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Kyle T. Rich

Education

2016 **Ph.D. candidate**, ***Biomedical Engineering***, University of Cincinnati.
Cincinnati, OH

2008 **Bachelor of Science (B.Sc.)**, ***Physics***, Northern Kentucky University.
Highland Heights, KY

Research Experience

2009 – 2016 **Biomedical Acoustics Laboratory**, *Graduate Research Assistant*, University of Cincinnati.

- Discovered primary mechanisms of ultrasound-enhanced skin permeability (sonophoresis)
- Developed theory, measurement and analysis techniques for standardized quantitative characterization of microbubble cavitation activity
- Developed signal processing algorithms (MATLAB and Python) for spectral analysis of measured acoustic emissions from microbubble cavitation
- Developed system and instrument control algorithms (MATLAB) for autonomous data acquisition
- Experience conducting data and statistical analyses (MATLAB and R)
- Experience with numerical, math. and stat. modeling and simulations (MATLAB and Mathematica)
- Experience presenting data-driven result to technical and non-technical audiences, and publishing results

2007 – 2008 **Solid State Physics Lab**, *Undergraduate Research Assistant*, Northern Kentucky Universtiy.

- Investigated the crystalline structure and electrical properties of bulk-produced CoFe(x)O(y) (cobalt ferrite) composites for potential pressure sensors applications

Technical Skills

Software/ Program.: MATLAB, Mathematica, LaTeX, Unix/Linux environment, Python (SciPy, Matplotlib, NumPy)*, R*, SAS* (* some experience)

Comput.: Quantitative acoustic characterization, numerical simulations, Monte Carlo methods, instrument control, signal analysis, data processing and visulization

Stats.: regression, uncertainty propagation, correlation, distribution (KS test), parametric (Kruskal-Wallis) and non-parametric analyses of variance (ANOVA) and covariance (ANCOVA)

Publications

Peer-reviewed manuscripts (published)

[P1] **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.

[P2] **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.

[P3] **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.

Manuscripts under review and in preperation

[U1] K. J. Haworth, K. B. Bader, **K. T. Rich**, C. K. Holland, T. D. Mast, "Frequency-domain passive imaging of ultrasonics emissions," *IEEE Trans. Ultrason., Ferroelect., Freq. Control.* (submitted 3/2016)

[U2] **K. T. Rich** and T. D. Mast, "Quantitative measurements and analysis of acoustic emissions from cavitation." (to be submitted 11/2016)

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 (presentation and published abstract) (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**, C. L. Hoerig, T. D. Mast. "Cavitation mechanisms in ultrasound-enhanced permeability of ex vivo porcine skin," Proceedings of Meetings on Acoustics 18:075002 (presentation, poster, published abstract and proceeding) (2012).

[C4] **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 Bio-membranes in Science and Technology, (poster) (2011)

[C5] **K. T. Rich**, M Burgess, S Nye, M Lee, B Posey, M Ericson, R Hoerr, T. D. Mast. "Ultrasound-mediated dermal and transdermal delivery of nanoformulated drugs." NSF Minimally Invasive Medical Technologies Center (MIMTeC) biannual meeting, (presentation and poster) (2009)

Academic Honors & Awards

2013 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

Teaching and Leadership Experience

2008–10 **Teaching Assistant**, *University of Cincinnati.*

- Modeling and Analysis of Systems (BME 306)
- Biomedical Instrumentation (BME 310)

2008 **Undergraduate Mentor and Teaching Assistant**, *Northern Kentucky University.*

- Introduction to Physics (PHY 110)

Professional Affiliations and Positions Held

2011–16 University of Cincinnati Student Chapter of the Acoustical Society of America; Member

2013–14 University of Cincinnati Student Chapter of the Acoustical Society of America; Representative to National Committee

2010-16 Sigma Xi, Associate Member

2009–16 Acoustical Society of America, Student Member

2007–08 Northern Kentucky University Physics Students Club, Vice President