Michael L. Simpson
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Education

Received Ph.D. in Electrical Engineering May, 1991, University of Tennessee, Knoxville. Ph.D. thesis topic was charge trapping and ballistic deficit correction in germanium radiation detectors. Advisor: Prof. J. M. Rochelle.

Research Interest

Complex systems at the boundaries between physical and life sciences, stochastic processes in complex nanoscale systems, nanostructured materials, bio-materials, synthetic biology

Professional Experience

2014–present	Corporate Fellow, Oak Ridge National Laboratory
2014–present	Director of the Joint Institute for Biological Sciences, University of Tennessee/Oak Ridge National Laboratory
2001–present	Group Leader, Nanofabrication Research Laboratory, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory
2009–present	Co-Theme Lead, Collective Phenomenon in Nanophases Theme, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory
2001–present	Professor of Materials Sciences and Engineering (Joint Faculty Appointment), University of Tennessee–Knoxville
2010–present	Assistant Director, Bredesen Center for Interdisciplinary Research and Education, University of Tennessee–Knoxville
1993–2001	Adjunct Assistant Professor (Electrical and Computer Engineering)/Professor (Materials Science and Engineering Department, UT/ORNL Joint Faculty Appointment), University of Tennessee-Knoxville
1991–present	Research Staff Member /Distinguished R&D Staff, Oak Ridge National Laboratory

Publications

~8,500 total cites; h-index=51; Google scholar profile:

http://scholar.google.com/citations?user=VQWzQg0AAAAJ

*Most Cited Publications (**** 500 or more cites; *** 200 or more cites; ** 100 or more cites, * 50 or more cites)*

1. **** Melechko, A.V., V.I. Merkulov, T.E. McKnight, M.A. Guillorn, K.L. Klein, D.H. Lowndes, and M.L. Simpson. "Vertically aligned carbon nanofibers and related structures: Controlled synthesis and directed assembly." *J. Appl. Phy*., **97**(4), Feb. 15, 2005, 041301-39.

2. ****Adcox, K., *et al.* "PHENIX detector overview," *Nuclear Instruments & Methods in Physics Research Section a- Accelerators Spectrometers Detectors and Associated Equipment*, vol. 499, pp. 469-479, 2003.

3. *** Merkulov, V. I., A. V. Melechko, M. A. Guillorn, D. H. Lowndes, and M. L. Simpson. “Alignment mechanism of carbon nanofibers produced by plasma-enhanced chemical-vapor deposition”. *Appl. Phys. Lett*., 79(18), October 29, 2001, 2970-2972.

4. *** Austin, D. W., M. S. Allen, J. M. McCollum, R. D. Dar, J. R. Wilgus, G. S. Sayler, N. F. Samatova, C. D. Cox, & M. L. Simpson, “Gene Network Shaping of Inherent Noise Spectra”, *Nature* 439, Feb. 2, 2006, 608-611

5. *** Merkulov, V. I. , M. A. Guillorn, D. H. Lowndes, M. L. Simpson, E. Voelkl, “Shaping carbon nanostructures by controlling the synthesis process”, *Appl. Phys. Lett*., 79(8), August 20, 2001, 1178-1180..

6. *** Aphecetche, L., *et al.* "PHENIX calorimeter," *Nuclear Instruments & Methods in Physics Research Section a- Accelerators Spectrometers Detectors and Associated Equipment*, vol. 499, pp. 521-536, 2003.

7. ** Allen, M., *et al.* "PHENIX inner detectors," *Nuclear Instruments & Methods in Physics Research Section a- Accelerators Spectrometers Detectors and Associated Equipment*, vol. 499, pp. 549-559, 2003.

8. ** Simpson, M. L., C. D. Cox, G. S. Sayler. “Frequency Domain Analysis of Noise in Autoregulated Gene Circuits”. *Proc. Nat. Acad. Sci. USA 100*, April 15, 2003, 4551-4556.

9. ** McKnight, T. E., A. V. Melechko, D. K. Hensley, G. D. Griffin, M. A. Guillorn, V. I. Merkulov, F. Serna, M. J. Doktycz, D. H. Lowndes, and M. L. Simpson. “Intracellular Integration of Synthetic Nanostructures with Viable Cells for Non-Inheritable Genetic Modification”. *Nanotechnology* 14, May 2003, 551-556.

10. ** McCollum, J. M., G. D. Peterson, C. D. Cox, M. L. Simpson, & N. F. Samatova, “The sorting direct method for stochastic simulation of biochemical systems with varying reaction execution behavior”, *Comp. Bio. and Chem.* 30, Feb. 2006, 39-49.

11. ** Guillorn, M. A., T. E. McKnight, A. Melechko, V. I. Merkulov, D. W. Austin, D. H. Lowndes and M. L. Simpson. “Individually addressable vertically aligned carbon nanofiber-based electrochemical probes”. *J. Appl. Phys*. 91(6), March 15, 2002, 3824-3828.

12. ** Simpson, Michael L., Gary S. Sayler, Steven Ripp, David E. Nivens, Bruce M. Applegate, Michael J. Paulus, and Gerald E. Jellison Jr. "Bioluminescent-Bioreporter Integrated Circuits Form Novel Whole-Cell Biosensors". *Trends Biotech.*, Vol. 16, August 1998, pp. 332-338.

13. ** Merkulov, V. I., A. V. Melechko, M. A. Guillorn, D. H. Lowndes, M. L. Simpson, J. H. Whealton, R. J. Raridon. **“**Controlled alignment of carbon nanofibers in a large-scale synthesis process”. *Appl. Phys. Lett*. 80(25), June 24, 2002, 4816-4818.

14. ** McKnight, T. E., A. V. Melechko, G. D. Griffin, M. A. Guillorn, V. I. Merkulov, F. Serna, D. K. Hensley, M. J. Doktycz, D. H. Lowndes, and M. L. Simpson. “Tracking Gene Expression after DNA Delivery Using Spatially Indexed Nanofiber Arrays.” *Nano Letts*. 4(7); July 7, 2004, 1213-1219.

