

Tyler Ray, PhD

Northwestern University, 2220 Campus Drive, Cook 2036, Evanston, IL 60208
tyler.ray at northwestern.edu • (803) 454-9612 • <http://tylerray.com>

EDUCATION

University of California, Santa Barbara, Santa Barbara, CA

Doctor of Philosophy (Ph.D.) in Mechanical Engineering

Sep 2010 – Dec 2015

Dissertation: Gold Nanoparticle Characterization: Improved Methods for Measuring Nanoparticle Surface Properties and Colloidal Stability

University of South Carolina, Columbia, SC

Master of Science (M.S.) in Mechanical Engineering

May 2008 – May 2010

Thesis: Electric Field Manipulation of Gold Nanorods: Characterization of Far-Field Alignment and Spatial Positioning Through Optical Response Imaging Techniques

Bachelor of Science (B.S.) in Mechanical Engineering

Aug 2004 – May 2008

Graduated with Honors from the University of South Carolina Honors College

Magna Cum Laude

RESEARCH EXPERIENCE

Postdoctoral Research Fellow, Northwestern University

Sep 2016 –

Professor John A. Rogers

- Development of wearable thermal-based flow measurement platform.
- Development of microfluidic, epidermal sweat measurement platform.

Postdoctoral Scholar, University of California, Santa Barbara,

Oct 2015 – Sep 2016

Professor Matthew Begley

- Developed composite polymer / magnetic material for use as a novel, non-contact oscillating pump for microfluidic circuits
- Developed acoustophoresis microfluidic device for the alignment of anisotropic particles for bio-inspired 3D printed materials
- Developed novel DNA purification device for forensic applications

Doctoral Projects, Professor Sumita Pennathur

Sep 2010 – Sep 2015

- Established new method for characterizing nanoparticle colloidal stability
- Developed method to characterize nanoparticle surface properties using microfluidics with greater accuracy than gold standard techniques
- Developing on-chip microfluidic integrated plasmonic detection platform for real-time sensing of pathogens in solution
- Developing plasmonic biosensors for real-time detection of *S. pneumonia* in whole blood

Research Projects, Professor Matthew Begley

Oct 2011 –

- Developed composite polymer / magnetic material for use as a novel, non-contact oscillating pump for microfluidic circuits
- Developed acoustophoresis microfluidic device for the alignment of anisotropic particles for bio-inspired 3D printed materials
- Developed novel DNA purification device for forensic applications

Research Projects, Professor Andrew Cleland

Oct 2011 – Dec 2014

Developed an aggregation-based biodiagnostic platform for the real-time detection of targets of interest using plasmonic nanoparticles

Masters Thesis, Professors Sarah Baxter and Thomas Crawford

Aug 2008 – Sep 2010

Development of plasmonic nanocomposite materials

- Developed a Total Internal Reflection Microscope to measure the alignment of gold nanorods using electric fields
- Developed a statistical method using darkfield microscopy to analyze degree of gold nanorod alignment
- Implemented a Kelvin Probe microscopy system on the lab AFM to improve images of both gold nanorods and magnetic nanoparticles

PATENTS

U.S. Provisional Patent Application 62/141,053. "System and method for tunable patterning and assembly of particles via acoustophoresis." R. Collino, **T. Ray**, M. Begley. 2015.

