

Exponent®
Engineering & Scientific Consulting

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Professional Profile

Dr. Barry specializes in the engineering analysis of thermal and fluid flow systems. He has broad expertise in experimental analysis of flow systems, including bio-fluids, fluid-structure interactions, and microscale flows.

Dr. Barry applies his expertise to the investigation of fires, equipment failures, and accidents. Dr. Barry has conducted origin and cause investigations involving storage facilities, commercial facilities, residences, and vehicles (automobiles, utility vehicles, lawnmowers).

Dr. Barry conducts investigations into failures of HVAC systems and related equipment in both residential and commercial settings. HVAC-related project work includes overall system design review, kitchen exhaust systems, hydronic systems, packaged and vertical terminal air conditioning units (PTAC/VTAC), chilled beam systems, Variable Refrigerant Flow (VRF) systems, duct construction and hangers, piping to HVAC equipment, water losses (due to frozen pipes or component failure), and coordination between design teams and contractors.

Dr. Barry employs analytical and experimental techniques to assess the risk of burn injury in consumer products such as electronics and household appliances as well as in industrial processes. Dr. Barry is a member of ASTM committees E37 (Thermal Measurements) and C16 (Thermal Insulation), which includes ASTM C1055 Standard Guide for Heated System Surface Conditions that Produce Contact Burn Injuries.

Dr. Barry performs assessments and testing related to the safety of batteries, particularly related to catastrophic failures such as thermal runaway of lithium-ion cells and batteries. He assists clients with issues relating to product and site compliance for grid-scale energy storage systems. He has worked with clients during facility siting proceedings and during discussions with AHJs with respect to product safety during failure events. He has assisted clients in the generation of Hazard Mitigation Analyses (HMAs) in accordance with guidance from NFPA 855 and has assisted in the evaluation of data produced by large-scale fire testing of grid-scale lithium-ion batteries. Dr. Barry has performed testing relevant to the potential hazards developed due to thermal runaway of lithium-ion cells including the measurement of gas quantity and gas species evolved during various abuse conditions, quantifying the explosibility of battery vent gases, as well as involving those measurements in toxicological assessments of the releases during battery failure. Dr. Barry has experience in experimentally measuring the thermal properties of battery cells in order to generate thermal models to assess heat propagation that can affect performance, safety and reliability of battery pack assemblies. Dr. Barry is a member of the standard technical panel for UL 9540 Standard for Energy Storage Systems and Equipment.

Dr. Barry applies his engineering expertise to intellectual property disputes. He has worked on multiple aspects of intellectual property including validity/invalidity, infringement/non-infringement, Markman

hearings, trade secrets, and copyright. His intellectual property work is varied and has involved issues such as fluid flow in toys, the fire safety properties of building materials, and medical devices.

Prior to joining Exponent, Dr. Barry used engineering tools to research biological questions, such as the swimming of micro-organisms and the mechanics of human phonation. He has experience with a range of experimental techniques including particle image velocimetry, digital holography, particle segmentation and tracking, and the design and fabrication of microfluidic devices. Prior to his work at MIT, Dr. Barry worked as an eighth-grade mathematics teacher in Brooklyn, New York as a member of the New York City Teaching Fellows. Prior to that, he designed HVAC systems for large commercial buildings at Jaros, Baum, and Bolles in New York City.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, Massachusetts Institute of Technology (MIT), 2014

M.S., Teaching, Pace University, 2008

M.S., Mechanical Engineering, Rutgers University, 2005

B.A., English, Rutgers University, 2004

B.S., Mechanical Engineering, Rutgers University, 2004

National Science Foundation Graduate Research Fellowship, 2009-2012

Licenses and Certifications

Professional Engineer, Alabama, #PE40070

Professional Engineer Mechanical, Arizona, #81668

Professional Engineer, Arkansas, #22036

Professional Engineer, Colorado, #PE.0063960

Professional Engineer, Connecticut, #PEN.0032929

Professional Engineer Mechanical, Massachusetts, #55974

Professional Engineer, Michigan, #6201314316

Professional Engineer, New Jersey, #24GE05661400

Professional Engineer, New York, #106663

Professional Engineer, North Carolina, #059088

Professional Engineer, Ohio, #PE.92317

Professional Engineer, South Dakota, #17291

Professional Engineer, Texas, #153574

40-Hour Hazardous Waste Operation and Emergency Response Certification (HAZWOPER)

