Tyler Ray, PhD

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EDUCATION

University of California, Santa Barbara
Santa Barbara, CA

Sep 2010 - Dec 2015

DOCTOR OF PHILOSOPHY, MECHANICAL ENGINEERING

Dissertation : Gold nanoparticle characterization: improved methods for measuring nanoparticle surface properties and colloidal stability

University of South Carolina
Columbia, SC

May 2008 - May 2010

MASTER OF SCIENCE, MECHANICAL ENGINEERING

Thesis: Electric field manipulation of gold nanorods: characterization of far-field alignment and spatial positioning through optical response imaging techniques

Aug 2004 - May 2008

BACHELOR OF SCIENCE, MECHANICAL ENGINEERING

- with Honors from the University of South Carolina Honors College
- Magna Cum Laude

RESEARCH EXPERIENCE

University of California, Santa Barbara
Oct 2015 - Present

POSTDOCTORAL SCHOLAR - *Professor Matthew Begley*

- Developed method for printing aligned two-phase composite materials via acoustic forces
- Established method for rapid fabrication of self-assembled microstructures

Sep 2010 - Sep 2015

CNSI GRADUATE FELLOW - *Professor Sumita Pennathur*

- Formulated new parameter for quantitatively assessing nanoparticle colloidal stability
- Devised new method for characterizing nanoparticle surface properties via microfluidic capillary electrophoresis
- Demonstrated real-time detection of *S. pneumonia* in whole blood using plasmonic biosensors

Oct 2011 - Dec 2014

COLLABORATION - *Professor Andrew Cleland*

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

Sep 2011 - Dec 2014

COLLABORATION - *Professor Matthew Begley*

- Created new method for controlling anisotropic microparticle orientation and position via applied acoustic fields
- Formulated a magnetic polymer composite for use as a novel, non-contact oscillating pump for microfluidic circuits

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RESEARCH EXPERIENCE *(cont.)*

University of South Carolina
Aug 2008 - Sep 2010

NDSEG FELLOW- *Professors Sarah Baxter & Thomas Crawford*

- Built a Total Internal Reflection Microscope for quantifying alignment of gold nanorods using electric fields
- Formulated a statistical method to quantify gold nanorod alignment via darkfield microscopy
- Modified an AFM to add a custom-fabricated Kelvin Probe microscopy system to characterize nanoparticles

Aug 2006 - May 2008

MAGELLAN SCHOLAR - *Profs Sarah Baxter & Cathy Murphy*

- Developed a cellular automata model for the crystal growth mechanism of gold nanorods

Aug 2005 - May 2006

UNDERGRADUATE RESEARCH - *Prof Cathy Murphy*

- Investigated the binding affinity of three variations of DNA (kinked, bent, straight) to Cadmium Sulfide quantum dots

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***, R. Fleming, J. Cornell, B. Compton, M. Begley, "Deposition of ordered two-phase materials using microfluidic print nozzles with acoustic focusing," *in review. Manuscript available upon request.*
- 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," *Biosensors and Bioelectronics*, **77**, 1062 (2016).
- R. Collino, ***T. Ray***, R. Fleming, C. Sasaki, H. Haj-Hariri, M. Begley, "Microfluidic masonry: tunable patterning and assembly of anisotropic particles via acoustophoresis," *Extreme Mechanics Letters*, **5**, 37 (2015). *Featured as Cover.*
- ***T. Ray***, B. Lettiere, J. de Rutte, S. Pennathur, "Quantitative characterization of the colloidal stability of metallic nanoparticles using UV-Vis absorbance spectroscopy," *Langmuir*, **31**, 3577 (2015).
- ***T. Ray***, C.J. Murphy, S. Baxter, "Diffusion linked solidification model of axisymmetric growth of gold nanorods," *Advances in Mathematical Modeling and Experimental Methods for Materials and Structures*, 199-210 (2009).
- 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, " *Journal of Inorganic Biochemistry*, **101**, 559 (2007).