PUBLICATIONS	R. Collino, T. Ray , L. Friedrich, J. Cornell, C. Meinhart, M. Begley “Scaling relationships for acoustic control of two-phase microstructures during extrusion printing,” <i>in preparation</i> .	
	R. Collino, T. Ray , R. Flemming, J. Cornell, B. Compton, M. Begley “Deposition of ordered two-phase materials using microfluidic print nozzles with acoustic focusing,” <i>Extreme Mechanics Letters</i> , 2016.	
	N. Rajan, S. Rajauria, T. Ray , S. Pennathur, A. Cleland “Multiplexed Serum Protein Quantification using an Aggregation Assay Platform Based on an Electrical Microfluidic Nanoparticle Analyzer,” <i>Biosensors and Bioelectronics</i> , 2016.	
	R. Collino, T. Ray , R. Flemming, C. Sasaki, H. Haj-Hariri, M. Begley “Microfluidic masonry: tunable patterning and assembly of anisotropic particles via acoustophoresis,” <i>Extreme Mechanics Letters</i> , 2015.	
	T. R. Ray , B. Lettiere, J. de Rutte, S. Pennathur, “Quantitative Characterization of the Colloidal Stability of Metallic Nanoparticles using UV-Vis Absorbance Spectroscopy,” <i>Langmuir</i> , 2015.	
	T. R. Ray , C. J. Murphy, S. Baxter, “Diffusion Linked Solidification Model of Axisymmetric Growth of Gold Nanorods,” in <i>Advances in Mathematical Modeling and Experimental Methods for Materials and Structures</i> , 2009.	
SELECTED TALKS	R. Mahtab, S. M. Sealy, S. E. Hunyadi, B. Kinard, T. Ray , C. J. Murphy, “Influence of the Nature of Quantum Dot Surface Cations on Interactions with DNA,” <i>Journal of Inorganic Biochemistry</i> 2007, 101 (4), 559-564.	
	“Field-Assisted 3D-Printing of Aligned Composites” T.R. Ray , R. Collino, L. Friedrich, J. Cornell, M. Begley, <i>XXIV ICTAM</i> , Montreal, Canada	Aug 2016
	(Invited) “Scaling Relationships Describing Microfluidic Acoustic Nozzles for 3D-Printing” R. Collino, T.R. Ray , L. Friedrich, J. Cornell, M. Begley, <i>XXIV ICTAM</i> , Montreal, Canada	Aug 2016
	“A Microfluidic-based Separation Device for the Accurate Characterization of Metallic Nanoparticles.” T.R. Ray , S. Pennathur, <i>27th International Symposium on MicroScale Bioseparations and Analyses</i> , Geneva, Switzerland	Feb 2012
	“Gold Nanorods: Exploration of the Growth Mechanism through Cellular Automata Modeling” T.R. Ray , S. Baxter, <i>University of South Carolina Discovery Day</i> , Columbia, SC	Apr 2008 Awarded Best Oral Presentation
POSTERS	“Acoustically Enhanced Aggregation: a Microfluidic Assay Platform for Point-of-Care Diagnostics.” T.R. Ray , R. R. Collino, M. R. Begley, <i>Gordon Conference on the Physics & Chemistry of Microfluidics</i>	Jun 2015
	“Microchannel Acoustophoresis for Particle Manipulation and Deposition.” R. R. Collino, T.R. Ray , R. C. Fleming, C. H. Sasaki, H. Haj-Hariri, M. R. Begley, <i>Gordon Conference on the Physics & Chemistry of Microfluidics</i>	Jun 2015
	“Detection of Pathogenic Bacteria in Whole Blood using Microfluidics-Based Plasmonic Biosensing for Rapid Point-of-Care Diagnostics.” T.R. Ray , S. Pennathur, <i>Gordon Conference on the Physics & Chemistry of Microfluidics</i>	Jun 2013
	“Nanofluidic-based Characterization of Gold Nanoparticles.” T.R. Ray , S. Pennathur, <i>Gordon Conference on the Physics & Chemistry of Microfluidics</i>	Jun 2011
	“Force Handles for Alignment of Metallic Nanoparticles” T.R. Ray , T.M. Crawford, and S. Baxter, <i>Materials Research Society Fall Meeting</i> , Boston, MA	Nov 2009
HONORS	Mechanical Engineering Grad Slam – First Place	2015
	Gordon Research Seminar on Microfluidics Elected Co-Chair (2015), Discussion Leader (2013, 2015)	
	Honorable Mention in the 2nd Annual Art of Science Competition, UCSB	2015
	Institute for Collaborative Biotechnology Graduate Fellow	2014–2015

	Best TA Award in Mechanical Engineering	2014
	UCSB Excellence Fellowship in Mechanical Engineering	2012
	California NanoSystems Institute Graduate Research Fellow	2010 – 2015
	University of California Regents Special Fellow	2010 – 2015
	National Defense Science and Engineering Graduate Fellow	2008 – 2010
	National Science Foundation Graduate Fellowship Honorable Mention	2008, 2009
	Barry M. Goldwater National Scholarship for Science and Engineering Honorable Mention	2007
	Caroliniana Award for Excellence in Student Leadership and Service Recipient	2008
	Outstanding Senior in Mechanical Engineering, University of South Carolina	2008
	Magellan Scholar Fellowship for independent undergraduate research	2007
	Robert McNair Scholarship Recipient Awarded to top 25 out-of-state undergraduate students at the University of South Carolina	2004–2008
TEACHING	University of California, Santa Barbara	
	Lecturing - Laboratory Classes: Introduction to Fabrication Methods	Spring 2013, 2014
	<ul style="list-style-type: none"> • Instructed 20–25 students in a weekly lab section on cleanroom fabrication techniques • Designed three labs to teach basic cleanroom fabrication processes using research-relevant MEMS devices • Mentored teaching experience, 4 opportunities to lecture (full-length) in the main section 	
	University of South Carolina	
	Lecturing - Numerical Methods	Fall 2009
	<ul style="list-style-type: none"> • Instructed 75 students in a weekly lab section on programming techniques in MathCad • Prepared course material to supplement and reinforce concepts taught in the primary section • Mentored teaching experience, opportunities to lecture in the main section 	
ASSOCIATIONS	Tau Beta Pi, Omicron Delta Kappa, Pi Tau Sigma, Pi Mu Epsilon, American Society of Mechanical Engineers, Materials Research Society	
TECHNICAL EXPERTISE	Microfluidics, nanofluidics, acoustophoresis, microscopy (brightfield, darkfield, TEM, SEM, AFM), cleanroom fabrication (9 years, lithography, deposition, etching, bonding, process engineering), metallic nanoparticle synthesis, 3D Printing (SLS, FDM)	
SERVICE	Reviewer – <i>Analytica Chimica Acta</i>	2016–
	Appointed by the Chancellor to the <i>Coordinating Committee on Budget Strategy</i> as the Graduate Student Body Representative	2013–2015
	Graduate Student Representative on the <i>Student Fee Advisory Committee</i> Administered \$350,000 annual budget, \$8.1 million reserve account	2012–2015