

Samantha McBirney

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EDUCATION

- AUG 2018 Doctorate of Philosophy in BIOMEDICAL ENGINEERING
University of Southern California
- DEC 2013 Master of Science in BIOMEDICAL ENGINEERING
University of Southern California
- MAY 2012 Bachelor of Science in BIOENGINEERING
University of California, Berkeley

AWARDS

- APR 2017 21st Annual Fred S. Grodins Research Symposium Platform Speaker, Runner-Up Award for Outstanding Oral Presentation, awarded by University of Southern California
- MAR 2015 Maseeh Entrepreneurship Prize Competition (MEPC) Finalist for malaria diagnostic, conducted through University of Southern California
- OCT 2014 IDEO Design-A-Thon "Most Potential to Change the World" award for malaria diagnostic
- MAY 2014 Alfred E. Mann Innovation in Engineering Doctoral Fellowship, awarded by University of Southern California
- FEB 2012 Provost-USC Graduate School Ph.D. Fellowship, awarded by University of Southern California
- 2008 & 2009 Summer Undergraduate Research Fellowship Awardee, awarded by California Institute of Technology

EXPERIENCE

- NOV 2017 TO PRESENT Associate
Robson Forensic, Inc.
Provides technical investigations, analysis, reports, and testimony towards the resolution of personal injury litigation involving injury analysis and causation, medical equipment, medical devices, and medical procedures
- AUG 2017 TO MAY 2018 Graduate Teaching Assistant
University of Southern California
Assisted professor with design of lectures/labs and writing exams
Led laboratory and discussion sections
Evaluated student performance, provides feedback, and assigned grades for approximately 40 students per semester
Explained challenging quantitative and conceptual physiological system concepts to students in upper division course
- JULY 2012 TO MAY 2018 Graduate Student Researcher at ARMANI RESEARCH LAB
University of Southern California
Pioneered and patented a new optical-based malaria diagnostic; led tests with malaria-infected blood samples in collaboration with NIH Malaria Center at UCSD and with Emory University
Developed an optical-based platform to study cells and cellular membranes while undergoing exposure to microcavitations *in vitro*, thereby studying the mechanisms of blast-induced neurotrauma

	<p>Invented a new method for characterizing microbial growth rates by implementing a wavelength-normalization step in the data analysis, significantly improving accuracy over current methods</p> <p>Have supervised and mentored 4 undergraduates between USC, Johns Hopkins, and Stanford, and 1 high school student, culminating in the high school student choosing to study engineering at UC Berkeley and the Hopkins student choosing to pursue a biomedical engineering Ph.D.</p>
MAY 2009 TO MAY 2012	<p>Undergraduate Researcher at BIOPOETS RESEARCH LAB <i>University of California, Berkeley</i></p> <p>Designed a highly-localized nanoplasmonic nucleic acid sensor, and integrated the sensor into a microfluidic device used for diagnosing HIV in sub-Saharan Africa</p>
JAN 2011 TO MAY 2012	<p>Undergraduate Researcher at JOSÉ CARMENA RESEARCH LAB <i>University of California, Berkeley</i></p> <p>Used MATLAB and Python to extract data from NeuroSky headset designed to detect subject's brain waves</p> <p>Built an algorithm to command a robot to move in certain directions when certain brain waves were dominant</p> <p>Continued project with more complex 16-electrode Emotiv headset, increasing the function of the robot and allowing individuals to play an online game by thought</p>
SEP 2010 TO MAR 2011	<p>Undergraduate Researcher at MOHAMMAD MOFRAD RESEARCH LAB <i>University of California, Berkeley</i></p> <p>Created a finite element model of an axon, and subjected model to a range of forces indicative of various types of football-related head injuries</p> <p>Used the above model to determine that forces applied rotationally are the most damaging, concluding that football players are subject to diffuse axonal injury at relatively low accelerations not even indicative of concussions</p> <p>Developed prototype of sports product designed to reduce rotational forces experienced in high impact sports</p>
SUMMER 2008	<p>Summer Undergraduate Research Fellow at LILY JAN RESEARCH LAB <i>University of California, San Francisco</i></p> <p>Studied Kv voltage-gated potassium channels, mutations of which are known to cause a myriad of diseases, primarily in the brain and heart</p> <p>Determined viable natural substrates of Kv1 voltage-gated potassium channel beta-subunit, with implications in treatment of Parkinson's disease</p> <p>Evaluated 200+ natural substances using FPLC and PCR, identifying 30+ to be used in further research</p>

