

Justin A. Bishop, Ph.D., CFEI
Senior Associate

Professional Profile

Dr. Justin Bishop is a Senior Associate in Exponent's Electrical Engineering and Computer Science practice. Dr. Bishop applies his knowledge of electrical/electronic system failure modes to the analysis and investigation of residential, commercial, and industrial fires and alleged product failures. Additionally, he applies his knowledge of simulation and measurement techniques associated with electric and magnetic fields, charged ion densities, and charged aerosols to characterize the environment around High Voltage DC transmission lines.

Dr. Bishop routinely conducts investigations involving electrical/electronic systems that are alleged to have caused fires in residential, commercial, and industrial facilities. He is actively involved in product recall/litigation investigations associated with electrical/electronic systems that are alleged to be associated with safety concerns such as potential fire and/or shock hazards. He has experience advising clients on issues pertaining to the National Electrical Code (National Fire Protection Association, NFPA, 70), including residential and industrial applications. Dr. Bishop has also performed research associated with the NEC for the Fire Protection Research Foundation, which is the research arm of the NFPA. Additionally, Dr. Bishop has experience in residential construction including framing and electrical wiring.

Dr. Bishop has substantial knowledge of optical systems, Micro-Mechanical-Electrical Systems (MEMS), Bio-MEMS, biological microarrays, and nano-applications. He has over 5 years of experience developing and testing sensor architectures utilizing electrical and/or optical readout for detection of parameters such as nucleic acid and protein presence, strain, and pressure.

At his previous employer, Dr. Bishop was in charge of multiple projects including designing an external respiration sensor to determine tidal volumes, and developing a method to maintain warmth and finger dexterity without the use of gloves. Additional projects included representing the human eye using optical components to characterize non-lethal weapons, developing protein biosensors, and developing a laser scalpel with tissue feedback control. Dr. Bishop's graduate research focused on real-time evanescent DNA biosensors and microarrays. He was responsible for developing the optical setup, activating and preparing the sensor surfaces, and writing the code to analyze the results of an experiment. In addition, he created a finite element model coupling mass transport and chemical reactions that accurately predicted the results of his experiments.

Dr. Bishop has experience writing and debugging Matlab, COMSOL, Fortran, LabView, and assembly language.

Academic Credentials and Professional Honors

Ph.D., Electrical Engineering, University of Utah, 2007
M.E., Electrical Engineering, University of Utah, 2005
B.S., Computational Physics, Illinois State University, 2002

NSF-Integrative Graduate Education and Research Traineeship Fellowship, 2003–2006

Licenses and Certifications

Certified Fire and Explosion Investigator (CFEI)
Engineer-in-Training (EIT), State of Illinois

Hazardous Waste Operations and Emergency Response (HAZWOPER) training in accordance with OSHA 29 CFR 1910.120

Patents

Patent Application: Methods and Compositions Related to Nucleic Acid Detection. File date 03/05/2008 (Blair SM, Chagovetz A, Bishop J).

Publications

Bailey WH, Johnson GB, Bishop J, Hetrick T, Su S. Measurements of charged aerosols near ± 500 -kV DC transmission lines and in other environments. *IEEE Transactions on Power Delivery* 2012; 27:371–379.

Bishop J, Chagovetz A, Blair S. Kinetics of multiplex hybridization: Mechanisms and implications. *Biophysical Journal* 2008; 94:1726–1734.

Bishop J, Chagovetz AM, Blair S. Competitive displacement: A sensitive and selective method for detection of unlabeled molecules. *Optics Express* 2007; 15:4390–4397.

Bishop J, Blair S, Chagovetz AM. Convective flow effects on DNA biosensors. *Biosensors and Bioelectronics* 2007; 22:2192–2198.

Bishop J, Wilson C, Chagovetz AM, Blair S. Competitive displacement of DNA during surface hybridization. *Biophysical Journal* 2007; 92:L10–L12.

Bishop J, Chagovetz A, Blair S. Effects of fill fraction on the capture efficiency of nanoscale molecular transducers. *Nanotechnology* 2006; 17:2442–2448.

Bishop J, Blair S, Chagovetz AM. A competitive model of nucleic acid surface hybridization in the presence of point mutants. *Biophysical Journal* 2006; 90:831–840.

Liu Y, Bishop J, Williams L, Blair S, Herron J. Biosensing based upon molecular confinement in metallic nanocavity arrays. *Nanotechnology* 2004; 15:1368–1374.

Conference Papers

Martens J, Fecke M, Bishop J, Ogle RA. Functional testing for industrial control systems. Proceedings, ASME 2011 International Mechanical Engineering Congress & Exposition, IMECE2011-63241, 2011.

Bishop J, Wilson C, Chagovetz AM, Blair S. Real-time optical detection of competitive hybridization on microarrays. Proceedings, SPIE Advanced Biomedical and Clinical Diagnostic Systems Vol. 6430, pp. 643002, 2007.

Bishop J, Blair S, Chagovetz AM. Theoretical limitations on sensing selectivity in nucleic acid microarrays. Proceedings, SPIE Advanced Biomedical and Clinical Diagnostic Systems IV 6080, pp. 182–187, 2006.

Blair S, Bishop J, Chagovetz AM. Mass transport effects on real-time nucleic acid microarrays. Proceedings, SPIE Phontonic Applications in Biosensing and Imaging, Vol. 5969, pp. 225–233, 2005.

Bishop J, Blair S, Adey N. Hybridization enhancement studied using real-time detection. JCIS 2005, 3rd Symposium on Photonics, Networking, and Computing, pp. 1389–1391, 2005.

Williams L, Bishop J, Blair S, Peters D, Okandan M. Toward a disposable real-time DNA biosensing platform. Proceedings, SPIE Microfluidics, BioMEMS, and Medical Microsystems II, Vol. 5345, pp. 61–67, 2004.

Book Chapters

Blair S, Williams L, Bishop J, Chagovetz A. Microarray temperature optimization using hybridization kinetics. In: *DNA Microarrays for Biomedical Research: Methods and Protocols* (Methods in Molecular Biology 529). Dufva M (ed), Humana Press, 2009.

Presentations

Bishop J, Daren S. Electrical failure modes, evidence, and litigation. The 7th Annual Midwest Product Safety & Liability Conference, Chicago, IL, 2011.

Chagovetz A, Williams L, Bishop J, Blair S. Achieving reliable microarray analysis results using competitive hybridization. AVS 53rd International Symposium and Exhibition, San Francisco, CA, 2006.

Bishop J, Wilson C, Chagovetz AM, Blair S. Microarray analysis using competitive hybridization. *Advances in Microarray Technology*, Amsterdam, The Netherlands, 2006.

Bishop J, Chagovetz AM, Blair S. Effects of fill fraction on the capture efficiency of nanoscale molecular transducers. 9th World Congress on Biosensor, Toronto, Canada, 2006.

Bishop J, Blair S, Chagovetz AM. A competitive kinetic model of nucleic acid surface hybridization. 9th World Congress on Biosensor, Toronto, Canada, 2006.

Bishop J, Blair S, Chagovetz AM. Modeling multi-analyte DNA competitive hybridization on biosensor surfaces. Biophysical Society Annual Meeting, Salt Lake City, UT, 2006.

Hecht KJ, Bishop J, Goeckeritz JJ. A comparison of passive mixing microchannels. 2005 AIChE Spring National Meeting, 8th International Conference on Microreaction Technology, Atlanta, GA, 2005.