Blasting Certificate of Competency (MA)

Certified Fire and Explosion Investigator (CFEI)

Certified Vehicle Fire Investigator (CVFI)

Professional Affiliations

American Society of Mechanical Engineers (ASME)

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

National Association of Fire Investigators (NAFI)

National Fire Protection Association (NFPA)

ASTM International

Society of Fire Protection Engineers (SPFE)

Publications

Barry MT. Shear-induced orientational dynamics and spatial heterogeneity in suspensions of motile phytoplankton. Journal of the Royal Society Interface 2015; 12(112).

Barry M. Mechanisms of reorientation in phytoplankton: fluid shear, surface interactions, and gravitaxis. Ph.D. Thesis, Massachusetts Institute of Technology, 2014.

Molaei M, Barry M, Stocker R, Sheng J. Failed Escape: Solid Surfaces Prevent Tumbling of Escherichia coli. Physical Review Letters 2014; 113:068103.

De Lillo F, Cencini M, Durham WM, Barry M, Stocker R, Climent E, Boffetta G. Turbulent fluid acceleration generates clusters of gyrotactic microorganisms. Physical Review Letters 2014; 112(4):044502.

Durham WM, Climent E, Barry M, De Lillo F, Boffetta G, Cencini M, Stocker R. Turbulence drives microscale patches of motile phytoplankton. Nature Communications 2013; 4.

Krane MH, Barry M, Wei T. Dynamics of temporal variations in phonatory flow. The Journal of the Acoustical Society of America 2010; 128:372-383.

Krane MH, Barry M, Wei T. Unsteady behavior of flow in a scaled-up vocal folds model. The Journal of the Acoustical Society of America 2007; 122:3659-3670.

Conference Proceedings and Presentations

Spray R, Barry M. Lithium-Ion Batteries in Fire Investigations. Metro Fire/Arson Investigators Association Monthly Meeting (September 5, 2023).

Leroy A, Ibarretta A, Hashad K, Barry M. Explosion Hazard Considerations for HVAC equipment serving Lithium-Ion Battery Energy Storage Systems. 2023 ASHRAE Annual Conference, June 24-28 Tampa, FL, USA.

Colella F, Mendoza S, Barry M, Kossolapov. A, Spray, R, Myers, T, Energy Release Quantification for Li-Ion Battery Failures, In Compliance Magazine, Feature Article, November 2022.

Davies W, M Wolf, M Barry, S O'Hern, T Morse. The Effect of Valve Closure Time on Water Hammer. Proceedings of the ASME 2021 International Mechanical Engineering Congress and Exposition (IMECE2021), November 1-5, 2021.

Colella, F., Barry, M., Vickery, J., "Contact Burn Injuries – Experimental Assessment of Short Duration Contact Exposure", IEEE International Symposium on Product Compliance Engineering, ISPCE 2021

Barry, M., Oelker, A., Parker, S., The Role of Technical Experts in Intellectual Property Litigation, American Chemical Society Fall Meeting, August 23, 2021.

Barry M., Colella, F., Gilman, L., Kytomaa, H., Acton, M. "Wear it Well", Launch Issue of Consumer Electronics Test & Development

Barry M, Vickery J, Spray R, Myers T. Understanding how testing conditions affect hazard quantification in lithium-ion battery abuse tests. Energy Storage Association Virtual Annual Meeting (August 2020)

O'Hern SC, Barry M, Sipe J. Ventilation and Hazard Considerations of Lithium-Ion Battery Processes: Current Status and Future Needs. ASHRAE 2020 Virtual Conference, 2020.

