher, E. J.; **Mulligan, C. C.** Rapid Screening of Performance Enhancing Drug Masking Agents in Biological Samples Using Desorption Electrospray Ionization Mass Spectrometry. *59th ASMS Conference on Mass Spectrometry and Applied Topics*, *Denver, CO,* **2011**.

Presentations (Continued)

(31) Ton, A. T.; Campbell, I. S.; **Mulligan, C. C.** Direct Analysis of Pharmaceutical and Personal Care Products in Drinking Water at Trace Levels with Desorption Electrospray Ionization Mass Spectrometry. *59th ASMS Conference on Mass Spectrometry and Applied Topics*, *Denver, CO,* **2011**.

(30) Santee, C. J.; Kennedy, J. H.; Wiseman, J.; Aurand, C.; **Mulligan, C. C.** Direct Analysis of Pharmaceutical and Personal Care Products from Solid-Phase Microextraction Fibers with Desorption Electrospray Ionization Mass Spectrometry. *59th ASMS Conference on Mass Spectrometry and Applied Topics*, *Denver, CO,* **2011**.

(29) Person, J. R.; Backhus, E.; **Mulligan, C. C.** Representative Sampling and Monitoring of the Synthesis of Tetraphenylporphyrin with Desorption Electrospray Ionization Mass Spectrometry. *59th ASMS Conference on Mass Spectrometry and Applied Topics*, *Denver, CO,* **2011**.

(28) Gizzi, M. C.; **Mulligan. C. C.** But is it in Plain View? Technology Enhancement, New Tools, and Their Implications for Search and Seizure Law. *Annual Meeting of the American Political Science Association, Washington, D.C.*, **2010**.

(27) Gizzi, M. C.; **Mulligan. C. C.** But is it in Plain View? Technology Enhancement, New Tools, and Their Implications for Search and Seizure Law. *Annual Meeting of the Midwestern Criminal Justice Association, Chicago, IL,* **2010**.

(26) Ton, A. T.; Campbell, I. S.; **Mulligan, C. C.** Trace Analysis of Pharmaceutical and Personal Care Products in Drinking Water with Desorption Electrospray Ionization Mass Spectrometry. *40th Annual Turkey Run Analytical Chemistry Conference*, *Turkey Run State Park, Marshall, IN*, **2010**.

(25) Person, J. R.; Santee, C. J.; **Mulligan, C. C.** Monitoring the Synthesis of Tetraphenylporphyrin With Desorption Electrospray Ionization. *40th Annual Turkey Run Analytical Chemistry Conference*, *Turkey Run State Park, Marshall, IN*, **2010**.

(24) Campbell, I. S.; Ton, A. T.; **Mulligan, C. C.** Improved Sensitivity of Direct Aqueous Sample Analysis with Thermally-Assisted Desorption Electrospray Ionization Mass Spectrometry. *58th ASMS Conference on Mass Spectrometry and Applied Topics*, *Salt Lake City, UT,* **2010.**

(23) **Mulligan, C. C.** Miniature Mass Spectrometer User's Group Roundtable Discussion. *3rd Annual Meeting of the Purdue University National Center for Analytical Instrumentation Development, West Lafayette, IN,* **2010.**

(22) Campbell, I. S.; Ton, A. T.; **Mulligan, C. C.** Improved Sensitivity of Direct Aqueous Sample Analysis with Thermally-Assisted Desorption Electrospray Ionization Mass Spectrometry. *58th ASMS Conference on Mass Spectrometry and Applied Topics*, *Salt Lake City, UT,* **2010.**

(21) **Mulligan, C. C.**; Campbell, I. S. Direct Detection of Pharmaceuticals and Personal Care Product Contaminants in Water with Desorption Electrospray Ionization. *58th ASMS Conference on Mass Spectrometry and Applied Topics*, *Salt Lake City, UT,* **2010.**

(20) Santee, C. J.; Person, J.; **Mulligan, C. C.** Synthetic Reaction Monitoring with Desorption Electrospray Ionization Mass Spectrometry. *58th ASMS Conference on Mass Spectrometry and Applied Topics*, *Salt Lake City, UT,* **2010.**

(19) **Mulligan, C. C.** Rapid Analysis of Pharmaceutical and Personal Product Contaminants in Water with Ambient Mass Spectrometry. *Midwestern Universities Analytical Chemistry Conference (MUACC), East Lansing, MI,* **2009.**

Presentations (Continued)

(18) Campbell, I. S.; Ton, A. T.; Thakkar, Y.; **Mulligan, C. C.** Pharmaceutical Contaminant Analysis in Water with Ambient Mass Spectrometry with Direct-Flow Sample Delivery. *15th Illinois Heartland Section Meeting of the American Chemical Society*, *Normal, IL*, **2009**.

