

Kyle T. Rich

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in kyletrich

Education

- 2016 **Ph.D. candidate, *Biomedical Engineering*.**
University of Cincinnati, Cincinnati, OH (anticipated defense date: 02/2017)
- 2008 **Bachelor of Science (B.Sc.), *Physics*, minor: Mathematics.**
Northern Kentucky University, Highland Heights, KY

Skills

Technical: Hypothesis testing & statistical analysis, experimental design, signal & image processing, instrument control, Monte Carlo methods, data visualization, and computational, mathematical and statistical modeling

Analysis software: MATLAB, Python (NumPy, SciPy, Matplotlib, Pandas*), R (ggplot2*), Mathematica, Git, L^AT_EX, Microsoft Office (* indicates basic experience)

Work Experience

- Aug 2008 – **Research Assistant, *Biomedical Acoustics Laboratory*, University of Cincinnati.**
- Aug 2011, Aug 2013 – present
- Developed probabilistic model to account for random diffraction effects in microbubble emission measurements, enabling estimates of tissue exposure to acoustic radiation from microbubbles.
 - Leveraged random processes simulations (MATLAB) to validate model and assess accuracy of radiated acoustic power estimates to within ± 1 decibel (dB) accuracy
 - Developed measurement and signal processing techniques for calibrating acoustic receivers for absolute pressure measurements. Numerically simulated (Python and MATLAB) scattered, transmitted, and radiated acoustic field measurements to define parameters for accurate calibration with less than 10% error
 - Fabricated and programmed (MATLAB) novel devices for autonomous acoustic field raster scan, monitoring microbubble-generated acoustic emissions, and measuring electrical resistance of tissue
 - Identified mechanisms of ultrasound-enhanced transdermal drug delivery (sonophoresis). Developed algorithms for spectral (MATLAB) and statistical (R) analysis of >300 GB of data, leading to discovery of empirical relationship between cavitation-radiated acoustic power and skin permeabilization
 - Disseminated results through 4 publications in peer-reviewed journals, presented data-driven results at national science meetings, and to technical and non-technical audiences
- Aug 2013 – **Assistant to Editor-in-Chief, *Ultrasound in Medicine and Biology (UMB)* journal.**
- Jul 2014
- Performed primary review of appx. 40 manuscripts submitted for publication per month
- Sep 2011 – **Research Fellow, *National Science Foundation IGERT Biomembrane Research Traineeship*,**
- Jul 2013
- 40 hrs/wk, \$30,000/yr.
 - Devised a research plan that was awarded funding over a 2 year period
 - Led interdisciplinary collaborative that resulted in the development of an *in vitro* skin model used for remote monitoring of skin permeability during sonophoresis
- Jan 2008 – **Research Assistant, *Solid State Physics Lab*, Northern Kentucky University,**
- May 2008
- 20 hrs/wk, \$0/yr.
 - Investigated bulk-produced CoFe(x)O(y) (cobalt ferrite) for potential pressure sensors applications. Manufactured and characterized composites using WAXS and impedance spectroscopy

Publications

Peer-reviewed manuscripts

- [P1] **K. T. Rich** and T. D. Mast, "A method for quantitative characterization of the acoustic power radiated by cavitation bubbles using a single-element passive cavitation detector measurements." (in preparation, anticipated submission: 2/2017)
- [P2] K. J. Haworth, K. B. Bader, **K. T. Rich**, C. K. Holland, T. D. Mast, "Quantitative Frequency-Domain Passive Cavitation Imaging," *IEEE Trans. Ultrason., Ferroelect., Freq. Control.* (online 10/2016)
- [P3] **K. T. Rich** and T. D. Mast, "Methods to calibrate the absolute receive sensitivity of single-element, focused transducers," *J. Acoust. Soc. Am.*, vol. 138, no. 3, pp. EL193–EL198, 2015.
- [P4] **K. T. Rich** and T. D. Mast, "Accuracy of a bistatic scattering substitution technique for calibration of focused receivers," *J. Acoust. Soc. Am.*, vol. 138, no. 5, pp. EL469–EL473, 2015.
- [P5] **K. T. Rich**, C. L. Hoerig, M. B. Rao, and T. D. Mast, "Relations between acoustic cavitation and skin resistance during intermediate- and high-frequency sonophoresis," *J. Control. Release*, vol. 194, pp. 266–277, 2014.

Conference abstracts, proceedings, and presentations

- [C1] **K. T. Rich**, T. D. Mast, "A method to calibrate the absolute receive sensitivity of spherically focused, single-element transducers," *J. Acoust. Soc. Am.* 136, 2302 (2014).
- [C2] **K. T. Rich**, C. L. Hoerig, and T. D. Mast, "Cavitation mechanisms in ultrasound-enhanced permeability of *ex vivo* porcine skin," *Proc. Mtgs. Acoust.*, vol. 18, no. 1, (2014).
- [C3] **K. T. Rich**, S. Nye, M. Ericson, R. Hoerr, T. D. Mast. "Visualization of Ultrasound-Enhanced Delivery of Polystyrene Nanoparticles into Ex Vivo Human Skin via the Follicular Route," Regional Symposium on Applications of Biomembranes in Sci. and Tech. (2011)

Teaching Experience

- 2008–10 **Teaching Assistant**, *University of Cincinnati*.
 - Modeling and Analysis of Systems (BME 306)
 - Biomedical Instrumentation (BME 310)
- 2008 **Teaching Assistant**, *Northern Kentucky University*.
 - Introduction to Physics (PHY 220)

Professional Affiliations and Positions

- 2013–15 University of Cincinnati Student Chapter of the Acoustical Society of America (Representative to National Committee, Chapter President)
- 2010–16 Sigma Xi (Associate Member)
- 2009–16 Acoustical Society of America (Student Member)
- 2007–08 Northern Kentucky University Physics Students Club (Vice President)

Honors & Awards

- 2013 University of Cincinnati, Editorial Assistantship: Ultrasound in Medicine and Biology
- 2011,12 National Science Foundation, IGERT Traineeship, Biomembrane Research
- 2010 American Institute of Physics, Physical Acoustics Summer School Scholarship
- 2008 University of Cincinnati, Graduate Student Scholarship
- 2008 Northern Kentucky University, Undergraduate Mentoring Scholarship