Curriculum Vitae

I. General Information

a. Name: R. Scott Martin, Ph.D.

Rank: Professor of Chemistry (2011 – present)

Associate Dean for Strategic Initiatives, School of Science and Engineering (2022-present)

Primary Appointment: Department of Chemistry, Saint Louis University

Secondary Appointment: Department of Pharmacological & Physiological Science, Saint Louis University, 2010-present

b. Degrees Earned:

Ph.D., Analytical Chemistry, University of Missouri-Columbia, 1999

Thesis: "ChemChar Gasification of Radioactive, Inorganic, and Organic Laden Wastes"

Thesis Advisor: Stanley E. Manahan

M.S., Chemistry, Missouri State University, 1996

B.S., Chemistry (cum laude) Missouri State University, 1994

c. Academic Experience:

Associate Dean for Strategic Initiatives, School of Science and Engineering (2022-present)

Chemistry Department Chair, 2015 - 2021

College of Arts and Sciences Endowed Professor, 2011 – 2015

Chemistry Graduate Program Director (2011 – 2015)

Professor of Chemistry, Saint Louis University, 2012 – present

Associate Professor of Chemistry, Saint Louis University, 2008 – 2012

Assistant Professor of Chemistry, Saint Louis University, 2003 – 2008

Assistant Professor of Chemistry, University of Iowa, 2002 – 2003

National Institutes of Health Post-Doctoral Fellow, University of Kansas, Department of Pharmaceutical Chemistry, 1999-2002

d. Academic Recognitions

1. Editor in Chief, Analytical Methods (RSC Journal) (2017-2023)

2. AES Mid-Career Award, presented at SciX 2017 in Reno, NV

3. Associate Editor for *Analytical Methods* (RSC journal), 2013-2017 (editor for ~350 manuscripts a year)

4. Named Fellow, Royal Society of Chemistry (2014)

5. Named College of Arts and Sciences Endowed Professor of Chemistry, July 2011 - 2015

6. Graduate Mentor Award, Saint Louis University Graduate Student Association, 2011 and 2022 (presented at the Arts and Sciences Pre-Commencement)

7. Secondary appointment in Department of Pharmacological & Physiological Science, Saint Louis University, 2010-present

8. Co-chair of 65th Midwestern Universities Analytical Chemistry Conference (MUACC), scheduled to be on the Saint Louis University Campus in Fall of 2011 (attended by ~100 faculty from Midwest Universities)

9. Member, Executive Council of Laboratory Automation Section, Society for Laboratory Automation and Screening, 2010-2011

10. Member, Board of Directors, Association for LabAutomation, 2009-2010

11. Associate Program Chair for LabAutomation 2008 and Program Chair for LabAutomation 2009. LabAutomation is the yearly conference for the Association for Laboratory Automation (~5,000 attendees)

12. Member, editorial board for *Electrophoresis* (2005-2008)

13. Award for Excellence in Research, Office of Research Services, Saint Louis University. Presented in April 2008 by Vice Provost Mike Dockter

14. Award for Excellence in Research, Office of Research Services, Saint Louis University. Presented in April 2005 by Dean Donald Brennan

15. National Institutes of Health Post-Doctoral Fellowship, 2000-2002

II. Publications

a. Peer reviewed publications from Saint Louis University

During SLU tenure (note: * denotes corresponding author, † denotes undergraduate research assistant, ‡ denotes graduate research assistant)

1. M.L. Kovarik,[†] N.J. Torrence,[‡] D.M. Spence, and R.S. Martin,[*] "Fabrication of Carbon Microelectrodes with a Micromolding Technique and Their Use in Microchip-based Flow Analyses," *Analyst*, **2004**, *129*, 400-405.

2. M.K. Hulvey[‡] and R.S. Martin,[*] "Microchip-Based Analysis Systems: An Undergraduate Laboratory Experiment," *Chem. Educator*, **2004**, *9*, 1-7.

3. N.A. Lacher, S.M. Lunte,[*] and R.S. Martin,[*] "Development of a Microfabricated Palladium Decoupler/Electrochemical Detector for Microchip Capillary Electrophoresis Using a Hybrid Glass/Poly(dimethylsiloxane) Device" *Anal. Chem*., **2004**, *74*, 1136-1143. *(note: co-corresponding authors)*

4. A.K. Price,[‡] D.J. Fischer, R.S. Martin, and D.M. Spence,[*] "Deformation-Induced Release of ATP from Erythrocytes in a Poly(dimethylsiloxane)-Based Microchip with Channels That Mimic Resistance Vessels," *Anal. Chem.*, **2004**, *76*, 4849-4855.