(17) Campbell, I. S.; Ton, A. T.; **Mulligan, C. C.** Rapid Analysis of Pharmaceutical Contaminants in Water with Ambient Mass Spectrometry. *57th ASMS Conference on Mass Spectrometry and Applied Topics*, *Philadelphia, PA*, **2009**.

(16) Ferrence, G. M.; Freisen, J. A.; Cedeño, D. L.; **Mulligan, C. C.** Teaching Content-Driven Courses to Students with Diverse Backgrounds, Needs, and Expectations. *Session Chair, Illinois State University 9th Annual University-Wide Teaching and Learning Symposium, Normal, IL,* **2009**.

--- Begins Assistant Professorship at Illinois State University ---

(15) Talaty, N.; **Mulligan, C. C.**; Jackson, A. U.; Cooks, R. G.; Cepa, S. Desorption Electrospray Ionization: Rapid *In-situ* Analysis of Ambient Surfaces. *50th Rocky Mountain Conference on Analytical Chemistry and Analytical Methods*, *Breckinridge, CO,* **2008**.

(14) Harper, J. D.; Charipar, N. A.; **Mulligan, C. C.**; Zhang, X.; Cooks, R. G.; Ouyang, Z. Low Temperature Plasma (LTP) Probe for Ambient Desorption Ionization. *56th ASMS Conference on Mass Spectrometry and Applied Topics*, *Denver, CO*, **2008**.

(13) **Mulligan, C. C.**; Hooser, S. B.; Harper, J. D.; Charipar, N. A.; Wilson, C.; Ouyang, Z.; Cooks, R. G. Toxicological Applications of Ambient Mass Spectrometry: Direct Analysis of Biological Matrices. *56th ASMS Conference on Mass Spectrometry and Applied Topics*, *Denver, CO*, **2008**.

(12) Ouyang, Z.; Gao, L.; **Mulligan, C. C.**; Cooks, R. G. Breaking the Limit of Pumping Capacity: Portable Mass Spectrometers with Atmospheric Pressure Ionization Sources. *59th Pittsburgh Conference on Analytical Chemistry*, *New Orleans, LA*, **2008**.

(11) Hooser, S.; **Mulligan, C. C.**; Cooks, R. G.; Streuh, K.; Meyerholtz, K.; Wilson, C. Desorption Electrospray Ionization (DESI) for Determination of Terbufos in Stomach Contents. *50th Annual Conference for the American Association of Veterinary Laboratory Diagnosticians (AAVLD)*, *Reno, NV*, **2007**.

(10) Talaty, N.; **Mulligan, C. C.**; Cooks, R. G. Desorption Electrospray Ionization: *In-situ* Analysis of Ambient Surfaces. *46th Eastern Analytical Symposium and Exhibition*, *Somerset, NJ*, **2007**.

(9) Soparawalla, S.; Venter, A.; **Mulligan, C. C.**; Talaty, N.; Cooks, R. G. Surface Effects in Desorption Electrospray Ionization (DESI). *55th ASMS Conference on Mass Spectrometry and Applied Topics, Indianapolis, IN*, **2007**.

(8) Sanders, N. L.; **Mulligan, C. C.**; Talaty, N.; Cooks, R. G. Investigating Fragmentation Mechanisms of Atmospheric Pressure Chemical Ionization Using a Homebuilt, Portable, Rectilinear Ion Trap Mass Spectrometer. 55th *ASMS Conference on Mass Spectrometry and Applied Topics*, *Indianapolis, IN*, **2007**.

