

# Kyle T. Rich

## Education

- 2016 **University of Cincinnati**, *PhD candidate*, Biomedical Engineering.  
Cincinnati, OH
- 2008 **Northern Kentucky University**, *BS*, Physics.  
Highland Heights, KY

## Research Experience

- 2009 – 2016 **Biomedical Acoustics Laboratory**, *University of Cincinnati*, Cincinnati, OH.
- Identified mechanisms of ultrasound-enhanced skin permeability (sonophoresis)
    - Investigated ultrasound-enhanced transdermal delivery of nanoscaled drugs
    - Developed an *in vitro* sonophoresis system for autonomous (MATLAB) treatment and data acquisition
    - Conducted spectral analysis of acoustically-measured cavitation bubble emissions (MATLAB)
    - Conducted data/statistical analyses on measured quantities (MATLAB/R)
  - Developed quantitative and system-independent acoustic measurement and analysis techniques for monitoring acoustic cavitation activity
    - Measured, simulated, and reconstructed transmitted, received, and scattered acoustic fields
    - Developed standard techniques for quantitative acoustic measurements
    - Developed theory for quantifying cavitation activity from quantitative acoustic measurements
    - Conducted validation simulations (Monte Carlo) and measurements
- 2007 – 2008 **Solid State Physics Lab**, *Northern Kentucky University*, Highland Heights, KY.
- Investigated the crystalline structure and electrical properties of bulk-produced  $\text{CoFe}(\text{x})\text{O}(\text{y})$  (cobalt ferrite) composites for potential pressure sensors applications

## Technical Skills

- Software/ Program.:  $\text{\LaTeX}$ , Mathematica, MATLAB, Python (SciPy, Matplotlib, NumPy, Pandas)\*, R\*, SAS\*,  
Unix/Linux environment (\* some experience)
- Comput.: Acoustic simulation and characterization, numerical simulations, Monte Carlo methods, instrument control, signal analysis, data wrangling, processing and visualization
- Stats.: regression, uncertainty propagation, correlation, distribution (KS test), parametric (Kruskal-Wallis) and non-parametric (ANOVA) analyses of variance and covariance (ANCOVA)

## Publications

### Peer-reviewed manuscripts

- [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.

#### Under review

- [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)

#### 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

- 2013-14 Editorial Assistantship: Ultrasound in Medicine and Biology
- 2011-12, National Science Foundation, Integrative Graduate Education and Research 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