
BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME Gale, Bruce Kent	POSITION TITLE Professor University of Utah		
eRA COMMONS USER NAME (credential, e.g., agency login) bkgale			
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	MM/YY	FIELD OF STUDY
Brigham Young University University of Utah	B.S. Ph.D.	08/95 05/00	Mechanical Engineering Bioengineering

A. Personal Statement

A goal of this project is to explore development of chromosome separation tools using microfluidics. My background of over 15 years in developing microfluidic devices and medical devices for the health sciences will be of great help in this work. I have significant experience in biocompatibility, manufacturing, fluid and transport modeling, and design of miniature and microscale medical devices. I have particularly emphasized rapid prototyping and overcoming difficult manufacturing challenges in my research, and expect to use those skills in this work. I have experience with several projects involving nucleic acid analysis, including DNA and RNA extraction from cells, blood, viruses, and bacteria, microfluidic based PCR and HRMA, and DNA transport. I have also supervised several projects involving small animal microfluidics and cells, including ovarian cancer cell culture, bacteria separation and detection, zebrafish genotyping and C. Elegans projects, all of which should provide excellent background for this work. We have recently been working to demonstrate zebrafish embryo sorting and processing devices, with significant success, and expect that effort to instruct us in these efforts. I will work carefully with Mario Capecchi to ensure the success of this project.

B. Positions and Honors

Positions and Employment

1999-2001 Assistant Professor, Biomedical Engineering, Louisiana Tech University
2001-2007 Assistant Professor, Mechanical Engineering, University of Utah
2007-2013 Associate Professor, Mechanical Engineering, University of Utah
2004-Present Director, Utah State Center of Excellence for Biomedical Microfluidics
2004-Present Chairman/CTO, Wasatch Microfluidics
2010-Present Chief Science Officer, Espira
2013-Present Professor, Mechanical Engineering, University of Utah
2013-Present Director, College of Engineering Nanofabrication Lab, University of Utah

Honors

August 2014 Researcher of the Year for 2013, Mechanical Engineering Department
May 2014 Distinguished Mentor Award, University of Utah
August 2013 Researcher of the Year for 2012, Mechanical Engineering Department
Fall 2004, 2010, 2011 Top 15% Instructor Commendation, College of Engineering
April, 2004 Nominated for Student Choice Teaching Award
September 2001 Louisiana Tech College of Engineering Outstanding Researcher Award