15. ** Weinberger, L. S., R. D. Dar, M. L. Simpson (2008) “Transient-mediated fate determination in a transcriptional circuit of HIV” *Nature Genetics*, **40**(4), 466-470.

16. ** Guillorn, M. A., E.. D. Ellis, C. L. Britton, M. L. Simpson, A.V. Melechko, V.I. Merkulov , G.J. Bordonaro, D. Woodie, L.R. Baylor, and D. H. lowndes. “Operation of a gated field emitter using an individual carbon nanofiber cathode”. *Appl. Phys. Lett.*, 79(21), November 19, 2001, 3506-3508.

17. ** Simpson, M. L., G. S. Sayler, J. T. Fleming, and B. A. Applegate. “Whole-cell biocomputing: engineering the information processing functionality of cells”. *Trends in Biotechnology* 19(8), August 2001, 317-323.

18. ** Nivens, D. E., T. E. McKnight, S. A. Moser, S. J. Osbourn, M. L. Simpson, and G. S. Sayler, "Bioluminescent bioreporter integrated circuits: potentially small, rugged and inexpensive whole-cell biosensors for remote environmental monitoring," *J. Appl. Microbio.*, vol. 96, pp. 33-46, 2004.

19. ** Yu, Z., T. E. McKnight, M. N. Ericson, A. V. Melechko, M. L. Simpson, B. Morrison III (2007) Vertically aligned carbon nanofiber arrays record hippocampal slice electrophysiological signals, *Nano Letts.* **7**(8), 2188 – 2195.

20. ** Morrison, D. P. *et al.* The PHENIX experiment at RHIC. *Nuclear Physics A* **638**, 565c-569c (1998).

21. ** Fuentes-Cabrera, M., M.I. Baskes, A. V. Melechko, and M. L. Simpson (2008) “Bridge structure for the graphene/Ni(111) system: a first principles study” *Phys. Rev. B.* **77**, 035405-1 – 035405-5.

22. * Bolton , E. K., G. S. Sayler, D. E. Nivens, J. M. Rochelle, S. Ripp, and M. L. Simpson. “Integrated CMOS Photodetectors and Signal Processing for Very Low-Level Chemical Sensing with the Bioluminescent Bioreporter Integrated Circuit”. *Sens. Act. B* 85(1-2), June 20, 2002, 179-185.

23. * Guillorn, M. A., A. V. Melechko, V. I. Merkulov, D. K. Hensley, M. L. Simpson, and D. H. Lowndes. "Self-aligned gated field emission devices using single carbon nanofiber cathodes." *Appl. Phys. Letts.*, 81, Nov. 4, 2002, 3660-3662.

24. * Dhindsa, M. S., N. R. Smith, J. Heikenfeld, P. D. Rack, J. D. Fowlkes, M. J. Doktycz, A. V. Melechko, and M. L. Simpson, “Reversible Electrowetting of Vertically Aligned Superhydrophobic Carbon Nanofibers”, *Langmuir* **22**, October 10, 2006, 9030-9034.

25. * Melechko, A. V., T. E. McKnight, D. K. Hensley, M. A. Guillorn, V. I. Merkulov, D. H. Lowndes, and M. L. Simpson. “Large-scale synthesis of arrays of high-aspect-ratio rigid vertically aligned carbon nanofibres,” *Nanotechnology* 14, August 2003, 1029-1035.

26. * Baylor, L. R., V. I. Merkulov, E.D. Ellis, M. A. Guillorn, D. H. Lowndes, A. V. Melechko, M. L. Simpson, J. H. Whealton. “Field-emission from isolated individual vertically aligned carbon nanocones”. *J. Appl. Phys.* 91(7), April 1, 2002, 4602-4606.

27. * Sanseverino, J., R. K. Gupta, A. C. Layton, S. S. Patterson, S. A. Ripp, L. Saidak, M. L. Simpson, T. W. Schultz, & G. S. Sayler, "Use of Saccharomyces cerevisiae BLYES Expressing Bacterial Bioluminescence for Rapid, Sensitive Detection of Estrogenic Compounds," *Appl. Environ. Microbiol.*, 71, August 2005, 4455-4460.

28. * Zhang, L., D. Austin, V. I. Merkulov, M. A. Guillorn, A. V. Meleshko, D. H. Lowndes, and M. L. Simpson. "Four-probe charge transport measurements on individual vertically aligned carbon nanofibers." *Appl. Phys. Letts.* 84(20), May 17, 2004, 3972-3974.

29. * Klein, K.L., A.V. Melechko, T.E. McKnight, J.D. Fowlkes, S.T. Retterer, P.D. Rack, D. Joy and M.L. Simpson (2008) "Surface Characterization and Functionalization of Carbon Nanofibers", *J. Appl. Phy.* **103**, 061301-1 - 061301-26.

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31. * Simpson, M. L., G. S. Sayler, G. Patterson, D. Nivens, E. K. Bolton, J. M. Rochelle, J. C. Arnott, B. M. Applegate, S. Ripp, and M. A. Guillorn. "An integrated CMOS Microluminometer for low-level luminescence sensing in the bioluminescent bioreporter integrated circuit". *Sens. and Act. B* 72(2), Jan. 2001, 135-141.

32. * Adler, S. S., *et al.* "PHENIX on-line systems," *Nuclear Instruments & Methods in Physics Research Section a- Accelerators Spectrometers Detectors and Associated Equipment*, vol. 499, pp. 560-592, 2003.

33. * Merkulov, V. I., D. K. Hensley, A. V. Melechko, M. A. Guillorn, D. H. Lowndes, and M. L. Simpson. "Control Mechanisms for the Growth of Isolated Vertically Aligned Carbon Nanofibers". *J. Phys. Chem. B* 106, 2002, 10570-10577.

