

Hamid Charkhkar

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Education	George Mason University (GMU) , Fairfax, VA	
	Ph.D. in Electrical and Computer Engineering,	2015
	<ul style="list-style-type: none"> • Thesis: <i>Microelectrode arrays for neuronal recordings: developing novel technology and applications</i> • Advisor: Joseph. J. Pancrazio, Ph.D. 	
	Ferdowsi University of Mashhad (FUM) , Mashhad, Iran	
	B.Sc. in Electrical Engineering	2005
Research Experience & Appointments	Research Assistant Professor	Sep. '20 - Present
	Department of Biomedical Engineering, Case Western Reserve University (CWRU), Cleveland, OH	
	Investigator	Mar. '17 - Present
	Advanced Platform Technology Center, Louis Stokes Cleveland VA Medical Center, Cleveland, OH	
	Senior Research Associate	Dec. '18 - Aug. '20
	Department of Biomedical Engineering, CWRU	
	Postdoctoral Scholar	Aug. '15 - Nov. '18
	Department of Biomedical Engineering, CWRU	
	Graduate Research Assistant	Sep. '10 - May '15
	Neural Engineering Lab., Department of Electrical Engineering, GMU	
	Research Intern	Jun.'10 - Aug. '10
	Center for Devices and Radiological Health, US Food and Drug Administration (FDA), White Oaks, MD	
Grants & Funding	Functional and Neuroprotective Effects of Restoring Lower Limb Sensation after Diabetic Peripheral Neuropathy	Jan. '21 - Jan. '25
	Awarded by: VA Rehabilitation Research and Development Service (Contract NO. 1I01RX003566-01A1)	
	Budget: \$ 1,179,708	
	Role : Co-Investigator	
	Smartphone Application to Interface with Sensory-enabled Prosthesis in People with Lower-Limb Amputation	Dec. '20 - Dec. '21

Awarded by: VA Advanced Platform Technology Center (Steven Garverick Innovation Incentive Program)
Budget: \$ 10,000
Role : Principal Investigator

Optimizing Warfighter Performance with Neurally Integrated Robotic Lower Limb Prostheses Sep. '20 - Aug. '24
Awarded by: DoD-DMRDP-CRMRP-RESTORE (Contract NO. W81XWH2010802)
Budget: \$ 2,998,229
Role : Co-Investigator

Natural Sensation of Foot-Floor Interactions for Transfemoral Amputees via Neural Stimulation Aug. '18 - Aug. '22
Awarded by: DoD-CDMRP (Contract NO. W81XWH1810321)
Budget: \$ 2,497,238
Role : Co-Investigator

Natural Sensation for Lower Limb Amputees Jul. '15 - Dec. '20
Awarded by: DARPA (Contract NO. N66001-15-C-4038)
Budget: \$ 1,745,713
Role : Senior Research Associate

Journal Publications (Peer-reviewed)