PUBLICATIONS & PRESENTATIONS

ARTICLES	<p>S.E. McBirney, K. Trinh, A. Wong-Beringer, A.M. Armani, "Wavelength-normalized spectroscopic analysis of <i>Staphylococcus aureus</i> and <i>Pseudomonas aeruginosa</i> growth rates", <i>Biomedical Optics Express</i> 7(10), 4034-4042 (2016).</p>
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CONFERENCE PROCEEDINGS | S.E. McBirney, D. Chen, A. Scholtz, B. Chen, and A.M. Armani, "Portable Diagnostic for Malaria Detection in Low-Resource Settings", in Conference on Lasers and Electro-Optics, OSA Technical Digest (online) (Optical Society of America, 2018), paper ATu4J.4.

S.E. McBirney, K. Trinh, A. Wong-Beringer, A.M. Armani, "Using wavelength-normalized optical spectroscopy to improve the accuracy of bacteria growth rate quantification", *Proc. SPIE 10068*, Imaging, Manipulation, and Analysis of Biomolecules, Cells, and Tissues XV, 1006817 (March 28, 2017).

A.M. Armani, D. Amchin, V. Diep, L. Fang, E. GÜngör, A. Hudnut, B. Hudnut, M. Lee, S.E. McBirney, S. Soltani, "Portable, low-power diagnostics based on integrated photonics and responsive materials", *Proc. SPIE 9930*, Biosensing and Nanomedicine IX, 99300P (September 27, 2016).

A.M. Armani, S. Mehrabani, M. Lee, E. GÜngör, S.E. McBirney, "Challenges in resonant cavity biosensor design: collection efficiency and specificity", *Proc. SPIE 8960*, Laser Resonators, Microresonators, and Beam Control XVI, 89600F (March 4, 2014).

PRESENTATIONS | S.E. McBirney. "Portable diagnostic for malaria detection in low-resource settings". Paper presented at Conference on Lasers and Electro-Optics (CLEO), San Jose, CA (May 15, 2018).

S.E. McBirney. "A Call to Leadership: Stepping Into Our Rightful Place". Invited talk given at Society of Women Engineers: Professional Development Conference, Los Angeles, CA (April 20, 2018).

S.E. McBirney. "Using wavelength-normalized optical spectroscopy to improve the accuracy of bacteria growth rate quantification". Paper presented at SPIE Photonics West, San Francisco, CA (February 1, 2017).

S.E. McBirney. "Rising Above the Glass Ceiling". Lecture given at Society of Women Engineers Conference, San Diego, CA (March 1, 2014).

MEDIA APPEARANCES

Grady, B. (2016, November 23). "PhD student finds surprising secret to detecting staph infections earlier" (News release). Retrieved from <https://news.usc.edu/111435/phd-student-has-the-secret-to-detecting-staph-infections-earlier-when-time-is-critical/>

Grady, B. (2016, November 10). "Sam McBirney, Superbug Sleuth" (News release). Retrieved from <https://viterbischool.usc.edu/news/2016/11/sam-mcBirney-superbug-sleuth/>

University of Southern California News Staff. (2014, November 26). "Team refines potentially game-changing malaria test" (News release). Retrieved from <https://news.usc.edu/71695/team-refines-potentially-game-changing-malaria-test/>

PATENTS

MAY 2016 | Andrea M. Armani, Alexa Hudnut, Samantha E. McBirney, *Malaria Diagnostic Device*, U.S. Patent Application Number 62/340,911