34. * Melechko, A. V., V. I. Merkulov, D. H. Lowndes, M. A. Guillorn, and M. L. Simpson. "Transition between "Base" and "Tip" Carbon Nanofiber growth modes". *Chem. Phys. Letts.* 356, April 26, 2002, 527-533.

35. * Doktycz, M. J. and M. L. Simpson, "Nano-enabled synthetic biology," *Mol Syst Biol*, vol. 3, 2007.

36. * Dar, R. D., B. S. Razooky, A. Singh, T. V. Trimeloni, J. M. McCollum, C. D. Cox, M. L. Simpson, L. S. Weinberger (2012) "Transcriptional burst frequency and burst size are equally modulated across the human genome." *Proc. Nat. Acad. Sci*. **109**(43), Oct.2012, 17454-17459.

37. * Singh, A, B. Razooky, C. D. Cox, M. L. Simpson, and L. S. Weinberger (2010), "Transcriptional Bursting from the HIV-1 Promoter Is a Significant Source of Stochastic Noise in HIV-1 Gene Expression," *Biophys. J.*, 98, L32-L34.

38. * Simpson, M.L., C.D. Cox, and G.S. Sayler, "Frequency domain chemical Langevin analysis of stochasticity in gene transcriptional regulation". *J. Theo. Bio.* 229(3), August 2004, 383-394.

39. * Merkulov,V. I., A. V. Melechko, M. A. Guillorn, D. H. Lowndes, and M. L. Simpson. "Effects of spatial separation on the growth of vertically aligned carbon nanofibers produced by plasma-enhanced chemical vapor deposition". *Appl. Phys. Lett.*, 80(3), January 21, 2002, 476-478.

40. * Guillorn, M. A., M. L. Simpson, G. J. Bordonaro, V. I. Merkulov, L.R. Baylor, and D. H. Lowndes. "Fabrication of Gated Cathode Structures Using an In-Situ Grown Vertically Aligned Carbon Nanofiber as a Field Emission Element". *J. Vac. Sci. Tech. B* 19, 573 (2001)

41. * Coffman, E. A., A. V. Melechko, D. P. Allison, M. L. Simpson, and M. J. Doktycz. "Surface patterning of silica nanostructures using bio-inspired templates and directed synthesis." *Langmuir* 20(20); Sept. 28, 2004, 8431-8436.

42. * Guillorn, M. A., X. Yang, A. V. Melechko, D. K. Hensley, V. I. Merkulov, M. L. Simpson, L. R. Baylor, W. L. Gardner, and D. H. Lowndes, "Vertically aligned carbon nanofiber-based field emission electron sources with an integrated focusing electrode**".** *J. Vac. Sci. Tech. B.* vol. 22(1), Jan. 2004, 35-39.

43. * Baylor, L. R., D. H. Lowndes, M. L. Simpson, C. E. Thomas, M. A. Guillorn, V. I. Merkulov, J. H. Whealton, E. D. Ellis, D. K. Hensley, and A. V. Melechko. **"**Digital electrostatic electron-beam array lithography". *J. Vac. Sci. Tech. B.* Vol. 20(6), Nov. 2002, 2646-2650.

44. * Zhang, L., A. V. Melechko, V. I. Merkulov, M. A. Guillorn, M. L. Simpson, D. H. Lowndes, and M. J. Doktycz. "Controlled transport of latex beads through vertically aligned carbon nanofiber membranes". *Appl. Phys. Letts.* 81(1), July 1, 2002, 135–137.

45. * Merkulov, V. I., A. V. Melechko, M. A. Guillorn, D. H. Lowndes, and M. L. Simpson. "Sharpening of carbon nanocone tips during plasma-enhanced chemical vapor growth". *Chem. Phys. Letts.* 350(5-6), December 28, 2001, 381-385.

46. * Yang, X., M. A. Guillorn, D. Austin, A. V. Melechko, H. M. Meyer III, H. Cui, V. I. Merkulov, J.B.O. Caughman, D. H. Lowndes, and M. L. Simpson. "Fabrication and characterization of carbon nanofiber-based vertically integrated Schottky-barrier junction diodes". *Nano Letts.* 3(12), December 2003, 1751-1755.

47. * Gupta, R. K., S. S. Patterson, S. Ripp, M. L. Simpson, and G. S. Sayler, "Expression of the Photorhabdus luminescens lux genes (luxA, B, C, D, and E) in Saccharomyces cerevisiae," *FEMS Yeast Research*, vol. 4, pp. 305-313, 2003.

48. * Jun, S.-I., T.E. McKnight, M.L. Simpson, and P.D. Rack, "A statistical parameter study of indium tin oxide thin films deposited by radio-frequency sputtering." *Thin Solid Films*, **476**(1), April 1, 2005, 59-64.

Additional Journal Publications

49. Dar, R. D., B. S. Razooky, L. S. Weinberger, C. D. Cox, and M. L. Simpson (2015) "The Low Noise Limit in Gene Expression." *PLoS ONE* **10**(10): e0140969. doi: 10.1371/journal.pone.0140969

50. Norred, S.E., Caveney, P.M., Retterer, S.T., Boreyko, J.B., Fowlkes, J.D., Collier, C.P., Simpson, M.L. "Sealable Femtoliter Chamber Arrays for Cell-free Biology." *J. Vis. Exp.* (97), e52616, doi:10.3791/52616 (2015).

51. Iyer S, D.K. Karig, S.E. Norred, M. L. Simpson, M. J. Doktycz (2013) "Multi-Input Regulation and Logic with T7 Promoters in Cells and Cell-Free Systems." *PLoS ONE* **8**(10): e78442. doi:10.1371/journal.pone.0078442

52. Karig, D. K., S. Y. Jung, B. Srijanto, C. P. Collier, & M. L. Simpson (2013), "Probing cell-free gene expression noise in femtoliter volumes," *ACS Syn. Bio.*, Sept. 2013.