1. C. Shell, B. Christie, P. Marasco, **H. Charkhkar**, R. Triolo. Lower-Limb amputees adjust quiet stance in response to manipulations of plantar sensation. *Frontiers in Neuroscience - Neuroprosthetics. (In Press)*
2. **H. Charkhkar**, B. Christie, R. Triolo. Sensory neuroprosthesis improves postural stability during Sensory Organization Test in lower-limb amputees. *Nature Scientific Reports*, 10(1), 1-13, 2020.
3. B. Christie, **H. Charkhkar**, C. Shell, C. Burant, D. Tyler, R. Triolo. Ambulatory searching task reveals importance of somatosensation for lower-limb amputees. *Nature Scientific Reports*, 10(1), 1-11, 2020.
4. E. Ereifej, C. Shell, J. Schofield, **H. Charkhkar**, I. Cuberovic, A. Dorval, E. Graczyk, T Kozai, K. Otto, D. Tyler, C. Welle, A. Widge, J. Zariffa, C. Mortiz, D. Bourbeau, P. Marasco. Neural engineering: the process, applications, and its role in the future of medicine. *Journal of Neural Engineering*, 16 (6), 063002, 2019.
5. B. Christie, **H. Charkhkar**, C. Shell, P. Marasco, D. Tyler, R. Triolo. Visual inputs and postural expectations affect the location of somatosensory percepts elicited by electrical stimulation. *Nature Scientific Reports*, 9(1), 1-14, 2019.
6. **H. Charkhkar**, B. Christie, G. Pinault, D. Tyler, R. Triolo. A Translational framework for peripheral nerve stimulating electrodes: Reviewing the Journey from Concept to Clinic. *Journal of Neuroscience Methods*, 108414, 2019.
7. B. Christie, E. Graczyk, **H. Charkhkar**, D. Tyler, R. Triolo. Visuotactile synchrony of stimulation-induced sensation and natural somatosensation. *Journal of Neural Engineering*, 16(3), 036025, 2019.
8. **H. Charkhkar**, C. Shell, P. Marasco, G. Pinault, D. Tyler, R. Triolo. High-density peripheral nerve cuffs restore natural sensation to individuals with lower-limb amputations. *Journal of Neural Engineering*, 15(5), 056002, 2018.

9. D. Simon, **H. Charkhkar**, C. St John, S. Rajendran, T. Kang, R. Reit, D. Arreaga-Salas, D. McHail, G. Knaack, A. Sloan, D. Grasse. T. Dumas, R. Rennaker, W. Voit, J. Pancrazio. Design and demonstration of an intracortical probe technology with tunable modulus. *Journal of Biomedical Materials Research Part A* . 105(1), 159-168, 2017.
10. **H. Charkhkar**, G. Knaack, D. McHail, H. Mandal, N. Peixoto, J. Rubinson, T. Dumas, J. Pancrazio. Chronic intracortical neural recordings using microelectrode arrays coated with PEDOT-TFB. *Acta Biomaterialia*. vol. 32: 57-67, 2016.
11. **H. Charkhkar**, D. Arreaga-Salas, T. Tran, A. Hammack, W. Voit, J. Pancrazio, B. Gnade. Novel disposable microelectrode array for cultured neuronal network recording exhibiting equivalent performance to commercially available arrays. *Sensors and Actuators B: Chemical*. vol. 226: 232-238, 2016.
12. **H. Charkhkar**, S. Meyyappan, E. Matveeva, J. Moll, D. McHail, N. Peixoto, R. Cliff, J. Pancrazio. Amyloid beta modulation of neuronal network activity *in vitro*. *Brain Res*. vol. 1629:1-9, 2015.
13. H. Mandal, G. Knaack, **H. Charkhkar**, D. McHail, J. Kastee, T. Dumas, N. Peixoto, J. Rubinson, J. Pancrazio. Improving the performance of poly(3,4-ethylenedioxythiophene) (PEDOT) for brain machine interface applications. *Acta Biomaterialia*. 10(6), 2014.
14. **H. Charkhkar**, C. Frewin, M. Nezafati, G. Knaack, N. Peixoto, S. Sadow, J. Pancrazio. Use of cortical networks for *in vitro* material biocompatibility testing. *Biosensors and Bioelectronics*. vol. 53, 2013.
15. G. Knaack, **H. Charkhkar**, F. Hamilton, N. Peixoto, T. O'Shaughnessy, J. Pancrazio. Differential responses to ω -Agatoxin IVA in murine frontal cortex and spinal cord derived neuronal networks. *Neurotoxicology*. vol. 37, 2013.
16. N. Peixoto, H. Nik, **H. Charkhkar**. Voice controlled wheelchairs: Fine control by humming. *Computer Methods and Programs in Biomedicine*. vol. 112, 2013.
17. **H. Charkhkar**, G. Knaack, B. Gnade, E. Keefer, J. Pancrazio. Development and demonstration of a disposable low-cost microelectrode array for cultured neuronal network recording. *Sensors and Actuators B: Chemical*. vol. 161, 2012.
18. E. Cohen, A. Agrawal, M. Connors, B. Hansen, **H. Charkhkar**, J. Pfefer. Optical coherence tomography imaging of retinal damage in real-time under a stimulus electrode. *Journal of Neural Engineering*. vol. 8, 2011.