(7) Talaty, N.; Chen, H.; Jackson, A.; Pan. Z.; **Mulligan, C. C.**; Kauppila, T.; Raftery, D.; Cooks, R. G. High Throughput Analysis by Desorption Electrospray Ionization (DESI). *58th Pittsburgh Conference on Analytical Chemistry*, *Chicago, IL*, **2007**.

Presentations (Continued)

(6) **Mulligan, C. C.**; Noll, R. G.; Cooks, R. G. Fast Analysis of Ordnance-Related Compounds and Agricultural Chemicals in Water with Desorption Electrospray Ionization (DESI). *55th ASMS Conference on Mass Spectrometry and Applied Topics*, *Indianapolis, IN*, **2007**.

(5) **Mulligan, C. C.**; Talaty, N.; Cooks. R. G. Desorption Electrospray Ionization with a Portable Mass Spectrometer: In-Situ Analysis of Ambient Surfaces. *54th ASMS Conference on Mass Spectrometry and Applied Topics*, *Seattle, WA*, **2006**.

(4) **Mulligan, C. C.**; Laughlin, B. C.; Justes, D. R.; Noll, R. J.; Cooks, R. G. Detection of Toxic Industrial Compounds from Air Using a Miniature Cylindrical Ion Trap Mass Spectrometer. *53rd ASMS Conference on Mass Spectrometry and Applied Topics*, *San Antonio, TX*, **2005**.

(3) Fico, M.; **Mulligan, C. C.**; Wu, G.; Guymon, A. J.; Cooks, R. G.; Blain, M. G.; Cruz, D.; Austin, D. E.; Fleming, J. G. Design Considerations, Simulation, and Fabrication of an Array of Micron-scaled Cylindrical Ion Trap Mass Analyzers. *17th Annual Sanibel Conference on Mass Spectrometry: Mass Spectrometry in Forensic Science and Counterterrorism, Clearwater Beach, FL*, **2005**.

(2) Laughlin, B. C.; **Mulligan, C. C.**; Cooks, R. G. Atmospheric Pressure Ionization in a Miniature Cylindrical Ion Trap Mass Spectrometer. *52nd ASMS Conference on Mass Spectrometry and Applied Topics, Nashville, TN*, **2005**.

(1) **Mulligan, C. C.**; Fico, M.; Wu, G.; Guymon, A. J.; Cooks, R. G.; Blain, M. G.; Cruz, D.; Austin, D. E.; Fleming, J. G. Design Considerations, Simulation, and Fabrication of an Array of Micron-scaled Cylindrical Ion Trap Mass Analyzers. *1st Annual Detector/Sensor Research and Technology for Homeland and National Security Meeting*, Gatlinburg, TN, **2004**.

Awards and Honors

2021 American Society for Mass Spectrometry (ASMS) Research at Primarily Undergraduate Institutions (PUI) Award Recipient
Selected for this merit-based award to promote academic research by PUI students in mass spectrometry-related projects

2020-2021 ISU College of Arts and Sciences (CAS) Distinguished Lecturer
Recognized for excellence and international reputation in research and scholarship. The CAS Distinguished Lectureship is one of the highest honors bestowed upon CAS faculty.

"Hot Article" in the Journal *Analyst*, March 2021
Article featured in a themed collection representing "the top 10% of research published in *Analyst*. Featured articles are marked as HOT by the handling editor or as recommended by referees."

"Top 20 Downloaded Articles" in JASMS, 2020
Featured as the corresponding author of one of the top 20 downloaded articles from the *Journal of the American Society for Mass Spectrometry* during the month of February 2020 and the subsequent 12 months

2018 "Power List – Top 40 Under 40" by the Analytical Scientist Magazine
Selected for inclusion to "shine a light on the scientists shaping our bright and innovation-rich future" in the analytical sciences.

2018 *Researchers to Know* Recognition, Illinois Science and Technology Coalition
Selected for the inaugural class of *Researchers to Know*, as list that is meant to highlight exemplary R&D activities happening at universities in the State of Illinois

Awards and Honors (cont.)

