

# Samantha McBirney

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## EDUCATION

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- PRESENT Doctorate of Philosophy in BIOMEDICAL ENGINEERING  
*University of Southern California | Los Angeles, CA*  
Health, Technology, and Engineering Program
- MAY 2012 Bachelor of Science in BIOENGINEERING  
*University of California, Berkeley | Berkeley, CA*

## AWARDS

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- APR 2017 21st Annual Fred S. Grodins Research Symposium Platform Speaker, Runner-Up Award for Outstanding Oral Presentation
- 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, Caltech

## RESEARCH

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- JULY 2012 TO PRESENT Graduate Student Researcher at ARMANI RESEARCH LAB  
*University of Southern California*  
Pioneered and patented a new optical-based malaria diagnostic; presently leading tests with malaria-infected blood samples in collaboration with NIH Malaria Center at UCSD  
Developing 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  
Developed a new method for characterizing microbial growth rates by implementing a wavelength-normalization step in the data analysis, significantly improving accuracy over current methods
- MAY 2009 TO MAY 2012 Undergraduate Researcher at BIOPOETS RESEARCH LAB  
*University of California, Berkeley*  
Designed a highly-localized nanoplasmonic nucleic acid sensor, and integrated the sensor into a microfluidic device used for diagnosing HIV in sub-Saharan Africa
- JAN 2011 TO MAY 2012 Undergraduate Researcher at JOSÉ CARMENA RESEARCH LAB  
*University of California, Berkeley*  
Used MATLAB and Python to extract data from NeuroSky headset designed to detect subject's brain waves  
Built an algorithm to command a robot to move in certain directions when certain brain waves were dominant  
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

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>Howard Hughes Medical Institute   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

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> <b>7</b>(10), 4034-4042 (2016).</p>
CONFERENCE PROCEEDINGS	<p>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", <i>Proc. SPIE 10068, Imaging, Manipulation, and Analysis of Biomolecules, Cells, and Tissues XV</i>, 1006817 (March 28, 2017)</p> <p>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", <i>Proc. SPIE 9930, Biosensing and Nanomedicine IX</i>, 99300P (September 27, 2016)</p> <p>A.M. Armani, S. Mehrabani, M. Lee, E. GÜNGÖR, S.E. McBirney, "Challenges in resonant cavity biosensor design: collection efficiency and specificity", <i>Proc. SPIE 8960, Laser Resonators, Microresonators, and Beam Control XVI</i>, 89600F (March 4, 2014)</p>

## PATENTS

MAY 2016	<p>Andrea M. Armani, Alexa Hudnut, Samantha E. McBirney, <i>Malaria Diagnostic Device</i>, U.S. Patent Application Number 62/340,911</p>
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## MENTORSHIP

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JULY 2017 TO PRESENT	<p>Joshua Greenberg <i>Undergraduate   Chemical Engineering   University of Southern California</i></p> <p>Introduced Josh to research in a laboratory setting, teaching him proper lab management skills, including how to keep a lab notebook detailing experiments and how to maintain equipment</p> <p>Taught him how to conduct a thorough literature search</p> <p>Designed a project suited to his interests while also exposing him to new fields, allowing him the freedom to choose what aspect of the project was most interesting to him</p> <p>Project focused on synthesizing chemical samples and testing biological samples with the malaria diagnostic</p>
JULY 2017 TO PRESENT	<p>Kristina Kaypaghian <i>Undergraduate   Biomedical Engineering   University of Southern California</i></p> <p>Introduced Kristina to research in a laboratory setting, teaching her proper lab management skills, including how to keep a lab notebook detailing experiments and how to maintain equipment</p> <p>Taught her how to conduct a thorough literature search</p> <p>Designed a project suited to her interests while also exposing her to new fields, allowing her the freedom to choose what aspect of the project was most interesting to her</p> <p>Project focused on writing / maintaining code and analyzing data for the malaria diagnostic</p>
SUMMER 2017	<p>Kaitlyn Olah <i>Undergraduate   Product Design   Stanford University</i></p> <p>Introduced Kaitlyn to research in a laboratory setting</p> <p>Granted her autonomy to work on an aspect of the malaria diagnostic within her field of design expertise</p> <p>Project focused on designing the malaria diagnostic on a larger scale, including creating instruction manuals and designing a user-friendly, universal interface</p>
SUMMER 2016 & SUMMER 2017	<p>Alexis Scholtz <i>Undergraduate   Bioengineering   Johns Hopkins University</i></p> <p>Helped Alexis write two successful proposals for summer research fellowships through the Bridge Undergraduate Science (BUGS) Program and Summer Undergraduate Research Experience (SURE) Program</p> <p>Designed a project suited to her interests, allowing her to have tremendous impact on the project (becoming co-author on multiple publications), granting her the flexibility to conduct her own research while maintaining proper trajectory to complete tasks set for the summer research programs</p> <p>Worked with her on advancing presentation skills, focusing on visuals, communication, and public speaking</p> <p>Influenced her decision to pursue graduate school; she is now interested in pursuing a Ph.D. because of her summer's experience</p> <p>Project focused on designing and building a portable, self-contained prototype for the malaria diagnostic</p>
JUN 2016 TO MAY 2017	<p>Bernard Chen <i>High school student   Diamond Bar High School, CA</i></p> <p>Helped Bernard write a successful proposal for a summer research fellowship through the Bridge Undergraduate Science (BUGS) Program</p> <p>Designed a summer project that was well-suited to Bernard's interests; he has enjoyed his work so much he is now continuing it through the school year</p> <p>Taught proper lab management skills, including how to keep a lab notebook detailing experiments and how to maintain equipment</p> <p>Project focused on aspects of the malaria diagnostic system spanning several topics, including biological testing of samples with the device and the automation of data acquisition using MATLAB</p> <p>His immense contributions to the project allowed him to become co-author on a publication as a high school student</p> <p>Helped in his decision to attend University of California, Berkeley as a bioengineering major starting fall of 2017</p>

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
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## OUTREACH AND SERVICE

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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
SEP 2014 TO PRESENT	Speaker for Wonderkids <i>USC's Joint Education Project</i> Speaker at 1 <sup>st</sup> through 3 <sup>rd</sup> grade after-school science programs, teaching science through hands-on lesson plans and encouraging students to pursue careers in STEM
MAY 2013 TO PRESENT	Science Fair Judge Judge at the annual Intel International Science and Engineering Fair (ISEF) and the California State Science Fair for the Junior Microbiology (Medical) Division, judging sixth- through eighth-grade projects
JAN 2013 TO PRESENT	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 <sub>2</sub> etcher, resonant cavity setup, tunable lasers, fluorescence microscope, and UV-visible spectrophotometer
SEP 2012 TO PRESENT	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)

## SKILLS

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Computer: Adobe Illustrator, Rhino 3D, COMSOL, ImageJ,  $\text{\LaTeX}$   
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

## PROFESSIONAL ORGANIZATIONS

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Southern California Biomedical Council (2014 to present) · Biomedical Engineering Society (2012 to present) · Disruptive Women in Healthcare (2014 to present) · Women in Science and Engineering (2012 to present) · Society of Women Engineers (2007 to present) · Institute of Electrical and Electronics Engineers (2012 to present) · IEEE Young Professionals, Los Angeles (2015 to present)