Morse T and Barry M. Combining Wind Power with Compressed Air Energy Storage. American Wind Energy Association Spring Virtual Learning Series (June 2020).

Barry M. Hazards Due to Thermal Runaway. PlugVolt Battery Seminar, July 16-18, 2019, Plymouth, MI.

Barry M, Vickery J, Spray R. Variation in thermal runaway characteristics in lithium-ion cells from different manufacturers. IEEE Symposium on Product Compliance Engineering. Boston, MA, November 12-13, 2018.

Kytomaa, H., Barry, M., Colella, F., Narajan, S., Lee, K., Morse, T., Investigating Burn Injuries, AEGIS 2018 Claims Seminar, October 2018.

Kytomaa, H., Barry, M., Colella, F., Narajan, S., Lee, K., Morse, T., Investigating Burn Injuries, DRI - Fire Science and Litigation: Burning down the House, September 2018.

Morse T, Colella F, Wolf M, Barry M. Space heater fires and fire investigation. International Symposium on Fire Investigation. Itasca, IL, September 24-26, 2018.

Spray R, Barry M. Understanding downstream risk from lithium-ion battery thermal runaway and designing for safety. Battcon Conference Proceedings. Nashville, TN, April 22-25, 2018.

Spray R, Barry M, Brown C, Marr K. Understanding downstream risks from battery thermal runaway and designing for safety. IEEE Symposium on Product Compliance Engineering. Boston, MA, November 6-7, 2017.

Barry M, Durham WM, Chengala A, Sheng J, Stocker R. Characterization of gyrotactic swimmers using digital holographic microscopy. 65th Annual Meeting of the APS Division of Fluid Dynamics, San Diego, CA, November 18-20, 2012.

Barry M, Durham WM, Climent E, Stocker R. Shaken, but not stirred: how vortical flow drives small-scale aggregations of gyrotactic phytoplankton. 64th Annual Meeting of the APS Division of Fluid Dynamics, Baltimore, MD, November 20-22, 2011.

Barry M, Krane M, Wei T. Design of apparatus for studying aerodynamics of voice production. American

Society of Mechanical Engineers International Mechanical Engineering Congress and Exposition, Anaheim, CA, November 2004.

Barry M, Krane M, Wei T. Flow in a scaled-up vocal folds model. International Conference on Vocal Fold Biomechanics and Physiology, Marseilles, France, August 2004.

Barry M, Krane M, Wei T. Measurements of scaled-up glottal flow: experiment design. 56th Annual Meeting of the APS Division of Fluid Dynamics. East Rutherford, NJ, November 23-25, 2003.

Webinars

Barry, M, Colella, F, Gilman, L, Morse, T. Carbon Monoxide — How Avoid a Deadly Situation, Exponent's Webinar Series, February 2022.

Barry, M., Hayes, T., Spray, R., Wright, S., Culprits or Collateral Damage? Lithium-Ion Batteries in Fire Investigations, Exponent Webinar Series, September 2021.

Barry, M., Colella, F., Gilman, L., Morse, T., Carbon Monoxide – How the Misuse of Common Equipment Can Be Deadly, Exponent’s Webinar Series, September 2020.

Kytomaa, H., Barry, M., Colella, F., Narajan, S., Morse, T., Understanding and investigating Burn Injuries, Exponent’s Webinar Series, August 2020.

Barry M, Horn Q, Harding J. Lithium-ion batteries: what fire protection engineers should know, part 2: abuse testing, quantifying hazards, and investigations for lithium-ion batteries. SFPE Premium Webinar Series (July-August 2020). Speaker and panelist.

Kytomaa, H., Barry, M., Colella, F., Narajan, S., Lee, K., Morse, T., Caution Hot, Understanding and investigating Burn Injuries, September 2017.