Benjamin G. Hawkins, Ph.D.

Professional Information
One Grand Avenue
Biomedical Engineering Department
Cal Poly, San Luis Obispo
San Luis Obispo, CA 93407-0365
805-756-6203
bghawkin@calpoly.edu

Education

Cornell University, Ithaca, NY 2005 – 2010
Ph.D., Biomedical Engineering.
Minor Field: Mechanical Engineering
Minor Field: Microbiology

California State University, Fresno, Fresno CA, 2000 – 2005
B.S., Electrical Engineering
Minor: Mathematics
Minor: Physics
Summa Cum Laude, with University Honors

Honors, Awards, and Fellowships

- National Research Council, Research Associateship Program (2010-2012)
- Fellowship, National Science Foundation, Graduate Research Fellowship Program (2007-2010)
- Honorable Mention, National Science Foundation, Graduate Research Fellowship Program (2006 & 2005)
- Dean's Medal, California State University, Fresno (2005)
- Smittcamp Family Honors College & President's Scholarship (2000-2005)

Grants and Funding

San José State University, College of Engineering "Mini-Grant"
- *Digital microfluidic platform "DropBot" development for on-chip detection of docosahexaenoic acid (DHA)*
- September 2015 – September 2016
- $10,000.00 total

California State University Program for Education and Research in Biotechnology (CSUPERB), "President's Commission Scholarship Program"

- *Measuring Mycobacterial biofilm growth in a microfluidic device using electrical impedance monitoring*
- May 2015 – August 2015
- $8,000.00 total

San José State University, Center for Faculty Development, "Research, Scholarly, and Creative Activity Grant"

- Multiphysics Simulation and Optimization of a Microfluidic System for Size-Independent Dielectrophoretic Cell Sorting
- May 2015 – August 2016
- $10,000.00 total (joint with Dr. Alessandro Bellofiore)

San José State University, Center for Faculty Development, "Undergraduate Research Grant"

- Design of Biofeedback Orthotic for Corrective Treatment of Gait & Posture
- May 2014 – August 2015
- $4,000.00 total

California State University Program for Education and Research in Biotechnology (CSUPERB), "New Investigator Grant"

- *Microfluidic Devices for Multiplexed Growth and Analysis of Mycobacterium smegmatis Biofilms*
- May 2014 – November 2015
- $15,000.00 total

San José State University, Center for Faculty Development, "Research, Scholarly, and Creative Activity Grant"

- Microfluidic Device for Culture and Characterization of Clinically Relevant Bacterial Biofilms
- January 2013 – May 2013
- $5,000.00 total

Teaching Experience

4 years teaching, assessment, and course development at the undergraduate and graduate level.

Assistant Professor: 2012-present
San Jose State University in San Jose, CA

- BME 115: Foundations of Biomedical Engineering (3 units lecture, 1 unit lab; taught 4 times)
    - Developed all new course content for conservation of mass, energy, and charge applied to biological systems
    - Created novel laboratory exercises connected to course content

- BME 117: Biotransport Phenomena (3 units lecture; taught 4 times)
    - Developed all new course materials

    - Integrated MATLAB and COMSOL elements to illustrate transport phenomena
- BME 198A: Senior Design I and II (2 units lecture, each; taught 3 times)
    - Developed all new course materials based on the Biodesign approach
    - Integrated upper division general education components
- BME 210: Mathematical Methods in Biomedical Engineering
    - Developed all new course materials
    - Integrated MATLAB for numerical analysis
- BME 254: Microscale Biomedical Systems: Physics and Applications
    - Developed all new course materials
    - Integrated COMSOL lessons to illustrate multiphysics coupling at the micro-scale in biomedical devices

Teaching Assistant: 2005-2006
Cornell University in Ithaca, NY
Instructor: Prof. Lawrence Bonassar

- BME401/MAE4660: Biomedical Engineering Analysis of Metabolic and Structural Systems
    - Held weekly recitation sections
    - Taught 2-week laboratory module

Tau Beta Pi Tutoring Program, Tutor: 2003-2005
California State University, Fresno in Fresno, CA
Instructor: Prof. Walter V. Loscutoff

- Introductory Physics, Electrical Engineering, and Mechanical Engineering Courses
    - Held weekly tutoring sessions for all lower division courses across engineering disciplines