5. D.M. Spence,[*] N.J. Torrence,[‡] M.L. Kovarik,[†] and R.S. Martin, "Amperometric Determination of Nitric Oxide Derived from Pulmonary Artery Endothelial Cells Immobilized in a Microchip Channel," *Analyst*, **2004**, *129,* 995-1000.

6. B.H. Huynh, B.A. Fogarty, R.S. Martin, and S.M. Lunte,[*] "On-Line Coupling of Microdialysis Sampling with Microchip-Based Capillary Electrophoresis," *Anal. Chem.*, **2004**, *76*, 6440-6447.

7. M.L. Kovarik,[†] M.W. Li,[‡] and R.S. Martin,[*] "Integration of a Carbon Microelectrode with a Microfabricated Palladium Decoupler for use in Microchip Capillary Electrophoresis/Electrochemistry," *Electrophoresis*, **2005**, *26*, 202-210.

8. B.A. Fogarty, K.E. Heppert, T.J. Cory, K.R. Hulbutta, R.S. Martin and S.M. Lunte,[*] "Rapid Fabrication of Poly(dimethylsiloxane)-based Microchip Capillary Electrophoresis Devices using CO_2 Laser Ablation, *Analyst*, **2005**, *130*, 924-930.

9. C.M. Moore,[‡] S.D. Minteer,[*] and R.S. Martin, "Microchip-based Ethanol/Oxygen Biofuel Cell," *Lab Chip*, **2005**, *5*, 218-225

10. M.W. Li,[‡] D.M. Spence, and R.S. Martin,[*] "A Microchip-Based System for Immobilizing PC 12 Cells and Amperometrically Detecting Catecholamines Released After Stimulation with Calcium," *Electroanalysis*, **2005**, *17*, 1171-1180.

11. A.K. Price,[‡] R.S. Martin, and D.M. Spence,[*] "Monitoring Erythrocytes in a Microchip Channel that Narrows Uniformly: Towards an Improved Microfluidic-based Mimic of the Microcirculation," *J. Chrom. A*, **2006**, *1111*, 220-227.

12. C.D. Kuhnline,[†] M.G. Gangel,[†] M.K. Hulvey,[‡] and R.S. Martin,[*] "Detecting Thiols in a Microchip Device using Micromolded Carbon Ink Electrodes Modified with Cobalt Phthalocyanine," *Analyst*, **2006**, *131*, 202-207.

13. M.W. Li,[‡] B.H. Huynh, M.K. Hulvey,[‡] S.M. Lunte and R.S. Martin,[*] "Design and Characterization of Poly(dimethylsiloxane)-Based Valves for Interfacing Continuous-Flow Sampling to Microchip Electrophoresis," *Anal. Chem.*, **2006**, *78*, 1042-1051.

14. M.J. Moehlenbrock,[‡] A.K. Price,[‡] and R.S. Martin,* "Use of Microchip-Based Hydrodynamic Focusing to Measure the Deformation-Induced Release of ATP from Erythrocytes," *Analyst*, **2006**, *131*, 930-937.

15. L.C. Mecker[‡] and R.S. Martin,* "Use of Micromolded Carbon Dual Electrodes with a Palladium Decoupler for Amperometric Detection in Microchip Electrophoresis," *Electrophoresis*, **2006**, *27*, 5032-5042

16. R.S. Martin, P.D. Root, and D.M. Spence,* "Microfluidic Technologies as Platforms for Performing Quantitative Cellular Analyses in an In Vitro Environment," *Analyst*, **2006**, *131*, 1197–1206.

17. M.W. Li[‡] and R. S. Martin,* "Integration of Continuous Flow Sampling to Microchip Electrophoresis using Poly(dimethylsiloxane)-based Valves in a Reversibly Sealed Device," *Electrophoresis*, **2007,** *28*, 2478–2488.

18. L.C. Mecker[‡] and R.S. Martin,* "Coupling Microdialysis Sampling to Microchip Electrophoresis in a Reversibly Sealed Device," *JALA*, **2007,** *12*, 296-302.

19. M.J. Moehlenbrock,[‡] and R.S. Martin,* "Development of an On-Chip Injector for Microchip-based Flow Analyses using Laminar Flow," *Lab Chip*, **2007**, 7, 1589-1596.

20. L.I. Genes, N. Villiere, M.K. Hulvey,[‡] R. S. Martin, and D.M. Spence,* "Addressing a Vascular Endothelium Array with Blood Components using Underlying Microfluidic Channels," *Lab Chip*, **2007**, 7, 1256-1259.

