

Tom J. Zajdel

Postdoctoral Fellow at Princeton University

Education

Ph.D., Electrical Engineering , University of California, Berkeley Dissertation: Electronic interfaces for bacteria-based biosensing	2012-2018
B.S., Electrical and Computer Engineering , <i>summa cum laude</i> , The Ohio State University Thesis: Asynchronous stimulation for cochlear implants	2008-2012

Research Experience

Postdoctoral Fellow , Mentor: Daniel Cohen Princeton University, Department of Mechanical & Aerospace Engineering Designing devices that electrically stimulate mammalian tissues to control cell migration, utilizing a phenomenon known as 'electrotaxis.'	2018 -
Graduate Student Researcher , Mentor: Michel Maharbiz University of California, Berkeley, Department of Electrical Engineering and Computer Sciences Developed electrochemical interfaces with chemotactic bacteria for bioelectronic devices. Worked in Marvell Nanofabrication Lab and collaborated with researchers at the Molecular Foundry at LBNL.	2012 - 2018
Undergraduate Researcher , Mentor: Bomjun Kwon Ohio State Medical Center, Eye and Ear Institute Implemented an asynchronous auditory nerve stimulation algorithm to preserve information in commercial cochlear implants (CIs). Tested algorithm via psychoacoustic experiments in CI users.	2011 - 2012
Undergraduate Researcher , Mentor: Joel Johnson Ohio State University, ElectroScience Laboratory Modeled and simulated electromagnetic wave scattering in layered media for soil moisture sensing	2010 - 2011

Publications

*indicates equal contribution

In Review

1. M.H. Heinrich, J.M. LaChance, **T.J. Zajdel**, R. Alert, A. Košmrlj, D.J. Cohen, Tissue size controls patterns of cell proliferation and migration in freely-expanding epithelia, submitted 2020.

Journal Publications

1. **T.J. Zajdel***, G. Shim*, L. Wang, A. Rossello-Martinez, D.J. Cohen, SCHEPDOG: programming electric cues to dynamically herd large-scale cell migration, *Cell Systems*, in press.
2. L. Su, T. Fukushima, A. Prior, M. Baruch, **T.J. Zajdel**, C.M. Ajo-Franklin, Enhancing current production in engineered *E. coli* by modifying the cytochrome c maturation pathway, *ACS Synthetic Biology*, 2019.
3. **T.J. Zajdel***, M. Baruch*, G. Mehes*, D.T. Simon, M.M. Maharbiz, C.M. Ajo-Franklin, PEDOT:PSS-based multilayer bacterial-composite films for bioelectronics, *Scientific Reports*, vol. 8, p. 1529314, 2018.
4. M.A. TerAvest, **T.J. Zajdel**, and C.M. Ajo-Franklin, The Mtr pathway of *Shewanella oneidensis* MR-1 couples substrate utilization to current production in *Escherichia coli*, *ChemElectroChem*, vol. 1, no. 11, pp. 1874-1879, 2014.
5. M.A. Demir, J.T. Johnson, and **T.J. Zajdel**, A Study of the Fourth-Order Small Perturbation Method for Scattering from Two-Layer Rough Surfaces, *IEEE Transactions on Geoscience and Remote Sensing*, vol. 50, no. 9, pp. 3374-3382, 2012.

Reviewed Conference Proceedings

1. **T.J. Zajdel**, A. Nam, J. Yuan, V. Shirsat, B. Rad, and M.M. Maharbiz, Applying machine learning to the flagellar motor for biosensing, *Proceedings of the 2018 IEEE Engineering in Medicine and Biology Conference*, Jul 2018.
2. **T.J. Zajdel**, A.N. Walczak, D. Sengupta, V. Tieu, B. Rad, and M.M. Maharbiz, Towards a biohybrid sensing platform built on impedance-based bacterial flagellar motor tachometry, *Proceedings of the 2017 IEEE BioCAS Conference*, Oct 2017.
3. **T.J. Zajdel** and M.M. Maharbiz, Teaching design with a tinkering-based circuits laboratory, *Proceedings of 2016 IEEE Frontiers in Education Conference*, Oct 2016.
4. **T.J. Zajdel** and M.M. Maharbiz, Introducing electronics at scale with a massive online circuits lab, *Proceedings of 123rd ASEE Annual Conference and Exposition*, Jun 2016.
5. A.Y. Zhou, **T.J. Zajdel**, M.A. TerAvest, and M.M. Maharbiz, A miniaturized monitoring system for electrochemical biosensing using *Shewanella oneidensis* in environmental applications, *Proceedings of 2015 Engineering in Medicine and Biology Conference*, Aug 2015.
6. **T.J. Zajdel**, M.A. TerAvest, B. Rad, C.M. Ajo-Franklin, and M.M. Maharbiz, Probing the dynamics of the proton-motive force of *E. coli*, *Proceedings of the 2014 IEEE Sensors Conference*, Nov 2014.