OUTREACH AND SERVICE

JUN 2015 TO PRESENT	Reviewer for <i>Journal of Emerging Investigators</i> Reviewer for journal that accepts articles written by middle- and high-school students, reviewing articles related to my areas of expertise
MAY 2013 TO PRESENT	Science Fair Judge Judge at the annual Intel International Science and Engineering Fair (ISEF) and the California State Science Fair, judging sixth- through eighth-grade projects
SEP 2014 TO MAY 2018	Speaker for Wonderkids <i>USC's Joint Education Project</i> Speaker at 1 st through 3 rd grade after-school science programs, teaching science through hands-on lesson plans and encouraging students to pursue careers in STEM
JAN 2013 TO MAY 2018	Super-user on Lab Equipment <i>Armani Research Lab</i> In charge of maintaining equipment and training other lab members on proper use, including XeF ₂ etcher, resonant cavity setup, tunable lasers, fluorescence microscope, and UV-visible spectrophotometer
SEP 2012 TO MAY 2018	Graduate Student Member of MESA <i>Mathematics, Engineering, Science Achievement</i> Speaker at events that serve educationally disadvantaged students in the Los Angeles area, teaching them about STEM and encouraging them to pursue advanced degrees in STEM-related fields
SEP 2013 TO APR 2014	Committee Chair for Engineering Symposium <i>Fred S. Grodins Graduate Research Symposium University of Southern California</i> Appointed by the chair of the biomedical engineering department to be one of five Ph.D. students composing the organizing committee Planned the department-wide symposium for 150 attendees, fundraised for the event, and organized a panel of speakers
JAN 2011 TO MAY 2012	External Vice President and Project Leader <i>The Berkeley Group: Pro-bono Consulting for the Social Sector</i> Increased consultant applicant pool by 52% through intensive recruitment and new marketing initiatives Collaborated with Executive Committee of five to train and lead 40 consultants Led team of four consultants in restructuring internal organization and introducing system of metrics for local nonprofit organization, ultimately recommending best internal structure and method of tracking social impact for sustainability (recommendations still in use today)
JAN 2011 TO MAY 2012	Supervisor and High School Liaison <i>Mentoring Underrepresented Students in Engineering (MUSE) University of California, Berkeley</i> Collaborated with president from a local high school with a low matriculation rate, and started a mentoring program designed to encourage students to attend college and major in STEM-related fields Developed in-depth survey and distributed to students before starting the program and upon completion Collected and analyzed data from survey to assess program's success, providing recommendations for further improvement Mentored high school students throughout the duration of the program, continuing to mentor them past their high school years and through college

SKILLS

Computer: Adobe Illustrator, Rhino 3D, COMSOL, ImageJ, SolidWorks, \LaTeX
Microscopy: Scanning electron, Optical, Wide-field, Upright, Bright-field, Dark-field, Fluorescence
Fabrication: Microfluidics, Photolithography, Soft/nano- lithography
Bio Methods: UV-visible absorption spectroscopy, Cell culture, Cell line maintenance, Fast protein liquid chromatography, Flow cytometry, Polymerase chain reaction (PCR), RT-PCR, GNP conjugation, Nucleic acid amplification, Assay design, Western blots, ELISA

PROFESSIONAL ORGANIZATIONS

The Institute of Electrical and Electronics Engineers (IEEE), Women in Engineering | 2018 to present
The Optical Society (OSA) | 2018 to present
The American Physical Society (APS) | 2018 to present
The International Society for Photonics and Optics (SPIE) | 2016 to present
The Institute of Electrical and Electronics Engineers, Young Professionals | 2015 to present
The Southern California Biomedical Council | 2014 to present
Disruptive Women in Healthcare | 2014 to present
The Biomedical Engineering Society (BMES) | 2012 to present
The Institute of Electrical and Electronics Engineers (IEEE) | 2012 to present
The Society of Women Engineers (SWE) | 2007 to present