21. M.K. Hulvey,[‡] L. Genes, D.M. Spence, and R.S. Martin,* "Fabrication and Evaluation of a 3-Dimensional Microchip Device where Carbon Microelectrodes Individually Address Channels in the Separate Fluidic Layers," *Analyst*, **2007**, *132*, 1246-1253.

22. J.F. Kauffman,* S.J. Gilliam, and R.S. Martin, "Chemical Imaging of Pharmaceutical Materials: Fabrication of Micropatterned Resolution Targets," *Anal. Chem.*, **2008**, *80,* 5706-5712.

23. M.W. Li[‡] and R.S. Martin,* "Microchip-based Integration of Cell Immobilization, Electrophoresis, Post-Column Derivatization, and Fluorescence Detection for Monitoring the Release of Dopamine from PC 12 Cells," *Analyst*, **2008**, *133,* 1358-1366.

24. L.C. Mecker[‡] and R.S. Martin,* "Integration of Microdialysis Sampling and Microchip Electrophoresis with Electrochemical Detection," *Anal. Chem,* **2008**, *80*, 9257–9264.

25. M.K. Hulvey[‡] and R. S. Martin,* "A Microchip-based Endothelium Mimic Utilizing Open Reservoirs for Cell Immobilization and Integrated Carbon Ink Microelectrodes for Detection," *Anal. Bioanal. Chem*., **2009**, *393*, 599-605.

26. N.G. Batz[‡] and R.S. Martin,* "Selective Detection of Endogenous Thiols Using Microchip-based Flow Analysis and Mercury/Gold Amalgam Microelectrodes," *Analyst*, **2009**, *34*, 372 – 379

27. I.Z Kiss,* N. Munjal,[†] R.S. Martin, "Synchronized Current Oscillations of Formic Acid Electro-oxidation in a Microchip-based Dual-Electrode Flow Cell," *Electrochimica Acta*, **2009**, *55*, 395-403

28. A.L. Bowen[‡] and R.S. Martin,* "Integration of serpentine channels for microchip electrophoresis with a palladium decoupler and electrochemical detection," *Electrophoresis*, **2009**, *30*, 3347–3354.

29. A.L. Bowen[‡] and R.S. Martin,* "Integration of On-Chip Peristaltic Pumps and Injection Valves with Microchip Electrophoresis and Electrochemical Detection," *Electrophoresis*, **2010,** *31*, 2534–2540.

30. D.C. Kirkpatrick,[†] C. Antwi, [‡] and R.S. Martin,* "Use of Recordable Compact Discs to Fabricate Electrodes for Microchip-based Analysis Systems," *Anal. Methods*, **2010**, *2*, 811-816. *(this was featured on the back cover of the journal)*

31. L.C. Mecker,[‡] L.A. Filla,[‡] and R.S. Martin,* "Use of a Carbon-ink Microelectrode Array for Signal Enhancement in Microchip Electrophoresis with Electrochemical Detection," *Electroanalysis*, **2010**, *22*, 2141 – 2146.

32. A. Selimovic,[‡] A.S. Johnson,[‡] I.Z. Kiss, and R.S. Martin,* "Use of epoxy-embedded electrodes to integrate electrochemical detection with microchip-based analysis systems," *Electrophoresis*, **2011**, *32*, 822–831.

33. C. Antwi,[‡] A.S. Johnson,[‡] A. Selimovic,[‡] and R.S. Martin,* "Use of Microchip Electrophoresis and a Palladium/Mercury Amalgam Electrode for the Separation and Detection of Thiols," *Anal. Methods*, **2011**, *3*, 1072-1078.

34. P.A. Vogel, S.T. Halpin, R.S. Martin, and D.M. Spence**,* "**Microfluidic Transendothelial Electrical Resistance Measurement Device that Enables Blood Flow and Postgrowth Experiments**,"** *Anal. Chem,* **2011**, *83*, 4296–4301.

35. A.G. Cioffi,[†] R.S. Martin, and I.Z. Kiss,* **"**Oscillations of Nickel Electrodissolution in an Epoxy-Based Microchip Flow Cell," J. Electroanal. Chem., **2011**, *659*, 92-100.

36. L.A. Filla,[‡] D.C. Kirkpatrick,[†], and R.S. Martin,* “Use of a Corona Discharge to Selectivity Pattern a Hydrophilic/Hydrophobic Interface for Integrating Segmented Flow with Microchip Electrophoresis and Electrochemical Detection,” *Anal. Chem.*, **2011**, *83*, 5996–6003.

37. A.S. Johnson[‡], A. Selimovic,[‡] and R.S. Martin,* “Integration of Microchip Electrophoresis with Electrochemical Detection Using an Epoxy-Based Molding Method to Embed Multiple Electrode Materials,” *Electrophoresis*, **2011**, 32, 3121–3128.