53. Teng, M.W., C. Bolovan-Fritts, R. D. Dar, A. Womack, M. L. Simpson, T. Shenk, L. S. Weinberger (2012), "An Endogenous Accelerator for Viral Gene Expression Confers a Fitness Advantage," *Cell* **151**(7), Dec. 21, 2012, 1569-1580.

54. Retterer, S. T., and M. L. Simpson (2012), "Microscale and nanoscale compartments for biotechnology", *Curr. Opin. Biotech.*, **23**(4), Aug. 2012, 522-528.

55. Yu, Z. T. E. McKnight, M. N. Ericson, A. V. Melechko, M. L. Simpson, B. Morrison III (2012), "Vertically aligned carbon nanofiber as nano-neuron interface for monitoring neural function," *Nanomed: Nanotech., Bio., and Med.* **8**, 419–423.

56. Karig, D. K., S. Iyer, M. L. Simpson, and M. J. Doktycz (2012), "Expression optimization and synthetic gene networks in cell-free systems," *Nuc.. Acids Res.*, **40**(8), 3763-3774.

57. Fuentes-Cabrera, M., B. H. Rhodes, M. I. Baskes, H. Terrones, J. D. Fowlkes, M. L. Simpson, and Philip D. Rack (2011), "Controlling the Velocity of Jumping Nanodroplets *Via* Their Initial Shape and Temperature," *ACS Nano*, **5**(9), 7130-7136.

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59. Collier, C. P. and M. L. Simpson (2011), "Micro/nanofabricated environments for synthetic biology," *Curr. Opin. Biotech.*, **22**(4), 516-526.

60. Simpson, M. L., and P. T. Cummings (2011), "Fluctuations and Correlations in Physical and Biological Nanosystems: The Tale Is in the Tails," *ACS Nano*, **5**(4), 2425–2432.

61. Fuentes-Cabrera, M., B. H. Rhodes, J. D. Fowlkes, A. Lopez-Benzanilla, H. Terrones, M. L. Simpson, P. D. Rack (2011), "Molecular dynamics study of the dewetting of copper on graphite and graphene: Implications for nanoscale self-assembly," *Phys. Rev. E* **83**(4**),** 041603.

62. Melechko, A. V., R. C Pearce, D. K. Hensley, M. L. Simpson and T. E. McKnight (2011), "Challenges in process integration of catalytic DC plasma synthesis of vertically aligned carbon nanofibers," *J. Phys. D: Appl. Phys.* **44**, 174008.

63. Karig, D. K., P. Siuti, R. D. Dar, S. T. Retterer, M. J. Doktycz, and M. L. Simpson (2011), "Model for Biological Communication in a Nanofabricated Cell-Mimic Driven by Stochastic Resonance," *Nano. Comm. Net*., **2**(1), 39-49.

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65. Dar, R. D., D. K. Karig, J. F. Cooke, C. D. Cox, and M. L. Simpson (2010), "Distribution and regulation of stochasticity and plasticity in *Saccharomyces cerevisiae*," *Chaos* **20**, 037106-1—8.

66. Fletcher, B.L., J. T. Fern, K. Rhodes, T. E. McKnight, J. D. Fowlkes, S. T. Retterer, D. J. Keffer, M. L. Simpson, and M. J. Doktycz (2009), "Effects of ultramicroelectrode dimensions on the electropolymerization of polypyrrole," *J. Appl. Phys.* **105**, 124312-1—6.

67. Peckys, D. B., A. V. Melechko, M. L. Simpson, and T. E. McKnight (2009) "Immobilization and release strategies for DNA delivery using carbon nanofiber arrays and self-assembled monolayers," *Nanotech.* 20, 145304-1—8.

68. Simpson, M. L., C. D. Cox, M. S. Allen, J. M. McCollum, R. D. Dar, D. K. Karig, and J. F. Cooke, "Noise in biological circuits," invited Advanced Review in *WIRE: Nanomed Nanobiotech*.**,** **1**(2), March-April 2009, 214-225

69. Merkulov, I. A., K. L. Klein, and M. L. Simpson (2009) "A synergetic description of carbon nanofiber growth," *J. Appl. Phys.* **105**, 064305-1—8.

70. Guan, Y., J. D. Fowlkes, S. T. Retterer, M. L. Simpson and P. D Rack (2008) "Nanoscale lithography via electron beam induced deposition," *Nanotech*. 19 505302-1—6.

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72. Fowlkes, J. D., B. L. Fletcher, S. T. Retterer, A. V. Melechko, M. L. Simpson and M. J. Doktycz (2008), "Size-selectivity and anomalous subdiffusion of nanoparticles through carbon nanofiber-based membranes," *Nanotechnology* 19, 415301-1-12.

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77. Rack, P. D., Y. F. Guan, J. D. Fowlkes, A. V. Melechko, and M .L. Simpson (2008) “Pulsed laser dewetting of patterned thin metal films: A means of directed assembly,” *Appl. Phys. Letts.* 92, 223108.

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80. Fletcher, B., S. Retterer, T.E. Mcknight, A. V. Melechko, J.D. Fowlkes, M. L. Simpson, M.J. Doktycz (2008) "Actuatable Membranes Based on Polypyrrole-Coated Vertically Aligned Carbon Nanofibers" *ACS Nano* 2(2), 247-254.

81. Mann, D., T. E. Mcknight, J. McPherson, P. Hoyt, A. V. Melechko, M. L. Simpson, and G. S. Sayler (2008) "Inducible RNAI-Mediated Gene Silencing Using Nanostructured Gene Delivery Arrays" *ACS Nano* **2**(1), 69-76.