Research Experience
Faculty Research: 2012 – Present
Biomedical Microfluidics Laboratory
San José State University

- Digital microfluidic devices for point-of-care diagnostics
- Biomedical device projects:
    - Integrated insole orthotics for monitoring and correcting gait abnormalities
    - Smart pill container for reducing patient non-compliance
- Microfluidic devices for studying *Mycobacteria*, biofilms, and the dynamics of antibiotic biofilm treatment
- Study of electrothermal flows in microfluidic systems
- Dielectrophoresis systems for cell manipulation, characterization, and sorting

Postdoctoral Research: 2010 – 2012
Biochemical Science Division, Bioassay Methods Group

National Institute of Standards & Technology (NIST)

- Microfluidic devices for standardized bacterial biofilm culture
- Dielectrophoresis techniques for microfluidic droplet manipulation and fabrication of giant unilamellar vesicles

Graduate Research: 2005 – 2010.
Kirby Research Group, Micro/Nanofluidics Laboratory,
Biomedical Engineering Department,
Cornell University in Ithaca, NY
Research Advisor: Prof. Brian J. Kirby

- Insulative dielectrophoresis devices for high-throughput, continuous flow isolation of bacterial subpopulations with phenotypic differences in membrane composition
- Automated electrode-based dielectrophoretic trapping devices for particle and cell characterization
- Computational modeling electrothermal flow phenomena in insulative dielectrophoresis devices
- Computational determination of electrical permittivity for cell membrane lipid structures using liquid crystal models
- High dynamic range insulative dielectrophoresis devices for high-throughput, continuous-flow particle sorting
- Photopolymerization of porous polymer monoliths for electrokinetic pumping

Refereed Journal Articles

Yee, W., Selvaduray, G. S., Hawkins, B. G. (2015), "Characterization of Silver Nanoparticle-Infused Tissue Adhesive for Ophthalmic Use," *Journal of Mechanical Behavior of Biomedical Materials,* 55:67-74.

Huang, C., Santana, S. M., Liu, H., Bander, N. H., Hawkins, B. G., Kirby, B. J. (2013) "Characterization of a hybrid dielectrophoresis and immunocapture microfluidic system for cancer cell capture," *Electrophoresis,* 34:2970-2979.

Hawkins, B. G., Huang, C., Arasaniplai, S., Kirby, B. J. (2011) "Automated dielectrophoretic characterization of *Mycobacterium smegmatis*," *Analytical Chemistry*, 83(9):3507-3515.

Pratt, E.D., Huang, C., Hawkins, B.G., Gleghorn, J.P., Kirby, B.J. (2011) "Rare Cell Capture in Microfluidic Devices," *Chemical Engineering Science*, 66(7):1508-1522.

Hawkins, B.G. and Kirby, B. J. (2010) "Electrothermal flow effects in insulating (electrodeless) dielectrophoresis systems," *Electrophoresis*, 31(22):3622-3633

George, P.A., Hui, W., Rana, F., Hawkins, B.G., Smith, A.E., Kirby, B.J. (2008) "Microfluidic devices for terahertz spectroscopy of biomolecules," *Optics Express*, 16(3):1577.

Hawkins, B.G., Smith, A.E., Syed, Y.A., and Kirby, B.J. (2007). "Continuous-flow particle separation by 3D insulative dielectrophoresis using coherently shaped, dc-biased, ac electric fields." *Analytical Chemistry*, 79(9):7291-7300.

Books

Hawkins, B.G., Gleghorn, J.P., Kirby, B.J. (2009). Dielectrophoresis for particle and Cell manipulations. In Zahn, J. (Ed.), *Methods in Bioengineering: Biomicrofabrication and Biomicrofluidics* (pp. 133-183). Boston: Artech House.

Invited Presentations

Hawkins, B. G. (2015). 3-D Bioprinting: Developments and Applications. Bay Area Biomedical Devices Conference. San Jose, CA.

Hawkins, B. G. (2014). Electrokinetic cell manipulation in microfluidic systems. San José State University Chemistry Department Seminar Series. San Jose, CA.

Hawkins, B. G. (2014). Polymeric materials in microfluidic devices (Invited Presentation). Society of Plastics Engineers, Golden Gate Section. San Jose, CA.