38. A.S. Johnson,[‡] K.B. Anderson, S.T. Halpin, D.C. Kirkpatrick,[†]**,** D.M. Spence and R. S. Martin, “Integration of multiple components in polystyrene-based microfluidic devices part I: fabrication and characterization,” *Analyst*, **2013**, *138*, 129-136.

39. K.B. Anderson, S.T. Halpin, A.S. Johnson,[‡] R.S. Martin and D.M. Spence, “Integration of multiple components in polystyrene-based microfluidic devices part II: cellular analysis,” *Analyst***,** **2013**, *138,* 137-143.

40. A.S. Johnson[‡], A. Selimovic,[‡] and R.S. Martin,* Microchip-based Electrochemical Detection for Monitoring Cellular Systems,” *Anal. Bioanal. Chem*., **2013,** *405*, 3013–3020**.**

41. A. Selimovic,[‡] and R.S. Martin,* “Encapsulated Electrodes for Microchip Devices: Microarrays and Platinized Electrodes for Signal Enhancement,” Electrophoresis, **2013**, *34*, 2092–2100.

42. K.B. Anderson, S.Y. Lockwood, R. S. Martin, and D.M. Spence,* “A 3D Printed Fluidic Device that Enables Integrated Features,” *Anal. Chem.*, **2013**, *85*, 5622−5626.

43. V. Becirovic,[‡] S.R. Doonan,[†], and R.S. Martin,* “Encapsulation of Fluidic Tubing and Microelectrodes in Microfluidic Devices: Integrating Off-Chip Process and Coupling Conventional Capillary Electrophoresis with Electrochemical Detection,” *Anal. Methods*, **2013**, *5*, 4220–4229.

44. Erkal, J. L.; Selimovic, A.; [‡] Gross, B. C.; Lockwood, S. Y.; Walton, E. L.; McNamara, S.; Martin, R. S.; Spence, D. M.,* “3D printed microfluidic devices with integrated versatile and reusable electrodes,” *Lab Chip* **2014**, *14*, 2023-2032.

45. A. Selimovic,[‡] J.L. Erkal, Jayda L., D.M. Spence, R.S. Martin,* “Microfluidic device with tunable post arrays and integrated electrodes for studying cellular release,” *Analyst*, **2014**, *139*, 5686-5694. (featured on the cover)

46. A.S. Johnson,[‡] B.T. Mehl,[‡] and R. S. Martin,* “Integrated hybrid polystyrene-polydimethylsiloxane device for monitoring cellular release with microchip electrophoresis and electrochemical detection,” *Anal. Methods*, **2015**, *7*, 884 - 893.

47. M.R. Bailey, A.M. Pentecost,‡ A. Selimovic,‡ R.S. Martin, and Z.D. Schultz,* "Sheath-Flow Microfluidic Approach for Combined Surface Enhanced Raman Scattering and Electrochemical Detection," *Anal. Chem.*, **2015**, *87*, 4347–4355.

48. A.M. Pentecost‡ and R.S Martin,* "Fabrication and characterization of all-polystyrene microfluidic devices with integrated electrodes and tubing," *Anal. Methods*, **2015**, 7, 2968-2976.

49. Y. Jia, A. Bi, A. Selimovic,‡ R.S. Martin, I. Z. Kiss,* Periodic and complex waveform current oscillations of copper electrodissolution in phosphoric acid in an epoxy-based microchip flow cell, *Journal of Solid State Electrochemistry*, **2015**, *19*, 3241-3251.

50. A. S. Munshi‡ and R. S. Martin,* "Microchip-Based Electrochemical Detection using a 3-D Printed Wall-Jet Electrode Device," *Analyst,* **2016**,141, 862-869.

51. A. D. Townsend, ‡ G.H. Wilken, K.K. Mitchell, R. S. Martin, H. Macarthur,* "Simultaneous analysis of vascular norepinephrine and ATP release using an integrated microfluidic system," *J Neurosci Methods.,* **2016**, *266*, 68-77.

52. C. Chen,‡ B.T. Mehl,‡ S. A. Sell, R. S Martin,* "Use of electrospinning and dynamic air focusing to create three-dimensional cell culture scaffolds in microfluidic devices," *Analyst***, 2016**, *141*, 5311-5320.

53. A. V. Forzano,‡ V. Becirovic,‡ R. S. Martin, J.L. Edwards,* "Integrated electrodes and electrospray emitter for polymer microfluidic nanospray-MS interface," *Analytical Methods*, **2016**, *8*, 5152-5157

54. M.R. Bailey, R. S. Martin, Z.D. Schultz,* "Role of Surface Adsorption in the Surface-Enhanced Raman Scattering and Electrochemical Detection of Neurotransmitters," *Journal of Physical Chemistry C,* **2016**, *120*, 20624–20633.