2018 Inductee to the Illinois State University Million Dollar Club
Selected for inclusion as a faculty researcher who has been award over $1 million from external research grants

"Top 10 Downloaded Articles" in JASMS, 2018
Featured as the corresponding author of one of the top 10 downloaded articles from the *Journal of the American Society for Mass Spectrometry*

2017 "Power List – The Magnificent Tens" by the Analytical Scientist Magazine
Selected for inclusion as a Top 10 entry in the "Public Defenders" category, highlighting the work of researchers "protecting people and the planet"

2017-2018 James L. Fisher Outstanding Thesis Award, Mentor
Served as research mentor/advisor for Zachary Lawton (M.S., 2016), the Overall University Winner and ISU's submission to the Midwestern Association of Graduate Schools (MAGS) regional competition.

"Emerging Investigator" in Analytical Sciences, 2015
Selected for inclusion to a themed issue of the journal *Analytical Methods* honoring early career researchers helping to define the future landscape of measurement science.

"Hot Article" in the Journal *Analytical Methods*, April 2015

Illinois State University College of Arts and Sciences Excellence Award for Outstanding Teaching by a Pre-Tenured Faculty Member, 2013

Faculty Participant – Midwest Counterdrug Training Center (MCTC) Clandestine Laboratory Safety Certification Course, 2013

Illinois State University College of Arts and Sciences Nominee to the University Teaching Initiative Award, 2012

Illinois State University Research Initiative Award, 2009

Midwestern Universities Analytical Conference (MUACC) James W. and Carolyn L. Taylor Travel Award, 2009

U. S. Department of Education Graduate Assistantships in Areas of National Need (GAANN) Fellow, 2004 – 2007

Merit-based Honors
- Sigma Xi Scientific Research Society, Illinois State University, 2013-Present
- Phi Lambda Upsilon Chemical Society, Purdue University, 2003-Present
- Phi Kappa Phi Honor Society, Northern Illinois University, 2002 - Present

Teaching Experience

Illinois State University, 2008 to Present
Professor, Analytical Chemistry
- Undergraduate Courses: Analytical Chemistry (w/ laboratory), Instrumental Analysis Laboratory, Gen. Chemistry I Laboratory, Gen. Chemistry II Laboratory
- Graduate Courses: Principles and Applications of Mass Spectrometry
- Graduate Seminar (Literature and Research)
- Nominated and selected for enrollment in the 2013 Design of Quality Online Coursework series through the ISU Center for Teaching, Learning, and Technology
- Experience in generating and delivering online curriculum/coursework in the analytical sciences, including laboratory courses.

Teaching Experience (cont.)

National Science Foundation – Science, Technology, Engineering, and Mathematics (NSF-STEM) Engines Research Advisor, Summers 2009/2010
Directed research for visiting undergraduate students focused on environmental monitoring of groundwater pollutants synthetic reaction monitoring via MS methods

U.S. Dept. of Education Graduate Assistantships in Areas of National Need (GAANN) Fellow, 2004 to 2007

- Designed undergraduate analytical instrumentation lab curriculum focused on important issues in homeland security
- Prepared accompanying budgetary consideration and course materials for instructors
- Attended "Focus on Teaching" seminars from Purdue Center for Instructional Excellence
- Completed graduate-level chemical education coursework: *Formulas for Successful Teaching*, (Instructor: Dr. George M. Bodner, Purdue University)

Lecturer, Purdue University, 2007
Particle Spectroscopy (Graduate Course)

Student Research Advisement

Illinois State University, Department of Chemistry (Aug. 2008 to Present)

- Total undergraduate students advised: **26**
- Total graduate (M.S.) students advised: **17**

Undergraduate Researchers (Graduation Year – Current Position/Career Goals)