C. Selected Peer-reviewed Publications (Selected from 80 peer-reviewed publications)

Most relevant to the current application

1. Kevin Petersen, Lucia Manangon, Joshua Hood, Samuel Wickline, Diego Fernandez, William Johnson, Bruce K. Gale, "A Review of Exosome Separation Techniques and Characterization of B16-F10 Mouse Melanoma Exosomes with AF4-UV-MALS-QELS-DLS-TEM," *Anal. Bioanal. Chem.*, published on the web, August 2014.
2. Tonguc O. Tasci, William. P. Johnson, Diego. P. Fernandez, Eliana. Manangon, Bruce. K. Gale, "Circuit modification in electrical field flow fractionation systems generating higher resolution separation of nanoparticles," *J. Chromatography A*, Vol. 1365, pp. 164–172, 2014. DOI: 10.1016/j.chroma.2014.08.097
3. Scott O. Sundberg, Carl T. Wittwer, Luming Zhou, Robert Palais, Zachary Dwight, and Bruce K. Gale, "Quasi-Digital PCR: Enrichment and Quantification of Rare DNA Variants," *Biomedical Microdevices*, Vol. 16(4), pp. 639-644, August 2014. doi: 10.1007/s10544-014-9866-0.
4. Jungkyu Kim, John Elsnab, Cody Gehrke, Jun Li, Bruce K. Gale, "Microfluidic Integrated Multi-walled Carbon Nanotube (MWCNT) Sensor for Electrochemical Nucleic Acid Concentration Measurement," *Sens. Act. B: Chemical.*, available on the web May 13, 2013.
5. Jungkyu Kim, Michael A. Johnson, Parker Hill, and Bruce K. Gale, "A microfluidic nucleic acid extraction system with both disposable and reusable components," *J. Micromech. Microeng.* Vol. 22, pp. 015007 (9pp), 2012.
6. Raheel Samuel, Himanshu J Sant, Fangxiang Jiao, Chris R Johnson and Bruce K Gale, "Microfluidic laminate-based phantom for diffusion tensor-magnetic resonance imaging," *J. Micromech. Microeng.* Vol. 21, pp. 095027 (11pp), 2011.
7. Julien Gigault , Bruce K. Gale , Isabelle Le Hécho , and Gaëtane Lespes, "Nanoparticle characterization by Cyclical Electrical Field-Flow Fractionation," *Anal. Chem.* Vol. 83, No. 17, p 6565-6572, 2011. DOI: 10.1021/ac2008948.
8. Balamurali K. Ambati, Gilbert Wong, Griffin J. Jardine, Bruce Gale and John Elsnab, "Endocapsular Carousel Technique Phacoemulsification," *Journal of Cataract & Refractive Surgery*, Vol. 37, No. 3, pp. 433-437, 2011.
9. Scott Sundberg, Carl Wittwer, Chao Gao, and Bruce Gale, "Spinning Disc Platform for Microfluidic Digital PCR," *Anal. Chem.* Vol. 82, pp. 1546-1550, 2010.
10. Guang Yan, Kevin S. Warner, Jie Zhang, Sanjay Sharma, and Bruce K. Gale, "Evaluation needle length and density of microneedle arrays in the pretreatment of skin for transdermal drug delivery," *International Journal of Pharmaceutics*, Vol. 391, pp. 7-12, 2010.
11. Jungkyu Kim, Adam Miles, and Bruce K. Gale, "Improved biomolecule microarrays by printing on nanoporous aluminum oxide using a continuous-flow microspotter," *Small*, Vol. 6, No. 13, pp. 1415–1421, 2010.
12. Jungkyu Kim, Michael Johnson, Parker Hill and Bruce K. Gale, "Microfluidic sample preparation: cell lysis and nucleic acid purification," *Integr. Biol.*, Vol. 1, No. 10, pp. 574 – 586, 2009.
13. Jungkyu Kim and Bruce K. Gale, "Rapid prototyping of microfluidic systems using a PDMS/polymer tape composite," *Lab. Chip*, Vol. 9, pp. 1290-1293, 2009.
14. Niel Crews, Carl Wittwer, Jesse Montgomery, Robert Pryor, Bruce K. Gale, "DNA Melting Analysis for Genotyping and Variant Scanning," *Anal. Chem.* Vol. 81, No. 6, pp. 2053-2058, 2009.
15. Ryan Sincic, David A. Chang-yen, Louis Barrows, Bruce K. Gale, "Parallel Determination of Phenotypic Cytotoxicity with a Micropattern of Mutant Cell Lines," *Biomed. Microdev.*, Vol. 11, No. 2, pp. 443-452, 2009. DOI: 10.1007/s10544-008-9250-z
16. Sriram Natarajan, David Chang-Yen, and Bruce Gale, "Large-area, high-aspect-ratio SU-8 molds for fabrication of PDMS microfluidic devices," *J. Micromech. Microeng.* Vol. 18, 045021, 2008.
17. Niel Crews, Carl Wittwer, and Bruce Gale, "Thermal Gradient PCR in a Continuous-Flow Microchip," *Biomed. Microdevices*, Vol. 10, No. 2, 2008.
18. Niel Crews, Timothy A. Ameel, Carl Wittwer, and Bruce Gale, "Flow-Induced Thermal Effects on Spatial DNA Melting," *Lab. Chip*, Vol. 8, pp. 1922-1929, 2008.

19. Sriram Natarajan, Phini S. Katsamba, Adam Miles, Josh Eckman, Giuseppe A. Papalia, Rebecca L. Rich, Bruce Gale, David G. Myszka, "Continuous-flow microfluidic printing of proteins for array-based applications including surface plasmon resonance imaging," *Anal. Biochem.* Vol. 373, pp. 141-146, 2008.