55. C. Chen, B.T. Mehl,‡ A. S. Munshi,‡ A.D. Townsend,‡ D.M. Spence, R.S. Martin,* "3D-printed microfluidic devices: fabrication, advantages and limitations—a mini review," *Anal. Methods*, **2016**, *8*, 6005-6012

56. C. Chen, B.T. Mehl,‡ S.A. Sell, R.S. Martin, "Use of electrospinning and dynamic air focusing to create three-dimensional cell culture scaffolds in microfluidic devices," *Analyst*, **2016**, *141*, 5311-5320.

57. C. Chen, A.D. Townsend,‡ S.A. Sell, R.S. Martin,* "Microchip-based 3D-Cell Culture Using Polymer Nanofibers Generated by Solution Blow Spinning," *Anal. Methods*, **2017**, *9*, 3274-3283.

58. Mehl, B.T.‡ and Martin, R.S.,* "Enhanced microchip electrophoresis separations combined with electrochemical detection utilizing a capillary embedded in polystyrene," *Anal. Methods*, **2018**,*10*, 37-45.

59. Chen C., Townsend A.D.,‡ Hayter E.A.,‡ Birk H.M.,† Sell S.A., Martin R.S.,* "Insert-based microfluidics for 3D cell culture with analysis," *Anal Bioanal Chem*. **2018,** *10*, 3025-3035.

60. M. J. Kimlinger† and R.S. Martin,* "The Use of a 3D-Printed Microfluidic Device and Pressure Mobilization for Integrating Capillary Electrophoresis with Electrochemical Detection," *Electroanalysis*, **2018**, 30, 2241-2249.

61. A.S. Munshi‡ and R. S. Martin, "Use of 3D printing and modular microfluidics to integrate cell culture, injections and electrochemical analysis," *Anal. Methods,* **2018**, *10*, 3364-3374.

62. Mehl, B.T.‡ and Martin, R.S.,* "Integrating 3D cell culture of PC12 cells with microchip-based electrochemical detection," *Anal. Methods*, **2019**,*11*, 1064-1072.

63. A.D. Townsend,‡ R. S. Sprague, and R.S. Martin,* "Microfluidic Device Using a Gold Pillar Array and Integrated Electrodes for On-chip Endothelial Cell Immobilization, Direct RBC Contact, and Amperometric Detection of Nitric Oxide," *Electroanalysis*, **2019**, 31, 1409–1415.

64. A.D. Castiaux, C. W. Pinger, E. A. Hayter, M. E. Bunn, R. S. Martin and D. M. Spence, *Analytical Chemistry*, **2019**, 91, 6910-6917.

65. A.D. Castiaux, D. M. Spence, R.S. Martin,* "Review of 3D cell culture with analysis in microfluidic systems," *Analytical Methods* 2019, 11, 4220-4232.

66. Hayter, E. A.;‡ Castiaux, A. D.; Martin, R. S.*, 3D-printed microfluidic device with in-line amperometric detection that also enables multi-modal detection, Anal Methods 2020, 12, 2046-2051.

67. Castiaux, A. D.; Currens, E. R.;‡ Martin, R. S.*, Direct embedding and versatile placement of electrodes in 3D printed microfluidic-devices, *Analyst* 2020, 145, 3274-3282.

68. Huang, K., Castiaux, A. D., Podicheti, R., Rusch, D. B., Martin, R. S., Baker, L. A.,* A Hybrid Nanofiber/Paper Cell Culture Platform for Building a 3D Blood–Brain Barrier Model. Small Methods 2021, 5, 2100592.

69. Castiaux, A.D., Selemani, M.A.;‡ Ward, M.A.,† Martin, R. S.*, Fully 3D printed Fluidic Devices with Integrated Valves and Pumps for Flow Injection Analysis, Anal. Methods, 2021, 13, 5017-5024.

70. M. Geiger, E. Hayter,‡ R. S. Martin, and D.M. Spence,* "Red Blood Cells in Type 1 Diabetes and Multiple Sclerosis and Technologies to Measure their Emerging Roles", *J. Transl. Autoimmun*, **2022**, *5*, 100161.

71. E.R. Currens,‡ M.R. Armbruster, A.D. Castiaux, J.L. Edwards, R.S. Martin,* "Evaluation and optimization of PolyJet 3D-printed materials for cell culture studies," *Anal Bioanal Chem*, **2022**, *414*, 3329–3339.