Book Chapters

1. G. Knaack, **H. Charkhkar**, S. Cogan, J. Pancrazio. Chapter 8 - Amorphous Silicon Carbide for Neural Interface Applications, In *Silicon Carbide Biotechnology (Second Edition)*, edited by Stephen E. Sadow, Elsevier, 2016, Pages 249-260.

Conference Papers (Peer-reviewed)

1. M. Schmitt, **H. Charkhkar**, R. Triolo. Mirror therapy improves the effectiveness of electrically elicited sensations. American Orthotic and Prosthetic Association (AOPA) 2019 National Assembly. San Diego, CA, Oct. 2019.
2. K. Cheng, **H. Charkhkar**, J. Yu, N. Makowski, R. Triolo. Probing peripheral neural pathways in electrically stimulation induced sensation. Proceedings of 2019 9th International IEEE/EMBS Conference on Neural Engineering (NER). San Francisco, CA, Mar. 2019, pp. 453-456.

3. **H. Charkhkar**, C. Shell, P. Marasco, D. Tyler, R. Triolo. Neural interface technology to restore natural sensation in lower-limb amputees. MEC '17: Myoelectric Controls Symposium. New Brunswick, Canada, Aug. 2017.
4. C. Shell, **H. Charkhkar**, P. Marasco, D. Tyler, R. Triolo. Standing balance responses to projected sensory stimuli in below-knee amputees. 41st Annual Meeting of the American Society of Biomechanics. Boulder, CO, Aug. 2017.
5. **H. Charkhkar**, G. Knaack, H. Mandal, E. Keefer, J. Pancrazio. Effects of carbon nanotube and conducting polymer coated microelectrodes on single-unit recordings *in vitro*. Proceedings of 36th Annual International Conference of the IEEE, Engineering in Medicine and Biology Society (EMBC'14), Chicago, IL, Aug. 2014, pp. 469-473.
6. F. Hamilton, A. Akhavian, G. Knaack, **H. Charkhkar**, S. Minnikanti, W. Kim, J. Kaste, N. Peixoto. Dynamic steering of *in vitro* cortical neurons using field stimulation. Proceedings of 36th Annual International Conference of the IEEE, Engineering in Medicine and Biology Society (EMBC'14), Chicago, IL, Aug. 2014, pp. 6577-6580.
7. **H. Charkhkar**, A. Asadi, R. Lotfi. A 1.8 V, 10-bit, 40MS/s, MOSFET-only pipeline analog-to-digital converter. Proceedings of IEEE International Symposium on Circuits and Systems (ISCAS), Island of Kos, Greece, May 2006, pp. 5363-5366.
8. R. Ghasemi, **H. Charkhkar**, A. Asadi, R. Lotfi, K. Mafinejad. Design of low-voltage MOSFET-only switched-capacitor filters. Proceedings of IEEE International Conference on Microelectronics (ICM), Islamabad, Pakistan, Dec. 2005, pp. 24-29.