Additional recent publications of importance to the field (in chronological order)

20. Russell Reid, Shelley D Minter, Bruce K Gale, "Contact Lens Biofuel Cell Tested in a Synthetic Tear Solution," *Biosensors and Bioelectronics*, Vol. 68, pp. 142-148, 2015. DOI: 10.1016/j.bios.2014.12.034.
21. Raheel Samuel, Colin M Thacker, A. Villu Maricq and Bruce K. Gale, "Simple and cost-effective fabrication of microvalve arrays in PDMS using laser cut molds with application to *C. elegans* manipulation in microfluidics," *Journal of Micromechanics and Microengineering*, Vol. 24(10), pp. 105007 (8 pages), 2014. DOI: 10.1088/0960-1317/24/10/105007
22. S. Nikki Davidoff, Adam R. Miles, Bruce K. Gale, Josh W. Eckman, and Benjamin D. Brooks, "The Submerged Printing of Cells onto a Modified Surface Using a Continuous Flow Microspotter," *J. Vis. Exp.* (86), e51273, 2014. doi:10.3791/51273
23. Valentin Romanov, S. Nikki Davidoff, Adam R. Miles, David W. Grainger, Bruce K. Gale, and Benjamin D. Brooks, "A Critical Comparison of Protein Microarray Fabrication Technologies," *Analyst*, Vol. 139 (6), pp. 1303-1326, 2014. doi: 10.1039/c3an01577g.
24. Wei Chen, Chong Wang, Li Yan, Longbiao Huang, Xiaoyue Zhu, Bing Chen, Himanshu J Sant, Xinrui Niu, Val Roy, Bruce K Gale, Xianfeng Chen, "Improved polyvinylpyrrolidone microneedle arrays with non-stoichiometric cyclodextrin," *J. Mater. Chem. B*, Vol. 2, pp. 1699-1705, 2014.
25. Cody Gehrke, Huizhong Li, Himanshu Sant, Bruce Gale and Jay Agarwal, "Design, Fabrication and Testing of a Novel Vascular Coupling Device," *J. Biomed. Microdev.*, Vol. 16, pp. 173-180, 2014.
26. Li Yan, Anthony P Raphael, Xiaoyue Zhu, Beilei Wang, Wei Chen, Tao Tang, Yan Deng, Himanshu J Sant, Guangyu Zhu, Kwong Wai Choy, Bruce K Gale, Tarl W Prow, Xianfeng Chen, "Nanocomposite strengthened dissolving microneedles for improved transdermal delivery to human skin." *Advanced Healthcare Materials*, Vol.;3(4), pp. 555-564, April 2014.. DOI: 10.1002/adhm.201300312.
27. Sarah Molokhia, Himanshu J Sant; Jacquelyn M Simonis; Corey J Bishop; R. Michael Burr; Bruce K Gale; and Balamurali K Ambati, "The Capsule Drug Device: Novel Approach for Drug Delivery to the Eye," *Vision Research*, Vol. 50, No. 7, pp. 680-685, 2010.
28. Michael Johnson, Greg Liddiard, Mark Eddings, and Bruce Gale, "Bubble inclusion and removal using PDMS membrane-based gas permeation for applications in pumping, valving, and mixing in microfluidic devices," *J. Micromech. Microeng.*, Vol. 9, pp. 095011 (9 pp), 2009.
29. Jungkyu Kim, Michael Junkin, Deok-Ho Kim, Seunglee Kwon, Young Shik Shin, Pak Kin Wong, and Bruce K. Gale, "Applications, Techniques, and Microfluidic Interfacing for Nanoscale Biosensing," *Microfluidics and Nanofluidics*, Vol. 7, No. 2, pp. 149-167, 2009.
30. Ameya S. Kantak, Bruce K. Gale, Yuri Lvov, Steven A. Jones, "Shear Activation of Platelets in Microchannels," *Biomedical Microdevices*, Vol. 5, pp. 207-215, September, 2003.