Tom J. Zajdel

Assistant Teaching Professor at Carnegie Mellon University

Education

Ph.D., Electrical Engineering, University of California, Berkeley 2012-2018
Dissertation: Electronic interfaces for bacteria-based biosensing

B.S., Electrical and Computer Engineering, *summa cum laude*, The Ohio State University 2008-2012
Thesis: Asynchronous stimulation for cochlear implants

Academic Experience

Assistant Teaching Professor 2021 -
Carnegie Mellon University, Department of Electrical and Computer Engineering
Developing curriculum and teaching core undergraduate ECE courses.

Postdoctoral Research Associate, Mentor: Daniel Cohen 2018 - 2021
Princeton University, Department of Mechanical & Aerospace Engineering
Designing devices that electrically stimulate mammalian tissues to control cell migration to accelerate wound healing, utilizing a phenomenon known as 'electrotaxis.'

Graduate Student Researcher, Mentor: Michel Maharbiz 2012 - 2018
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.

Undergraduate Researcher, Mentor: Bomjun Kwon 2011 - 2012
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.

Undergraduate Researcher, Mentor: Joel Johnson 2010 - 2011
Ohio State University, ElectroScience Laboratory
Modeled and simulated electromagnetic wave scattering in layered media for soil moisture sensing

Publications

*indicates equal contribution

Journal Publications

1. **T.J. Zajdel***, G. Shim*, L. Wang, A. Rossello-Martinez, D.J. Cohen, SCHEEPDOG: programming electric cues to dynamically herd large-scale cell migration, *Cell Systems*, vol. 10, no. 6, pp. 506-514, 2020.
2. M.H. Heinrich, J.M. LaChance, R. Alert, **T.J. Zajdel**, A. Košmrlj, D.J. Cohen, Size-dependent patterns of cell proliferation and migration in freely-expanding epithelia, *eLife*, vol. 9, p. e58945, 2020.
3. 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*, vol 9. no. 1, pp.115-124, 2019.
4. **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.
5. 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.
6. 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.

Preprints

1. D. Suo, U. Ghai, E. Minasyan, P. Gradu, X. Chen, N. Agarwal, C. Zhang, K. Singh, J. LaChance, **T. Zajdel**, M. Schottdorf, D. Cohen, and E. Hazan, Machine learning for mechanical ventilation control, *arXiv*, 2021.
2. **T.J. Zajdel**, G. Shim, and D.J. Cohen, Come together: bioelectric healing-on-a-chip, *bioRxiv*, 2020. In review.
3. J. LaChance, **T.J. Zajdel**, M. Schottdorf, J.L. Saunders, S. Dvali, C. Marshall, L. Seirup, D.A. Notterman, and D.J. Cohen, PVP1–The People's Ventilator Project: A fully open, low-cost, pressure-controlled ventilator, *medRxiv*, 2020.

Presentations

Research Talks

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

Research Posters

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

Public Outreach

J. R. Brinkley: The Goat Doctor is on the Air, Odd Salon NYC	August 2019
The radio spectrum and you, 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 & Automotive Electronics*, Northern Technical College (NORTEC), Ndola, Zambia
May 2021 – Aug 2021
Jan 2016 – May 2016
- Developed hands-on laboratory curriculum to teach practical electronics to mechanics-in-training at NORTEC (2016).
- Facilitated an on-site workshop training 20 instructors in laboratory pedagogy and lecturing techniques (2016).
- Recorded instructional videos and facilitated remote office hours to prepare automotive instructors for electronics instruction (2021).

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
Janet Wang	Princeton ECE	2021
Linus Wang	Princeton ME	2019-2021
Heather Cho	Princeton Chem/BioE	2019
Meera Lester	UC Berkeley EECS	2018
Andrew Nam	UC Berkeley EECS	2017-2018
Jove Yuan	UC Berkeley EECS	2017-2018
Debleena Sengupta	UC Berkeley EECS	2015-2017
Victor Tieu	UC Berkeley BioE	2015-2017
Alex Walczak	UC Berkeley EECS	2014-2017
Robin Herbert	Berkeley CC Biotech	2012-2013

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

Researchers use electric fields to herd cells like flocks of sheep, M. Sharlach, *Princeton Engineering* 2020
Tom Zajdel: From skin wounds to ventilators, D. Krakow, *Princeton University MAE Department Spotlight* 2020
To teach the world robotics, D. McGlynn, *BerkeleyENGINEER Magazine* 2015
Berkeley MOOC offers hardware-based engineering training for all, *Texas Instruments E2E blog* 2014
Lending a helping hand: Tom Zajdel, C. Clevinger, *OSU Dept. 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 Tech.	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 Engineering and Computer Sciences, University of California Berkeley
Relationship: PhD advisor

Caroline M. Ajo-Franklin

Professor, BioSciences, Rice University
Relationship: Research collaborator

Michael (Miki) Lustig
Professor, Electrical Engineering and Computer Sciences, University of California Berkeley
Relationship: Teaching collaborator