Hawkins, B. G. (2013). Microfluidic devices for studying Mycobacterial biofilms. San José State University Biology Department Seminar Series. San Jose, CA.

Hawkins, B. G., Tandon, V., & Kirby, B. J. (2007). Electrokinetic tools for cellular screening in plastic microdevices: Interfacial characterization and engineering design (Invited Presentation). In *H. D. Long, G. Brisard, J. Davidson, et al. (Eds.), ECS Meeting Abstracts (p. 1455)*. Pennington, NJ: The Electrochemical Society.

Conference Podium Presentations

Hawkins, B.G., Kirby, B.J. (2010). Electrothermal flow effects in insulating (electrodeless) dielectrophoresis systems. In *2010 AIChE annual conference proceedings*. New York: American Institute of Chemical Engineers.

Hawkins, B.G., Gleghorn, J.P., Kondapalli, S., Kirby, B.J. (2008). Sorting, capture, and concentration of cells in microdevices: geometric design. In *Joint meeting of the International Society of Biorheology and the International Society for Clinical Hemorheology*. Washington, DC: IOS Press.

Hawkins, B.G., Smith, A.E., Kirby, B.J. (2007). High-throughput, continuous-flow, dielectrophoretic screening of *mycobacterium smegmatis* in coherently patterned, polymeric micro-channels. In *Proceedings of MicroTAS 2007, the eleventh international*

conference on miniaturized systems for chemistry and life sciences. San Diego, CA: The Chemical and Biological Microsystems Society.

Hawkins, B.G., Smith, A.E., Syed, Y.A., Kirby, B.J. (2006). Continuous flow dielectrophoretic particle sorting using insulative, polymeric structures. In *2006 AIChE annual conference proceedings*. New York: American Institute of Chemical Engineers.

Chatterjee, K., Matos, P., Hawkins, B. (2004) A novel stochastic algorithm for the extraction of frequency independent partial inductances in digital IC interconnect structures and a frequency-dependent generalization. In *20th Annual Review of the Applied Computational Electromagnetics Society*. Syracuse, NY.

Chatterjee, K., Matos, P., Hawkins, B., Jahanian, S. (2003) Stochastic extraction of partial inductances in digital IC interconnect structures: 2D verification. *VLSI Multilevel Interconnection Conference*. Marina Del Rey, CA.

Conference Poster Presentations

Nguyen, H., Hawkins, B. G. (2016 *Accepted*) Monitoring of microfluidic *M. smegmatis* biofilm growth using electrical impedance spectroscopy. Garden Grove, CA: California State University Program for Education and Research in Biotechnology (CSUPERB).

Nguyen, H., Hawkins, B. G. (2015) Electrical Measurement of Microfluidic *M.Smegmatis* Biofilm Growth Using Electrical Impedance Spectroscopy. In *Proceedings of the BMES annual meeting, 2015.* Tampa Bay, FL: Biomedical Engineering Society

Barrera-Barraza, R., Parajuli, R., Hawkins, B.G. (2015) Microfluidic device designed to simultaneously grow and expose several bacterial biofilms to varying concentrations of antibiotics. Santa Clara, CA: California State University Program for Education and Research in Biotechnology (CSUPERB).

Khuk, D., Sugiarto, S., Hawkins, B.G. (2015) Development and implementation of microfluidic device platform for the study of antibiotic treatment efficacy of *Microbacterium smegmatis* biofilms. Santa Clara, CA: California State University Program for Education and Research in Biotechnology (CSUPERB).

Castañeda, D., Hawkins, B.G. (2014) Multiphysics Simulation of the Krogh Tissue Cylinder System for Undergraduate Education. In *Proceedings of the BMES annual meeting, 2014.* San Antonio, TX: Biomedical Engineering Society.

Barrera-Barraza, R., Hawkins, B.G. (2014) Design of chemical gradient generator for *Mycobacterium smegmatis* biofilm studies within a PDMS microfluidic device. Santa Clara, CA: California State University Program for Education and Research in Biotechnology (CSUPERB).

Yee, W., Selvaduray, S., Hawkins, B.G. (2013) Characterization of Silver Nanoparticle Infused High Strength Tissue Adhesive for Ophthalmic Use. In *Proceedings of the BMES annual meeting, 2013.* Seattle, WA: Biomedical Engineering Society.