- Alain Ton (2010 – Chemical Industry)
- Eric Flesher (2010 – Element Dental and Orthodontics, Spring, TX)
- Jonathan Person (2011 – Process Scientist, Sexton Biotechnologies)
- Alexandra Elledge (2011– Quality Control Analyst, CSL Behring)
- Adam O'Leary (Spring 2013 – Senior Analytical Chemist, Flavors of North America (FONA), Int.)
- Alex Swiontek (Spring 2014 –Research Assistant, PPD, LLC.)
- Angelica Traub (Spring 2016 – Chemical Industry)
- Alessandra Bruno (Spring 2017 – Laboratory Technician, BP)
- William Fatigante (Spring 2017 – Clinical Analyst, Lurie Children's Hospital)
- Scott Cleary (Spring 2018 – Doctoral Studies, Colorado School of Mines)
- Sara Bell (Spring 2018 – Doctoral Studies, UIUC)
- Chase Deberry (Spring 2018 – Doctoral Studies, Indiana U.)
- Ashley Stelmack (Spring 2018 – Graduate Studies, ISU)
- Yasminda Ruiz (Spring 2019 – Quality Analyst, ACT Laboratories, Inc.)
- Abigail Poehls (Spring 2019 - Doctoral Studies, U. Cincinnati)
- Alyssa Gasa (Spring 2019) – Doctoral Studies, UW - Madison)
- Trevor McDaniel (Spring 2019 – Graduate Studies, ISU)
- Noah McClurg (Fall 2019 – Chemist, Archer Daniels Midland (ADM))
- Jose Mancias (Spring 2020 – Engineer, U. S. Naval Research Laboratory)
  **Enrolled at UIUC, but conducted research during summer sessions at ISU*
- Phoebe Clowser (Spring 2020 – R&D Laboratory Technician, Pall Corporation)
- Jessica Holtz (antic. Spring 2021 – Forensic Science)
- Makoy Overfelt (antic. Fall 2021 – Environmental Epidemiology)

Undergraduate Research Honors Projects

- Bethany Roach (2009 – Medical School)
  "*Using DESI-MS to Analyze the Active Ingredients Rabeprazole and Lansoprazole in Commonly Prescribed Ulcer Medications"*
- Marcus Bivens (2010 – High School Chemical Education)
  "Experiment X: High Performance Liquid Chromatography of Ibuprofen in OTC Tablets"

Summer Research Mentoring, NSF-STEM Engines Program

- Yesha Thakkar (2012 B.S. Graduate, Loyola University, Chicago, IL – Morehouse School of Medicine – Psychiatry and Behavioral Sciences Residency) "*Applications of Desorption Electrospray Ionization Mass Spectrometry to Pharmaceutical and Agrochemical Analysis"*
- James Tufts (2012 B.S. Graduate, W.R. Harper College, Palatine, IL – Doctoral Studies, Illinois Institute of Technology) *"Representative Sampling and Analysis of Synthetic Reactions with Desorption Electrospray Ionization Mass Spectrometry*

Student Research Advisement (cont.)

Graduate (M.S.) Researchers (Graduation Year – Current Position/Career Goals)

- Ian Campbell (Spring 2012 –Adjunct Chemistry Faculty, Florida Gulf Coast U.)
- Christopher Santee (Spring 2012 - Analytical Chemist – Aquestive)
- Jonathan Person (DNC - Process Scientist, Sexton Biotechnologies)
- Kyle Vircks (Spring 2013 – Forensic Scientist II, Harris Co. (TX) Institute of Forensic Science)
- Jamie Nizzia (Fall 2013 –Scientist I, NCE Analytical R&D, AbbVie)
- Adam O'Leary (Summer 2015 – Senior Analytical Chemist, Flavors of North America (FONA), Inc.)
- Alain Ton (DNC – Pharmacy Technician, Walgreens)
- Seth Hall (Spring 2016 – Quality Analyst, BASF)
- Zach Lawton (Fall 2016 – Portable GC/MS Application Scientist, PerkinElmer)
- Angelica Traub (DNC– MBA, Aurora University)
- Shahnaz Mukta (Fall 2018 – Research Scientist, Toronto Research Chemicals)
- William Fatigante (Summer 2019 – Clinical Analyst, Lurie Children's Hospital)
- Ashley Stelmack (Fall 2020 – Chemical Industry)
- Trevor McDaniel (Antic. Summer 2021– Forensic Science)
- Ebenezer Bondzie (Antic. Spring 2023 – Analytical Instrumentation)
- Rosemary Addo (Antic. Spring 2023 – Environmental Science/Protection)
- Adewale Adehinmoye (Joint Appointment with Dr. Jun-Hyun Kim, Antic. Spring 2023 – Forensics/Nanomaterials)

Student Mentoring

Faculty Mentor, NSF Lewis Stokes Alliances for Minority Participation (LSAMP) Program

- Chidinma Umesegha (Spring 2013 – Graduate School, M.S. in Public Health Administration – U. of Illinois-Springfield)