72. K. Cenhrang,‡ L. Robart,‡ A.D. Castiaux, R.S. Martin,* "3D Printed Devices with Integrated Collagen Scaffolds for Cell Culture Studies Including Transepithelial/Transendothelial Electrical Resistance (TEER) Measurements," *Anal. Chim. Acta*, **2022**, *1221,* 340166.

73. E. A. Hayter,‡ S. Azibere,‡ L.A. Skrajewski, L.D. Soule, D.M. Spence, R.S. Martin,* "A 3D-printed, multi-modal microfluidic device for measuring nitric oxide and ATP release from flowing red blood cells," *Anal Methods*. **2022**, *14*, 3171-3179.

74. M.A. Selemani,‡ A.D. Castiaux, R.S. Martin,* "PolyJet-Based 3D Printing against Micromolds to Produce Channel Structures for Microchip Electrophoresis," *ACS Omega*, **2022**, *7*, 13362-13370.

75. J. A. Tetteh, E. A. Hayter,‡ R. S. Martin, I. Z. Kiss,* "Oscillations and bistability of complex electrochemical reactions in 3D printed microfluidic devices," Journal of Electroanalytical Chemistry, **2023**, *948*, 117830.

76. Dana M. Spence* and R. Scott Martin*, "Chapter 8 - 3D-Printed Devices Containing Membranes for Biological Applications," in 3D printing in Analytical Chemistry: Sample preparation, separation, and sensing. Editors/Authors: Enrique Carrasco-Correa, Jose Manuel Herrero-Martinez, Manuel Miro, María Vergara-Barberán, pages 199-215, **2024**.

77. M. A. Selemani‡ and R. S. Martin,* "Integrating Electrochemical Detection In 3D-printed Microchip Electrophoresis Devices", *Analytical and Bioanalytical Chemistry*, **2024**, *416*, 4749-4758.

78. Major A. Selemani,‡ Khamhbawihum Cenhrang,‡ Samuel Azibere,‡ Mariama Singhateh,‡ and R. Scott Martin,* "3D Printed Microfluidic Devices with Electrodes for Electrochemical Analysis," *Analytical Methods*, **2024**, 16, 6941-6953.

79. S. Ubeysinghe, C.O. Sebilleau, W. Thotamune, C. Rajarathna, S. Azibere,‡ M. Tennakoon, J.L. Payton, R.S. Sprague, R.S. Martin, S.J. Sucheck, A. Karunarathne,* "Recombinant–Chemosynthetic Biosensors for Probing Cell Surface Signaling of Red Blood Cells and Other Cells," Chemical & Biomedical Imaging, **2025**, 3, 95-110.

80. Samuel Azibere,‡ Michael Borovik, Andrew F. Hall, Scott A. Sell and R.S. Martin,* "Evaluation of fused deposition modeling (FDM)-printed devices for microfluidic-based cell culture studies," *Anal Bioanal Chem,* **2025**, *417*, 4435–4447.

81. Major A. Selemani,‡ Jason L. Assafeen,† and R.S. Martin,* PolyJet 3D-Printed Microchip Devices with Integrated Carbon Electrodes for Neurotransmitter Analysis. *J. Sep. Sci.*, **2025**, *48,* e70224.

82. Major A. Selemani,‡ Giraso K.M. Kabandana, Chengpeng Chen, and R. Scott Martin,* “3D-Printed Microfluidic-Based Cell Culture System with Analysis to Investigate Macrophage Activation,” *Electrophoresis* **2025,** doi.org/10.1002/elps.8109.

83. Khamhbawihum Cenhrang,‡ Cody W. Leasor, Waruna Thotamune, Ajith Karunarathne, Lane A. Baker, and R. Scott Martin,* “3D Printed Transwell Microfluidic Devices for Epithelial Cell Culture with Shear Stress, *ACS Measurement Science Au*, **2025**, *5*, 547-558.

84. S. A. Branch, Y. Wang, S. Azibere, L.D. Soule, A.R. Davis, T. McMahon, R. S. Martin, L.A. Baker, M.K. Geiger, D.M. Spence, ACS Measurement Science Au **2025**, *5*, 511-519.

III. Current Funding

2R01NS105888-06A1
Spence (PI), Martin (PI), and Baker (PI); Zinn (Co-I)
07/22/2024 – 05/31/2029
NIH: NINDS
Based on our recent results, and supported by existing literature, our multi-PI investigative team hypothesizes that a reduction in blood brain barrier integrity, and subsequent onset of MS, is due, in part, to hypermetabolic RBCs. The investigative team has carefully developed the following aims describing unprecedented single cell pharmacodynamic measurements of MS disease modifying therapies, creation of more realistic in vitro BBB mimics, and in vivo imaging of MS patients at time points before and after their normal dosing of INF-β, to investigate our hypothesis.