Yee, W., Selvaduray, S., Hawkins, B.G. (2013) Characterization of Silver Nanoparticle Infused High Strength Tissue Adhesive for Ophthalmic Use. Santa Clara, CA: California State University Program for Education and Research in Biotechnology (CSUPERB).

Huang, C., Hawkins, B.G., Arisanipalai, S., Kirby, B.J. (2010) Automated dielectrophoretic characterization for microfluidic cell separation devices. In *Proceedings of the BMES annual meeting, 2010*. Landover, MD: Biomedical Engineering Society.

Hawkins, B.G., Kirby, B.J. (2010) Electrothermal effects in insulating (electrodeless) dielectrophoresis systems. In *Proceedings of MicroTAS 2010, the fourteenth international conference on miniaturized systems for chemistry and life sciences*. San Diego, CA: The Chemical and Biological Microsystems Society.

Huang, C., Hawkins, B.G., Arisanipalai, S., Kirby, B.J. (2010) Automated dielectrophoretic characterization for microfluidic cell separation devices. In *Proceedings of MicroTAS 2010, the fourteenth international conference on miniaturized systems for chemistry and life sciences.* San Diego, CA: The Chemical and Biological Microsystems Society.

Hawkins, B.G., Huang, C., Stranic, I.S., Kondapalli, S., Kirby, B.J. (2009) Particle screening in polymeric microfluidic devices using insulating dielectrophoresis and frequency modulated electric fields. In *Proceedings of MicroTAS 2009, the thirteenth international conference on miniaturized systems for chemistry and life sciences*. San Diego, CA: The Chemical and Biological Microsystems Society.

Hawkins, B.G., Kirby, B.J. (2008) High-dynamic range dielectrophoresis devices for cell screening. In *Proceedings of the BMES annual meeting, 2008.* Landover, MD: Biomedical Engineering Society.

Hawkins, B.G., Kirby, B.J. (2008). High-dynamic range particle separation via insulating dielectrophoresis. In *Proceedings of MicroTAS 2008, the twelfth international conference on miniaturized systems for chemistry and life sciences.* San Diego, CA: The Chemical and Biological Microsystems Society.

Hawkins, B.G., Smith, A.E., Kirby, B.J. (2007). High-throughput, continuous-flow, dielectrophoretic screening of mycobacterium smegmatis in coherently patterned, polymeric micro-channels. In *2007 AIChE annual meeting and fall showcase conference proceedings.* New York: American Institute of Chemical Engineers.

Hawkins, B.G., Smith, A.E., Kirby, B.J. (2007). High-throughput screening for membrane-lipid mutations in mycobacterium using dielectrophoresis. In *Proceedings of the BMES annual meeting, 2007*. Landover, MD: Biomedical Engineering Society.

Smith, A.E., Hawkins, B.G., Baldasaro, N.G., Syed, Y.A., Simmons, B.A., Cummings, E.B., Kirby, B.J. (2006). Dielectrophoretic particle manipulation in ridged microchannels. In *Microelectromechanical Systems (pp. 617-618)*. New York: American Society of Mechanical Engineers.

Professional Affiliations

- AES Electrophoresis Society (AES)
- American Institute of Chemical Engineers (AIChE)
- Biomedical Engineering Society (BMES)
- Tau Beta Pi, Engineering Honors Society
- Eta Kappa Nu, Electrical Engineering Honors Society

Service

Journal Peer Review

- *Analytical Methods*
- *Electrophoresis*
- *Lab on a Chip*
- *Sensors and Actuators B: Chemical*
- *International Journal of Heat and Mass Transfer*
- *Biomechanics*

- Councilor, AES Electrophoresis Society, 2014-Present
- Faculty Consensus Group, CSUPERB, 2012-Present
- President, Cornell Chapter of the Biomedical Engineering Society, 2007-2008
- Vice-President, Cornell Chapter of the Biomedical Engineering Society, 2006-2007
- Chairperson, IEEE Student Branch, California State University, Fresno, 2004-2005
- President, Tau Beta Pi, California Rho Chapter, CSU, Fresno, 2005
- President, Eta Kappa Nu, Theta Kappa Chapter, CSU, Fresno, 2003/2005
- Representative, Engineering Student Joint Council, CSU, Fresno 2005