Presentations

Research Talks

<u>Characterizing electrotaxis for control of cellular migration</u> , APS Annual Meeting	March 2019
<u>Environmental BioSensing: Engineering bacteria-based floating sensor nodes</u> , Berkeley BSAC IAB	March 2016
<u>Electronic interfaces for synthetic biology</u> , Agilent-UC Berkeley SBI Technical Exchange Workshop	October 2014

Research Posters

<u>A chemotactic bacteria-based biohybrid sensor</u> , LBNL Molecular Foundry User Meeting	August 2017
<u>Impedance-based electrochemical readout of bacterial flagellar rotation</u> , BPS Biomolecular Motors	June 2016

Public Outreach

<u>J. R. Brinkley: The Goat Doctor is on the Air</u> , Odd Salon NYC	August 2019
<u>The radio spectrum and you</u> , Princeton Public Library Tower to Town Lecture Series	June 2019

Teaching & Mentorship Experience

Lab Assistant, MAE 519: *Advanced Topics in Experimental Methods I: Introduction to Experimental Methods*, Princeton University
October 2019

- Three week laboratory module covering benchtop bioengineering techniques
- Provided instruction on laboratory techniques including mammalian cell culture and tissue patterning

Acting Instructor, EE198/298: *Hands-on Ham Radio*, UC Berkeley

Jan 2017 – May 2017

Effectiveness rating: 4.9/5.0

Aug 2016 – Dec 2016

Effectiveness rating: 4.9/5.0

- Taught seminar of 30+ students for two semesters that ended in an amateur radio licensing exam for the campus community.
- 76 Technician, 9 General, and 4 Extra amateur radio licenses were earned during these licensing sessions.

Engineering and Curriculum Consultant, *Applied Electrical I*, Northern Technical College (NORTEC), Ndola, Zambia

Jan 2016 – May 2016

- Developed hands-on laboratory curriculum to teach practical electronics to mechanics-in-training at NORTEC
- Facilitated an on-site workshop training 20 instructors in laboratory pedagogy and lecturing techniques.

Co-instructor and MOOC Developer, EE40LX: *Electronic Interfaces MOOC*, BerkeleyX

Jan 2015 – Jan 2016

Course rating: 94/100

- Developed curriculum, parts kits, videos, and handouts for a lab-based massive open online course (MOOC) hosted by EdX.
- 80000+ students enrolled from over 190 nations. 2233 students completed the course; 850 final projects were submitted.

Head Lab Graduate Student Instructor, EE40: Introduction to Microelectronic Circuits, UC Berkeley

Aug 2014 – Dec 2014

Effectiveness rating: 4.7/5.0

- Developed design-oriented lab curriculum and coordinated lab sections for class of 350+ students.
- Studied design project's effect on student self-efficacy and presented results at 2016 IEEE Frontiers in Education Conference.

Instructor, Pre-Engineering Program: Introduction to Mechanics, UC Berkeley

9 Aug 2016 – 18 Aug 2016

Effectiveness rating: 4.9/5.0

11 Aug 2015 – 21 Aug 2015

Effectiveness rating: 4.6/5.0

12 Aug 2014 – 22 Aug 2014

Effectiveness rating: 4.5/5.0

14 Aug 2013 – 22 Aug 2013

- Developed curriculum, course notes, assignments, exams, and lectures for two-week mechanics course for 20+ students.
- Incorporated research-based learning methods and assessment, including peer instruction and concept inventories.