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SELECTED CONFERENCE PRESENTATIONS

- "Acoustic enhanced aggregation: a microfluidic assay platform for point-of-care diagnostics." ***T.Ray***, R. Collino, M. Begley, Poster presentation at *Gordon Conference on the Physics & Chemistry of Microfluidics*, Mt. Snow, VT, Jun 2015.
- "Microchannel acoustophoresis for particle manipulation and deposition." R. Collino, ***T. Ray***, R. Flemming, C. Sasaki, H. Haj-Hariri, M. Begley, Oral presentation at *Gordon Research Seminar on the Physics & Chemistry of Microfluidics*, Mt. Snow, VT, Jun 2015.
- "Detection of pathogenic bacteria in whole blood using microfluidics-based plasmonic biosensing for rapid point-of-care diagnostics." ***T. Ray***, S. Pennathur, Poster presentation at the *Gordon Conference on the Physics & Chemistry of Microfluidics*, Lucca, Italy, Jun 2013.
- "A microfluidic-based separation device for the accurate characterization of metallic nanoparticles." ***T. Ray***, S. Pennathur. Oral presentation at the *27th International Symposium on MicroScale Bioseparations and Analyses*, Geneva, Switzerland, Feb 2012.
- "Nanofluidic-based characterization of gold nanoparticles." ***T. Ray***, S. Pennathur. Poster presentation at the *Gordon Conference on the Physics & Chemistry of Microfluidics*, Waterville Valley, NH, Jun 2011.
- "Gold nanorods: exploration of the growth mechanism through cellular automata modeling." ***T. Ray***, S. Baxter. Oral presentation at the *University of South Carolina Discovery Day*, Columbia, SC, Apr 2008. ***Awarded best oral presentation.***

HONORS AND AWARDS

2015	USCB Mech. Eng. Grad Slam - First Place
	Gordon Research Seminar on Microfluidics
2015	› Elected co-chair for 2017 conference
2013, 2015	› Discussion Leader
2015	Art of Science Competition, UCSB - Hon. Men.
2014 - 2015	Institute for Collaborative Biotechnology Grad. Fellowship
2014	Best Teaching Assistant Award in Mech. Eng., UCSB
2012	UCSB Excellence Fellowship in Mech. Eng.
2010 - 2015	**California NanoSystems Institute Grad. Research Fellowship**
2010 - 2015	**University of California Regents Special Fellowship**
2008 - 2010	**National Defense Sci. & Eng. Grad. Fellowship**
2008, 2009	National Science Foundation Grad. Fellowship - Hon. Men.
2008	Caroliniana Award for Excellence in Student Leadership & Service
2007	Barry M. Goldwater National Scholarship for Sci. & Eng. - Hon. Men.
2008	Outstanding Senior in Mech. Eng., USC
2007	Magellan Scholar, USC *(Fellowship for Independent Research)*
2004 - 2008	**Robert McNair Scholar** *(Awarded to top 25 out-of-state undergrads, USC)*

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SELECTED TEACHING

University of California,
Santa Barbara
Spring 2013, 2014

LECTURING: INTRODUCTION TO FABRICATION METHODS

- Instructed 20 - 25 students in a weekly lab section on cleanroom fabrication techniques
- Designed three labs to teach basic cleanroom techniques through fabrication of research-relevant MEMS devices
- Mentored teaching experience: taught four lectures (full-length) in main classroom section

ASSOCIATIONS

- Tau Beta Pi
- Omicron Delta Kappa
- Pi Tau Sigma
- Pi Mu Epsilon
- American Society of Mechanical Engineers
- Materials Research Society

TECHNICAL EXPERTISE

- *Microfabrication:* Lithography (stepper, contact); Etching (wet, DRIE, RIE, novel chemical), Deposition (ALD, Sputter, Thermal, E-beam, Oxidation), Bonding (Fusion, Anodic, Eutectic, Low-Temp), Moldmaking (SU-8, PDMS, Silicon)
- *Microfluidics:* Device design, capillary electrophoresis, dielectrophoresis, acoustophoresis, nano/microchannel sample handling, paper-based microfluidics, PDMS/Glass/Novel Materials (silicon, polymer)
- *Characterization:* Microscopy (TEM, SEM, darkfield, brightfield, fluorescence), Dynamic Light Scattering / Zeta Potential, Capillary Electrophoresis, UV-Vis Spectroscopy, Ellipsometry
- *Software:* Matlab, Mathcad, Excel, IgorPro, R, Latex, Objective-C, Adobe Illustrator, Adobe Photoshop, Adobe Premiere / Apple Final Cut Pro, Apple Motion, HTML / CSS

CAMPUS SERVICE

- Appointed by the Chancellor to the *Coordinating Committee on Budget Strategy* as the Graduate Student Body Representative, UCSB (2013 - 2015)
- Graduate Student Body Representative on the *Student Fee Advisory Committee* which administers $350,000 annual budget, $8.1 million reserve account, UCSB (2012 - 2015)