Zachary Scott Ballard

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Education

University of California Los Angeles **Los Angeles, CA 2014-present**

Pursuing a PhD in Electrical Engineering (Physical and Wave Electronics) under the guidance of Aydogan Ozcan at UCLA
Awarded 2015 NSF and NDSEG Graduate Student Research Fellowship

Brown University, Bachelor of Science in Engineering Physics, 3.8/4.0 GPA **Providence, RI 2009-2013**

Outstanding Engineering Physics Student for class of 2013
Finalist for Domenico A. Ionata award for outstanding creativity in Honors Thesis Projects
Honors Thesis entitled, "*Fiber-coupled microcavity probe for in vivo near-field sensing"*

Relevant Course Work:

Computational Electromagnetics, Advanced Electromagnetic Theory, Applied Electromagnetics, Photonics and Optoelectronics, Biophotonics and Photonics, Biosensors and Applied Microfluidics, Physics and Informatics of Biomedical Imaging, The Physics of Solar Cells, Solid State Electronics

Research Experience and Publications

Ozcan Lab of Nano-Biophotonics Los Angeles, CA 2014-present **Los Angeles, CA 2014-present**

- Researching robust read-out schemes for plasmonic biosensors under the guidance of Aydogan Ozcan

Vollmer Lab of Nanophotonics and Biosensing, Max Planck Institute for the Science of Light **Erlangen, Germany 2013-2014**

- Designed and implemented experimental set-up to achieve first ever free space coupled high-Q whispering gallery mode resonator in water to enable a simplified and low-loss coupling mechanism for highly sensitive bio-detection
- Published in Sensors special issue Advances in Optical Biosensors 2015 entitled, "*Stand-off Biodetection with Free-Space Couple Asymmetric Microsphere Cavities"*
- Published in Chemical Communications*" Expanding the genetic code for site-specific labeling of tobacco mosaic virus coat protein and building biotin-functionalized virus-like particles"*

Lab of Emerging Technologies, Brown University **Providence RI, 2012-2013**

- Developed novel fiber-coupled microcavity probe for robust sensing in bio-environments under the guidance of Jimmy Xu
- Presented honors thesis entitled *"Fiber-coupled microcavity probe for in vivo near-field sensing"* at 2013 International, Academy, and Research Association (IARIA) conference in Barcelona, Spain
- Publication in International Journal On Advances in Systems and Measurements vol. 7, *"Fiber-Coupled Microcavity Probe – A Novel Optical Biosensor for Near-Field Real-Time Monitoring of Biomolecular Interactions"*

Non-Linear Optics Lab, Tufts University **Medford MA, 2012**

- Imaged second harmonic generation and two photon fluorescence in infarcted heart tissue under the guidance of Irene Georgakoudi
- Developed image processing code and numerical model for Second Harmonic Generation within collagen fiber bundles using MATLAB
- Presented manuscript "*Neo-natal, adult, and infarcted adult rat heart optical metrics and correlation with mechanical properties*"
- Paper accepted to BMES 2014 Presentation in San Antonio, TX *"Characterizing the dynamic relationship between extracellular matrix composition and mechanical properties following myocardial infarction through multi-photon microscopy"*

NASA Ames Research Center, Undergraduate Student Research Project (USRP) **Mountain View CA, 2011**

- Constructed and programmed data acquisition and control systems imbedded in UH-60 helicopters and remote rover vehicles for prognostics research as a part of the Intelligent Systems Division under the guidance of Edward Balaban
- Programmed MATLAB GUI for rover robot simulation

Teaching and Leadership Experience

Brown Engineering department, Teaching Assistant **Providence RI, 2013**

- Wrote and graded assignments, designed lab set-ups and manuals for upper level "Bio-photonics and Photonics*"* class

Brown Computer Science department, Teaching Assistant **Providence RI, 2010**

- Teaching assistant for "Concepts and Challenges of Computer Science"

Rainwater for Humanity, Brown Team President **Kerala, India & Providence, RI 2010-2013**

- Rainwater for Humanity (founded 2008) is a non-profit social enterprise dedicated to improving access to potable water in Kerala, India
- Traveled to Kerala, India and coordinated with the Mahatma Gandhi University doing E. Coli testing, and worked with community leaders to develop an alternative micro-loan structure for families seeking to purchase rainwater catchment tanks
- Winner of the Ford College Community Challenge $25,000 grant for "Building Sustainable Communities"

Skills and Interests

- **Programs and Programming languages**: MATLAB, LabView, C++, ImageJ, SolidEdge, Rsoft
- Experience designing and machining hardware for experimental set-ups
- **Interests**: cycling, hiking, performing poetry, playing music, cooking recipes from the Silk Road, and Star Wars
- Keynote speaker at 2011 Highland Park Independent School District convocation
- Awarded the 2013 Beth Lisa Feldman Prize in Children's Literature for picture-book entitled "*Miles to Go*"