82. Randolph, S. J., J. D. Fowlkes, A. V. Melechko, K. L. Klein, H. M. Meyer III, M. L. Simpson, and P. D. Rack (2007) “Controlling thin film structure for the dewetting of catalyst nanoparticle arrays for subsequent carbon nanofiber growth”, *Nanotechnology* **18**, 465304-1-8.

83. Melechko, A. V., K. L. Klein, J. D. Fowlkes, D. K. Hensley, I. A. Merkulov, T. E. McKnight, P. D. Rack, J. A. Horton, M. L. Simpson (2007) “Control of carbon nanostructure: from nanofiber toward nanotube and back”, *J. Appl. Phys* .**102**(7), 074314-1 – 7.

84. Merkulov, I. A., V. I. Merkulov, A.V. Melechko, K. L. Klein, D. H. Lowndes, and M. L. Simpson (2007) “Instability of catalytic growth interface in carbon nanofiber synthesis”, *Phys. Rev. B.*, **76**, 014109-1 – 14109-8.

85. Guan, Y.F., A.V. Melechko, A.J. Pedraza, M.L. Simpson, and P.D. Rack (2007) “Non-Lithographic Organization of Nickel Catalyst for Carbon Nanofiber Synthesis on Laser-Induced Periodic Surface Structures”, *Nanotechnology* **18**, 335306-335312.

86. Fletcher, B. L., T. E. McKnight, J. D. Fowlkes, D. P. Allison, M. L. Simpson, M. J. Doktycz (2007) Controlling the Dimensions of Carbon Nanofiber Structures through the Electropolymerization of Pyrrole. *Synth. Metals* **157**, 282-289.

87. Mann, D. G. J., McKnight, T. E., Melechko, A. V., Simpson, M. L. & Sayler, G. S. (2007) Quantitative Analysis of EDC-Condensed DNA on Vertically Aligned Carbon Nanofiber Gene Delivery Arrays. *Biotechnol. Bioeng*. **97**(4), 680-688.

88. Yang, X., W. L. Gardner, L. R. Baylor, H. Cui, D. H. Lowndes, D. C. Joy, and M. L. Simpson (2007) "Electron-beam focusing characteristics of double-gated carbon nanofiber based field emission sources," *J. Vac. Sci. & Tech. B*, vol. 25, pp. 394-399.

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Book Chapters

1. McKnight, T. E. A. V. Melechko, G. D. Griffin, M. A. Guillorn, V. I. Merkulov, M. J. Dokycz, M. N. Ericson, M. L. Simpson. " Cellular Interfacing with Arrays of Vertically Aligned Carbon Nanofibers and Nanofiber-Templated Materials" in Nanotechnology in Biology and Medicine, T. Vo-Dinh, Editor, CRC Press, Boca Raton, Florida 2007.

2. McKnight, T. E., A. V. Melechko, M. A. Guillorn, V. I. Merkulov, D. H. Lowndes, and M. L. Simpson. "Synthetic Nanoscale Elements for the Delivery of Materials into Viable Cells", In BioNanoTech Protocols, Sandra J. Rosenthal and David W. Wright, Editors, Humana Press, 2005, 191-208.

3. Simpson, M. L., G. S. Saylor, J. T. Fleming, J. Sanseverino, and C. D. Cox. "The Biology of Integration of Cells into Microscale and Nanoscale Systems". In Cellular Computing, Martyn Amos, Editor, Oxford University Press, 2004.

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Invited Talks

- "Footprints in the Noise" invited Plenary talk at the 2012 Society for Mathematical Biology Annual Meeting and Conference, Knoxville, TN, July 26, 2012.
- "Footprints in the Noise" invited talk at the Mathematical Biosciences Institute Workshop on Stochastic Processes in Cell and Population Biology, October 28, 2011.
- "Noise and Function in Complex Nanoscale Systems," Keynote Address, 11th Annual Nanoscience and Nanotechnology Forum, Vanderbilt University, October 27, 2010.
- "The Role of Noise in Information Processing in Complex Nanoscale Systems," NSF Workshop on Shared Principles in Biology and Computation, May 25-26, 2010.
- "Gene Circuit Noise Mapping: A tool for characterization and discovery", Mathematical Biosciences Institute Workshop on Synthetic Biology, Columbus, Ohio, January 28, 2010.
- "Using Noise to Characterize Gene Circuits and Networks", Biomedical Engineering Society Fall Meeting, October 3, 2008.
- "The DOE Nanoscale Science Research Centers and Emergent Properties Theme at the CNMS: Biological Lessons for Stochasticity at the Nanoscale" Plenary Lecture at the IEEE 8th International Conference on Nanotechnology, August 20, 2008.
- "The Role of Stochastic Fluctuations in Biological Decision Circuits" Keynote Address at The 3rd Miami University CACR Symposium on Dynamical Systems in Sciences, Arts, and Engineering, March 6, 2008
- "What I cannot create I do not understand": The parallel synergistic pathways of design and discovery. NSF Workshop on Molecular Communication: Biological Communications Technology, February 20-21, 2008.
- "Center for Nanophase Materials Sciences", Joint Genomics: GTL Awardees Workshop VI and Metabolic Engineering 2008, February 10-13, 2008.
- "Probing Gene Circuit Structure and Function Using Noise" Aspen Center for Physics Conference on Biophysics, January 6-12, 2008.
- "Materials for the 21st Century: Biological Inspiration for Complex Synthetic Nanoscale Materials Systems", The Center for Nanoscale Science and Technology Nanotechnology Workshop, University of Illinois at Urbana-Champaign, May 3, 2007.
- "Cell-Like Computation in Synthetic Nanoscale Systems", Unconventional Computation: Quo Vadis? March 21-23, 2007, Santa Fe, New Mexico.