Martin Role: PI
Total Award Amount (including Indirect Costs): $2,928,192

1R01NS137462-01A1
An Enhanced Neurovascular Model with Scanning Conductance Imaging of Cell Junctions to Determine the Role of Matrix Metalloproteases in Multiple Sclerosis
05/01/2025 – 04/30/2030
NIH: NINDS
An investigate team of researchers proposes development of an enhanced model of the neurovascular unit (NVU) that will be interrogated with scanning conductance imaging to determine mechanisms contributing to MS onset. We will apply this NVU platform to a major human health problem and determine if a popular MS disease modifying therapy, interferon-beta (IFN-β), helps slow MS by inhibiting the overproduction of a molecule known as matrix metalloprotease-9 (MMP-9) in people with MS.

Martin Role: PI
Total Award Amount (including Indirect Costs): $2,564,132

IV. Brief Biography

R. Scott Martin is a Professor of Chemistry at Saint Louis University. He also currently serves as Associate Dean of Strategic Initiatives in the School of Science and Engineering. He received his Ph.D. in Analytical Chemistry from The University of Missouri-Columbia (with Stanley Manahan) in 1999. He then received a NIH Post-doctoral Fellowship under the direction of Sue Lunte in the Department of Pharmaceutical Chemistry at the University of Kansas. He started at Saint Louis University in 2003 and was promoted to Associate Professor in 2008 and Full Professor in 2012. In 2011, he was named the College of Arts and Sciences Endowed Chair, a position he held until 2015 when he was named Department Chair.

Professor Martin served as Chair of the Chemistry Department for 2 terms, from 2015 to 2021. Under his leadership, the department grew in terms of faculty (from 16 to 24) and research expenditures (from $600,000 to over $3 million). He led the department through academic program review, ACS re-certification, the addition of a chemical biology degree, strategic planning, and the addition of recitations for general chemistry. He was on the planning board for the new Interdisciplinary Science and Engineering Building, leading the design of the chemistry teaching labs in the building (10 in total). He also led the department during the pandemic, developing protocols to have students return to the research lab in May of 2020 and holding in-person teaching labs in July of 2020. After his terms as chair, he assumed the role of Associate Dean of Strategic Initiatives in the inaugural year of the School of Science and Engineering, to help with the transition of science departments and lead projects around space and workload.

In the Fall of 2013, Professor Martin was named an Associate Editor for the RSC journal, *Analytical Methods*. He handled over 300 manuscripts a year in this role and worked closely with RSC editors to improve the transfer procedures across the analytical journals. In 2017 he was named Editor-in-Chief of *Analytical Methods.* Under his leadership, the journal re-defined their scope, started a dedicated associate editor for reviews, increased the impact factor from 1.5 to 3.1, and led the successful application for inclusion in PubMed. Even though RSC journals have term limit, he extended his service period and recently helped on-board a new Editor-in-Chief.

In addition to the appointments named above, Professor Martin has received the following recognition: Mid-Career Award from AES Electrophoresis Society (presented at SciX 2017), chair of the 65th Midwestern Universities Analytical Chemistry Conference (MUACC 2011), Member of the Board of Directors for the Association for LabAutomation (2009-2010), program Chair for LabAutomation (2009), member of the editorial board for Electrophoresis (2005-2008), and the Award for Excellence in Research (Office of Research Services at Saint Louis University, in both 2005 and 2008). He has also organized numerous sessions at ACS conferences and Pittcon.

Dr. Martin has mentored a large number of students in the research lab. This includes 7 M.S. students, 8 Ph.D. students, 2 post-docs, and 15 undergraduate students (not counting current group members). His mentoring has been recognized by receipt of the Graduate Mentor Award from the Saint Louis University Graduate Student Association in 2011 and 2022. He has published 77 papers during his tenure at Saint Louis University and he has a h-index of 38. His research has been continually funded by the NIH since 2004. This includes a number of R15s, R21s, and R01s. He has averaged over $130,000/year in expenditures during his time at SLU without any funding gaps.