Professional Service & Affiliations

American Chemical Society (ACS)

- Review of Grant Proposals for the ACS Petroleum Research Fund (ACS-PRF) Program, **2021**

American Society for Mass Spectrometry (ASMS)

- Chair – Forensics/Homeland Security Special Interest Group, **2019**
- Co-Chair – Forensics/Homeland Security Special Interest Group, **2018**
- Session Chair, "Instrumentation: Miniaturization of MS," **2016**
- Conference Planning Committee – Abstract Selection Panel (Posters), **2011**
- Participant - Forensics/Homeland Security Special Interest Group(s), **2008 to Present**

National Institute of Justice (NIJ)

- Review of Technical Reports for Projects Funded Under the Applied Research and Development in Forensic Science for Criminal Justice Purposes Program, **2017**

Professional Service & Affiliations (cont.)

National Science Foundation (NSF)

- Contributor/Invited Workshop Attendee, *Science on Location: Forensic Science on the Move*, **Dec 3rd, 2012.**
- Faculty Mentor, NSF Lewis Stokes Alliances for Minority Participation (LSAMP) Program, **2009 to 2014**
- Faculty Research Advisor, NSF Science, Technology, Engineering, and Mathematics (NSF-STEM) Engines Program, **Summers 2009/2010**

Research Corporation for Scientific Advancement (RCSA)

- Review of Grant Proposals for the Cottrell College Science Awards (RCSA-CCSA) Program, **2014**

Journal Peer Reviewer (in Alphabetical Order)

- Analyst, **2014 to Present**
- Analytical Chemistry, **2013 to Present**
- Analytical Methods, **2014 to Present**
- Analytica Chimica Acta, **2018**
- Applied Sciences, **2018**
- Coloration Technology, **2020**
- Cosmetics, **2016 to Present**
- Drug Testing and Analysis, **2014 to Present**
- Food Analytical Methods, **2018**
- Foods, **2020**
- Forensic Chemistry, **2016 to Present**
- Forensic Science International, **2018**
- International Journal of Mass Spectrometry, **2012 to Present**
- Journal of the American Society for Mass Spectrometry, **2012 to Present**
- Journal of Chromatography, A, **2018**
- Journal of Mass Spectrometry, **2014 to Present**
- Journal of Pharmaceutical and Biomedical Analysis, **2018**
- Journal of Visualized Experiments (JOVE), **2017**
- Metabolites, **2020**
- Planta, **2017**
- Rapid Communications in Mass Spectrometry, **2009 to Present**
- RSC Advances, **2020**
- Science and Justice, **2011 to Present**

Affiliations

- Sigma Xi Scientific Research Society, Illinois State University Chapter
- American Society for Mass Spectrometry
- American Chemical Society
- Phi Lambda Upsilon Chemical Society, Purdue University Chapter
- Phi Kappa Phi Honor Society, Northern Illinois University Chapter

University and Departmental Service

Illinois State University (ISU)

- ISU University Research Council (URC) (3 yr appointment) – **2016 to 2019**
- ISU Graduate Research Council (GRC) (3 yr appointment) – **2016 to 2019**
  - GRC Research Committee Member – **2016 to 2019**

ISU Department of Chemistry

- Departmental Faculty Status Committee (DFSC) Member, **Fall 2017 to Spring 2018, Fall 2020 - Present**
- Departmental Council Member, **2016, 2019**
- Departmental Mass Spectrometry Facility Coordinator, **Fall 2020 - Present**
- Departmental Facilities Committee, **Fall 2008 to Spring 2020**
  - Chairman, **2010 to 2018, 2019**
- Departmental Industry Liaison, **Fall 2020 - Present**
- Graduate Programs Committee, **2011 to Spring 2016**
- Graduate Student Seminar Coordination Committee (ad-hoc), **2010**
- Course Evaluation Development Committee, **2009**
- External Seminar Coordinator, **2008 to 2010**
- Search Committees
  - Inorganic/General Chemistry Faculty Search, **2016**
  - Analytical Chemistry Faculty Search, **2008, 2010**
  - Dept. of Chemistry Chair Search, **2009**
  - Instrument Technician Search, **2011**