- "Materials for the 21st Century: Biological Inspiration for Complex Synthetic Nanoscale Materials Systems", Informatics Needs for Nanomaterials Workshop, February 8-9, 2007, Oak Ridge, TN.
- "Tuning structure and function of carbon nanofibers and metal nanoparticles in a controlled co-synthesis process", Materials Research Society Fall Conference, November 27, 2006, Boston, MA.
- "Nanobiotechnology: Nanotechnology, Biology, and an Even More Synthetic Biology", The Cell-Like Entity Workshop, Dayton, Ohio, September 14, 2005.
- "The Spectral Features of Stochastic Fluctuations Reveal Details of the Underlying Gene Circuit Structure and Function", First International Symposium on Cellular Computing, University of Warwick, United Kingdom, December 9, 2004.
- "Probing Gene Circuit Structure and Function Using Noise", Mathematical Biosciences Institute Workshop on Gene Regulatory Networks, Columbus, Ohio, November 11, 2004.
- "Research at the Bio-, Info-, Nano-Sciences Interfaces", Biomedical Engineering Society Annual Meeting, Philidelphia, Pennsylvania, October 15, 2004.
- "The Functional Role of Noise in Quorum Sensing", SIAM Life Sciences Symposium, Portland, Oregon, July 12, 2004.
- "Controlled Synthesis and Directed Assembly of Carbon Nanofibers: Molecular-Scale Interface to Cells", Materials Research Society Spring Conference, April 15, 2004.
- "Intelligence in the Genes", Council for the Advancement of Science Writing (CASW) New Horizons in Science Briefing, Knoxville, TN, October 27, 2003.
- "Controlled Synthesis of Carbon Nanostructures for the Realization of Functional Molecular-Scale Materials, Devices, and Systems". Condensed Matter Physics Seminar, Vanderbilt University, February 27, 2002.
- "Controlled Synthesis of Carbon Nanostructures for the Realization of Functional Molecular-Scale Materials, Devices, and Systems". MARTECH Condensed Matter Physics Seminar, Florida State University, December 3, 2001.
- "Controlled Synthesis of Carbon Nanostructures for the Realization of Functional Molecular-Scale Materials, Devices, and Systems". 2001 ASME International Mechanical Engineering Congress and Exposition, November 12, 2001, New York, New York.
- "Controlled Synthesis of Carbon Nanofibers for the Realization of Molecular-Scale Devices". University of Kentucky Condensed Matter Physics Seminar, October 16, 2001.
- "Carbon Nanotube and Nanofiber Based Devices". Materials Research Society Spring Meeting, April 18, 2001, San Francisco, CA.
- "Whole-Cell Biocomputing: Engineering the Information Processing Functionality of Cells". Horizons in Biotechnology Seminar, DuPont Corporation, March 2, 2001.
- "Bioluminescent Bioreporter Integrated Bioluminescent Bioreporter Integrated Circuits (BBICs): Whole Cells as Microelectronic Components". 11th International Symposium

on Bioluminescence and Chemiluminescence, Pacific Grove, California, September 8, 2000.

- "Integrated Optical Sensors and Biosensors". NASA Kennedy Space Flight Center, January 3, 2000.
- "Single-Chip Photo-Spectrometers Realized in Standard Complementary-Metal-Oxide-Semiconductor (CMOS) Technology". The 44th Annual International Instrumentation Symposium, May 5, 1998.
- "Bioluminescent Bioreporter Integrated Circuits (BBICs)". SPIE conference on Smart Electronics and MEMS, March 3, 1998.
- "Bioluminescent Bioreporter Integrated Circuits (BBICs): Whole-Cell Biosensors". NASA-JDF Workshop Non/Minimally Invasive Measurement of Physiological Analytes, April 1998.
- "Integrated Time-Interval Measurements Systems". University of New Hampshire, June 1997.
- "Integrated Electronics for Nuclear Physics Detectors". Low/Medium Energy Gamma-Ray Astrophysics Mission Workshop, Lansdown, Virginia, November 1996.
- "Integrated Electronics for Collider Detectors". Georgia Institute of Technology, April 1996.
- "Analog Integrated Circuit Research at the Oak Ridge National Laboratory". University of New Hampshire, Nov. 1995.

Patents

1. T. E. McKnight, A. V. Melechko, G. D. Griffin, M. A. Guillorn, V. I. Merkulov, and M. L. Simpson. Patent Number. 8,993,327 "Parallel Macromolecular Delivery and Biochemical/Electrochemical Interface to Cells Employing Nanostructures".

2. T. E. McKnight, A. V. Melechko, and M. L. Simpson. Patent Number 8,343,766 "Method and Apparatus for Sustaining Viability of Biological Cells on a Substrate".

3. A. V. Melechko, T. E. McKnight, M. A. Guillorn, B. Illic, V. I. Merkulov, M. J. Doktycz, D. H. Lowndes, and M. L. Simpson. Patent Number 8,142,877 "Nano transfer and nanoreplication using deterministically grown sacrificial nanotemplates".

4. T. E. McKnight, A. V. Melechko, and M. L. Simpson. Patent Number 8,101,388 "Method and structure for extracting molecular species".

5. T. E. McKnight, A. V. Melechko, and M. L. Simpson. Patent Number 8,076,124 "Method and apparatus for sustaining viability of biological cells on a substrate".

6. A. V. Melechko, T. E. McKnight, M. A. Guillorn, B. Illic, V. I. Merkulov, M. J. Doktycz, D. H. Lowndes, and M. L. Simpson. Patent Number 8,003,220 "Nanotransfer and nanoreplication using deterministically grown sacrificial nanotemplates".

7. V. I. Merkulov, A. V. Melechko, M. A. Guillorn, D. H. Lowndes, and M. L. Simpson. Patent Number 7,947,976 “Controlled Alignment of Catalytically Grown Nanostructures in a Large-Scale Synthesis Process”.

8. A. V. Melechko, T. E. McKnight, M. A. Guillorn, B. Ilic, V. I. Merkulov, M. J. Doktycz, D. H. Lowndes, and M. L. Simpson. Patent Number 7,943,196 “Nanotransfer and nanoreplication using deterministically grown sacrificial nanotemplates”.