V. Major Research Accomplishments

When Scott Martin started his independent research career at Saint Louis University, he focused on a new area at the time, the use of microchip-based systems to study cellular systems in a way that also integrated analysis. This involved integrating electrochemical detection in these devices, as analytes such as catecholamines and nitric oxide can be directly detected with this technique. One of the initial papers from his group focused on the ability of microfabricated palladium decouplers to provide a field free region for downstream electrodes (*Anal. Chem*., **2004**, *74*, 1136-1143). This eliminated band broadening seen with end-channel approaches and enabled real-time detection (after electrophoretic separation) of catecholamine neurotransmitters. This was followed by a description of how to integrate carbon ink electrodes (similar to those used for screen printed electrodes) into microfluidic devices (*Analyst*, **2004**, *129*, 400-405). This was key to the first paper in the field of directly detecting analytes released from an immobilized cell layer, where nitric oxide release from endothelial cells after ATP stimulation was monitored (published by his group in *Analyst* **2004**, *129*, 995-1000). This is often cited in review articles as seminal work in the field. Subsequent work showed a similar approach could be used to monitor release of catecholamines from PC 12 cells (*Electroanalysis*, **2005**, *17*, 1171-1180). When using electrophoresis to analyze cellular release, an important consideration is the method of injection. His group realized early on that traditional gated or pinched injection schemes are not well-suited for high ionic strength cellular samples. To circumvent this, they pioneered the use of PDMS elastomeric valves to both isolate cell culture from the electrophoretic voltages and provide a pressure-based injection for microchip CE (*Anal. Chem*., **2006,** *78*, 1042-1051 and *Electrophoresis*, **2007**, *28*, 2478–2488). His group used this approach to look at neurotransmitter release from PC 12 cells (*Electrophoresis,* **2010**, *31*, 2534–2540), thiols in red blood cells (*Anal. Methods*, **2011**, **3**, 1072-1078), and to integrate microdialysis sampling with microchip CE (*Anal. Chem*, **2008**, *80*, 9257–9264).

Dr. Martin started collaborations with researchers at Michigan State University (Dana Spence, Ph.D.) and SLU's School of Medicine (Randy Sprague, M.D.) early in his career in order to study the release of ATP from red blood cells (RBCs), how the release of ATP is modulated in diseases such as diabetes and multiple sclerosis, and how the released ATP leads to downstream production of NO from endothelial cells. Work in this area included the first description of RBC deformability and ATP measurement in microfluidic devices (*J. Chrom. A*, **2006**, *1111*, 220-227 and *Analyst*, **2006**, *131*, 930-937) and monitoring the interplay between RBCs and endothelial cells (*Electroanalysis*, **2019**, *31*, 1409–1415).

Starting in 2011, his group reported on different substrate materials for microchip fabrication, one that uses either epoxy or polystyrene to encapsulate traditional electrode materials. They were able to show that this approach enabled the use of different electrode materials and greatly enhanced the performance of the devices (*Electrophoresis*, **2011**, *32*, 822–831 and *Analyst*, **2013**, *138*, 129-136). They eloquently showed how this new approach can be used to enable microchip-CE based analysis of dopamine and norepinephrine release from PC 12 cells in a modular platform (*Anal. Methods*, **2015**, *7*, 884-893) as well as the ability to measure NO release from endothelial cells (*Electrophoresis,* **2013**, *34*, 2092–2100) and red blood cells (*Analyst*, **2014**, **139**, 5686-5694).

More recently, his group has pioneered investigated the use of 3D printing to create fluidic devices for studying cell-to cell-communication. This includes the first report of 3D printing for fluidic devices and the first incorporation of electrodes in 3D printed devices (*Lab Chip* **2014**, 14, 2023-2032, cited 340 times), as well as the ability to 3D print devices for microchip electrophoresis (*ACS Omega*, **2022**, 7, 13362-13370.). These devices are robust have been used to monitor the release of ATP and NO from RBCs including over 10 patient samples, and to study long term blood storage (*Anal Methods,* **2022**, 14, 3171-3179). They have also studied the effect of 3D printed substrates and cleaning methods on the culture of cells (*Anal Bioanal Chem*, **2022**, 414, 3329–3339). His group now uses 3D printing exclusively for fabrication of devices.

Finally, work in this field has historically utilized cell culture on the flat surface of microfluidic devices; however, this does not emulate the 3D nature of *in vivo* extracellular matrices. Martin's group has been studying how to integrate 3D culture with flow into devices. His lab has used electrospinning for facile creation of 3D scaffolds for cell culture in microfluidic devices (*Analyst*, **2016**, *141*, 5311-5320 and *Anal Bioanal Chem*, **2018**, 10, 3025-3035.). In collaboration with Lane Baker at Texas A&M (*Small Methods*, **2021**, *5*, 2100592), his group have developed a BBB mimic that involves co-culture of endothelial cells and astrocytes. In addition, they have been using 3D collagen scaffolds in 3D printed devices for fluidic based TEER devices (*Anal. Chim. Acta*, **2022**, *1221*, 340166) as a step towards a true BBB mimic, one that incorporates endothelial cell culture on collagen and blood flow to determine the role of the RBC in multiple sclerosis.