Grader, ECE301: Design and Analysis in Circuits, Ohio State University

Sep 2011 – Dec 2011

- Provided written feedback on problem sets
- Developed detailed solution keys for homework assignments

Undergraduate Teaching Assistant, ENG191/192/193: Fundamentals of Engineering Honors, Ohio State University

Sep 2009 – Jun 2012

- For seven quarters, worked with first-year students in the Fundamentals of Engineering Honors program
- Graded assignments and provided supplemental instruction in technical writing, programming, and engineering design

Undergraduate Research Mentorship

Student	Major	Time	What are they doing now?
Linus Wang	Princeton ME	2019-2020	B.S. student in ME at Princeton University
Heather Cho	Princeton Chem/BioE	2019	B.S. student in CBE at Princeton University
Meera Lester	UC Berkeley EECS	2018	B.S. student in EECS at UC Berkeley
Andrew Nam	UC Berkeley EECS	2017-2018	R&D Senior Analyst at Accenture
Jove Yuan	UC Berkeley EECS	2017-2018	B.S. student in EECS at UC Berkeley
Alex Walczak	UC Berkeley EECS	2014-2017	Engineer at Apple
Debleena Sengupta	UC Berkeley EECS	2015-2017	Software Engineer at Qualcomm
Victor Tieu	UC Berkeley BioE	2015-2017	Bioengineering Ph.D. student at Stanford University
Robin Herbert	Berkeley CC Biotech	2012-2013	Microbial Biology Ph.D. student at UC Berkeley

Awards and Press**Awards**

NJ ACTS Postdoctoral Fellowship , NIH Clinical and Translational Science Awards Program	2019-2020
Outstanding Graduate Student Instructor Award , UC Berkeley	2018
Best Paper, ECE Division , ASEE Annual Conference & Exposition	2016
Biophysical Journal Outstanding Student Poster Award	2016
Berkeley EECS Chair's Special Award	2015
NSF Graduate Research Fellowship	2012-2017
UC Berkeley Chancellor's Fellowship	2012-2014
Best Engineering Poster , Ohio State University Denman Undergraduate Research Forum	2012
Most Outstanding Undergraduate Teaching Assistant , Ohio State University First-Year Engineering Honors	2010

Press

To teach the world robotics , BerkeleyENGINEER Magazine	2015
Berkeley MOOC offers hardware-based engineering training for all , Texas Instruments E2E blog	2014
Lending a helping hand: Tom Zajdel , OSU Department of Electrical and Computer Engineering	2012

Professional Development & Service

Professional Development

CIRTL.2x: Advancing Learning Through Evidence-Based STEM Teaching	BUx - edX	2018
CIRTL.1x: An Introduction to Evidence-Based Undergraduate STEM Teaching	BUx - edX	2016
EE375: Electrical Engineering Pedagogy Seminar	UC Berkeley	2014
CS375: Computer Science Pedagogy Seminar	UC Berkeley	2014
MACH: Making Academic Change Happen Workshop	Rose-Hulman Inst. of Technology	2014
FABE810: College Teaching in Engineering	Ohio State University	2012

Reviewer

American Society for Engineering Education Annual Conference	2016-2020
IEEE Engineering in Medicine and Biology Conference	2018
IEEE Frontiers in Education Conference	2016

Professional Engineering Experience

RF Engineering Intern – Antenna Group, Mentor: Tony Walkup Summer 2011

Syracuse Research Corporation (SRC), Syracuse, New York

Determined scalability and scanning limits of antenna arrays used in lightweight counter mortar (LCMR) radars by numeric simulation and anechoic chamber measurements.

Product Supply Engineering Intern – Baby Care, Mentor: Tim Storer Summer 2010

Procter & Gamble, Cincinnati, Ohio

Modularized programmable logic controller and human machine interface (HMI) software to enable code reuse. Consulted with operators to redesign HMI displays used in production lines worldwide.

References

Daniel J. Cohen

Assistant Professor, Mechanical & Aerospace Engineering, Princeton University
Relationship: Postdoc advisor

Michel M. Maharbiz

Professor, Electrical and Computer Engineering, University of California Berkeley
Relationship: PhD advisor

Caroline M. Ajo-Franklin

Professor, BioSciences, Rice University
Relationship: Scientific collaborator