9. M. J. Doktycz, M. L. Simpson, T. E. McKnight, A. V. Melechko, D. H. Lowndes, M. A. Guillorn, V. I. Merkulov. Patent Number 7,641,863 “Nanoengineered membranes for controlled transport”.

10. V. I. Merkulov, A. V. Melechko, M. A. Guillorn, D. H. Lowndes, M. L. Simpson. Patent Number 7,408,186 “Controlled Alignment Catalytically Grown Nanostructures”.

11. M. L. Simpson, M. J. Paulus, G. S. Sayler, B. M. Applegate, S. A. Ripp. Patent Number 7,371,538 “Microluminometer chip and method to measure bioluminescence”.

12. V. I. Merkulov, A. V. Melechko, M. A. Guillorn, D. H. Lowndes, M. L. Simpson. Patent Number 7,245,068 “Apparatus for controlled alignment of catalytically grown nanostructures”.

13. A. V. Melechko, T. E. McKnight, M. A. Guillorn, B. Ilic, V. I. Merkulov, M. J. Doktycz, D. H. Lowndes, and M. L. Simpson. Patent Number 7,229,692 “Nanoconduits and nanoreplicants”.

14. M. L. Simpson, M. J. Paulus, G. S. Sayler, B. M. Applegate, S. A. Ripp. Patent Number 7,208,286 “Bioluminescent bioreporter integrated circuit devices and methods for detecting ammonia”.

15. M. A. Guillorn, B. Ilic, A. V. Melechko, V. I. Merkulov, D. H. Lowndes, M. L. Simpson. Patent Number 7,151,256 “Vertically aligned nanostructure scanning probe microscope tips”.

16. M. A. Guillorn, T. E. McKnight, V. I. Merkulov, A. V. Melechko, M. L. Simpson. Patent Number 7,144,287 “Individually electrically addressable carbon nanofibers on insulating substrates”.

17. V. I. Merkulov, D. H. Lowndes, M. A. Guillorn, M. L. Simpson. Patent Number 7,109,515 “Carbon containing tips with cylindrically symmetrical carbon containing expanded bases”.

18. M. L. Simpson, M. J. Paulus, G. S. Sayler, B. Applegate, S. Ripp. Patent Number 7,090,992 “Bioluminescent bioreporter integrated circuit devices and methods for detecting estrogen”.

19. G. S. Sayler, J. T. Fleming, B. Applegate, M. L. Simpson. Patent Number 7,020,560. “Methods for cell-based combinatorial logic”.

20. M. A. Guillorn, T. E. McKnight, V. I. Merkulov, A. V. Melechko, M. L. Simpson. Patent Number 6,982,519. “Individually electrically addressable vertically aligned carbon nanofibers on insulating substrates”.

21. V. I. Merkulov, A. V. Melechko, M. A. Guillorn, D. H. Lowndes, M. L. Simpson. Patent Number 6,958,572. “Controlled non-normal alignment of catalytically grown nanostructures in a large-scale synthesis process”.

22. C. E. Thomas, L. R. Baylor, E. Voelkl, M. L. Simpson, M. J. Paulus, D. H. Lowndes, J. Whealton, J. C. Whitson, J. B. Wilgen. Patent Number 6,917,043. “Individually addressable cathodes with integrated focusing stack or detectors”.

23. M. L. Simpson, M. J. Paulus, G. S. Sayler, B. M. Applegate, S. A. Ripp. Patent Number 6,905,834. “Bioluminescent bioreporter integrated circuit detection methods”.

24. M. A. Guillorn, M. L. Simpson, V. I. Merkulov, A. V. Melechko, D. H. Lowndes. Patent Number 6,858,455. “Gated fabrication of nanostructure field emission cathode material within a device”.

25. M. L. Simpson, D. H. Lowndes, V. I. Merkulov, M. A. Guillorn, and C. L. Britton. Patent Number 6,692,324. "Single Self-Aligned Carbon Containing Tips".

26. G. S. Sayler, M. L. Simpson, B. M. Applegate, S. A. Ripp. Patent Number 6,673,596. “In Vivo Biosensor Apparatus and Method of Use”.

27. V. I. Merkulov, D. H. Lowndes, M. A. Guillorn, M. L. Simpson. Patent number 6,649,431. "Carbon tips with expanded bases grown with simultaneous application of carbon source and etchant gases ".

28. M. J. Paulus, Michael J. H. Sari-Sarraf, M. L. Simpson, and C. L. Britton, Jr. Patent Number 6,399,951 “Simultaneous CT and SPECT tomography using CZT detectors”.

29. C. E. Thomas, L. R. Baylor, E. Voelkl, M. L. Simpson, M. J. Paulus, D. H. Lowndes, J. H. Whealton, J. C. Whitson, J. B. Wilgen. Patent Number 6,498,349. “Electrostatically focused addressable field emission array chips (AFEA's) for high-speed massively parallel maskless digital E-beam direct write lithography and scanning electron microscopy”.

30. M. L. Simpson, G. S. Sayler, and M. J. Paulus. Patent Number 6,117,643 “Bioluminescent Bioreporter Integrated Circuit”.

31. M. L. Simpson, M. N. Ericson, G. E. Jellison, A. L. Wintenberg, W. B. Dress, and D. N. Sitter. Patent Number 5,965,873 , “Photo-Spectrometers, Method of Use and Manufacture”.

32. Larry R. Baylor, Clarence E. Thomas, Edgar Voelkl, James A. Moore, Michael L. Simpson, and Michael J. Paulus. Patent Number 5,892,231, “Virtual mask digital electron beam lithography”.

33. M. L. Simpson and T. W. Raudorf. Patent Number 4,937,452, “Charge Trapping Correction in Photon Detection Systems”.
34. M. L. Simpson. Patent Number 4,878,014, “Ion Beam Profile Scanner having Symmetric Detector Surface to Minimize Capacitance Noise”.
35. M. L. Simpson. Patent Number 4,833,394, “Ion Beam Profile Analyzer with Noise Compensation”.

Awards and Honors

- Elected Fellow of The American Association for the Advancement of Science (AAAS), November 2011.

- Inducted into the College of Fellows of the American Institute for Medical and Biomedical Engineering, ‘For contributions to the understanding and engineering of information transport in genetic circuits and systems’, February 2010.

- Received UT-Battelle Distinguished Scientist Award for 2009 for ‘Pioneering efforts to establish the research field of Noise Biology.’

- Named a Fellow of the IEEE for ‘Contributions to nanotechnology in engineered devices and biology’, January 1, 2008.

- Named a Battelle Memorial Institute Distinguished Inventor in 2007

- One of 100 invitees at the Second National Academies Keck Future Initiative Workshop on “Designing Nanostructures at the Interface between Biomedical and Physical Systems”.

- One of 100 invitees at the First National Academies Keck Future Initiative Workshop on “Signals, Decisions, and Meaning in Biology, Chemistry, Physics, and Engineering”.

- 1998 Kermit Fischer Environmental Award for the Pioneering Development of an Integrated CMOS Photo-Spectrometer for Wide Applications including Environmental Monitoring.

- Finalist for a 1998 Discover Magazine Technology Innovation award for the development of the Bioluminescent Bioreporter Integrated Circuit.

- Awarded Lockheed-Martin Energy Research Corporation Medal for Excellence in Technical Achievement, May 1998 for the co-development of a deep submicron lithography method.

- Awarded Lockheed-Martin Energy Research Corporation Medal for Excellence in Technical Achievement, May 1998 for the co-development of an integrated circuit for a collider detector application.

- Awarded Lockheed-Martin Energy Research Corporation Medal for Excellence in Technical Achievement, May 1997 for the development of a single-chip photo-spectrometer.

Professional Activities

- Editorial Board Member of *SOJ Materials Science & Engineering*

- Member of Program Committee for the 1st International Workshop on Molecular and Nano scale Communication, held at The 30th IEEE International Conference on Computer Communications, Shanghai, China, April 2011.

- External Advisory Board for the BACTOCOM consortium led by Manchester Metropolitan University, United Kingdom

- Editorial Board Member of the *Journal of Nanomedicine and Biotherspeutic Discovery*

- Faculty Advisory Board for UT/ORNL Joint Institute for Biological Sciences

- Editorial Review Board for *International Journal of Natural Computing Research*

- Scientific Advisory Board, Vanderbilt Institute for Integrative Biosystems Research and Education

- Co-Chair and IEEE-EMBS representative for the second Bio-, Micro-, and Nanosystems Biology Conference sponsored by the American Society of Microbiology and IEEE-EMBS, January 15-18, 2006.

- Member of the Editorial Board of the journal *Nanomedicine: Nanotechnology, Biology And Medicine*

- Co-Chair and IEEE-EMBS representative for the first Bio-, Micro-, and Nanosystems Biology Conference sponsored by the American Society of Microbiology and IEEE-EMBS, July 7-10, 2003.

- Member of the Advisory Committee for the Georgia Tech Conference on Nanosciene and Nanotechnology, 2001

- Member of the Advisory Committee for the Georgia Tech First Conference on Nanosciene and Nanotechnology, October 2000

- Member of the Oak Ridge National Laboratory Nanoscale Science, Engineering, and Technology (NSET) Advisory Committee

- Member of the Program Committee for the 1997 IEEE Nuclear Science Symposium.

- Instructor for the short course "Designing Integrated Circuits for Mixed Analog/Digital Signal Processing Systems" presented at the 1997 IEEE Nuclear Science Symposium.

- General Chairman for the First Southeastern Workshop on Mixed-Signal VLSI and Monolithic Sensors, April 1997.

- Assistant Program Chairman for the 1996 IEEE Nuclear Science Symposium.

- Instructor for the short course "Designing Integrated Circuits for Mixed Analog/Digital Signal Processing Systems" presented at the 1996 IEEE Nuclear Science Symposium.

- Organizer and lead instructor of the short course "Precision Timing Measurements: Fundamentals and Instrumentation", presented at the 1995 IEEE Nuclear Science Symposium.

- Member of the Program Committee for the 1994 IEEE Nuclear Science Symposium.

Graduate Students and Postdoctoral Fellows

Masters
- Jackson, R. G. Electrical and Computer Engineering, UTK.
- Smith, R. S. Electrical and Computer Engineering, UTK.
- Vann, M. Electrical and Computer Engineering, UTK.
- Arnott, J. C. Electrical and Computer Engineering, UTK.
- Patterson, G. Electrical and Computer Engineering, UTK.
- Guillorn, M. A. Electrical and Computer Engineering, UTK.
- Bolton, E. K. Electrical and Computer Engineering, UTK.
- Austin, D. W. Electrical and Computer Engineering, UTK.
- Hale, M. Electrical and Computer Engineering, UTK.
- Hullander, E. Electrical and Computer Engineering, UTK.

Ph.D.
- Guillorn, M. A., Material Science and Engineering, UTK.
- Austin, D. Electrical and Computer Engineering, UTK.
- Yang, X. Material Science and Engineering, UTK.
- Zhang, L. Material Science and Engineering, UTK.
- Fletcher, B. Material Science and Engineering, UTK.
- Klein, K. Material Science and Engineering, UTK.
- Dar, R. D., Physics, UTK.
- Charles Chin (current), Energy Science and Engineering, UTK
- Liz Norred (current), Energy Science and Engineering, UTK
- Patrick Caveney (current), Energy Science and Engineering, UTK

Postdoctoral Scholars Sponsored

- Melechko, A. V.
- Allen, M. S.
- Fowlkes, J. D.
- Edwards, L. M.
- Peckys, D.
- Karig, D.