Poster Presentations

1. C.Shell, **H. Charkhkar**, B. Christie, P. Marasco, R. Triolo. Sensory Neuroprosthesis feedback impacts movement planning in obstacle clearing. 44th Meeting of American Society of Biomechanics. Virtual Format, Aug. 2020.
2. **H. Charkhkar**, K. Cheng, N. Makowski, R. Triolo. Neural stimulation eliciting sensation activates reflex pathways in lower-limb amputees. 2019 Meeting of Society for Neuroscience (SfN). Chicago, IL, Oct. 2019.
3. B. Christie, **H. Charkhkar**, C. Shell, D. Tyler, R. Triolo. Evaluating the role of electrically-evoked plantar sensation in an ambulatory searching task. 2019 Meeting of Society for Neuroscience (SfN). Chicago, IL, Oct. 2019.
4. B. Christie, **H. Charkhkar**, D. Tyler, R. Triolo. Visual and proprioceptive inputs affect the location of evoked somatosensory percepts in amputees. 2018 Meeting of Society for Neuroscience (SfN). San Diego, CA, Nov. 2018.
5. **H. Charkhkar**, B. Christie, D. Tyler, R. Triolo. The effect of sensory feedback on postural stability in lower-limb amputees. Neural Interface Conference (NIC) 2018, Minneapolis, MN, Jun. 2018.
6. B. Christie, **H. Charkhkar**, D. Tyler, R. Triolo. Somatosensory feedback via peripheral nerve stimulation minimizes postural sway while trans-tibial amputees multi-task. Neural Interface Conference (NIC) 2018, Minneapolis, MN, Jun. 2018.
7. **H. Charkhkar**, B. Christie, D. Tyler, R. Triolo. Elicited sensation in lower-limb amputees could improve their postural stability. Presented at Research ShowCASE, Case Western Reserve University, Cleveland, OH, Apr. 2018 (*Won the First Place award in the postdoctoral research category*).

8. B. Christie, **H. Charkhkar**, E. Graczyk, D. Tyler, R. Triolo. Latency of the perceived sensation evoked by peripheral nerve stimulation in people with lower limb amputations. Biomedical Engineering Society (BMES) Annual Meeting, Phoenix, AZ, Oct. 2017.
9. B. Christie, **H. Charkhkar**, E. Graczyk, D. Tyler, R. Triolo. Timing of restored tactile sensation in people with lower limb amputations. Society for Neuroscience (SfN), Washington D.C., Nov. 2017.
10. **H. Charkhkar**, C. Shell, P. Marasco, D. Tyler, R. Triolo. Sensory restoration in lower-limb amputees using neural interface technology. Presented at Research ShowCASE, Case Western Reserve University, Cleveland, OH, Apr. 2017. (*Won the First Place award in the postdoctoral research category*)
11. S. Gok, **H. Charkhkar**, J. Pancrazio, M. Sahin. *In vivo* impedance characterization of PEDOT:TFB coated and chronically implanted multi electrode arrays. Biomedical Engineering Society (BMES) Annual Meeting, Tampa, Florida, Oct. 2015.
12. D. McHail, **H. Charkhkar**, G. Knaack, H. Mandal, J. Kaste, J. Rubinson, J. Pancrazio, T. Dumas. Assessing novel materials to improve chronic cortical implants. Society for Neuroscience (SfN), Washington D.C., Nov. 2014.
13. **H. Charkhkar**, G. Knaack, H. Mandal, D. McHail, J. Kaste, J. Rubinson, T. Dumas, J. Pancrazio. Assessing the stability of PEDOT-coated electrodes for chronic cortical implants. Neural Interfaces Conference 2014 (NIC'14), Dallas, Texas, Jun. 2014.
14. **H. Charkhkar**, G. Knaack, M. Wechsler, E. Keefer, J. Pancrazio. CNT/PEDOT coatings improve neural recordings and affect network structure. Neural Interfaces Conference 2012, Salt Lake City, Utah, Jun. 2012.
15. G. Knaack, F. Hamilton, **H. Charkhkar**, N. Peixoto, J. Pancrazio. Unit specific responses to ω -agatoxin in a cultured neuronal network. 8th International Meeting on Substrate-Integrated Microelectrode Arrays. Reutlingen, Germany, July 2012.
16. **H. Charkhkar**, G. Knaack, G. Pollack, R. Robbins, B. Gnade, J. Pancrazio, E. Keefer. Design of a novel low-cost MEA for high-content/high-throughput experiments with excitable cells. Biomedical Engineering Society Annual Meeting, Hartford, Connecticut, Oct. 2011.
17. **H. Charkhkar**, E. Cohen. Semi-automatic measurement of damage in stimulated H&E sections of retinal regions. OSEL/FDA Student Science Poster Exhibit, White Oak, Maryland, Aug. 2010.

**Invited Talks,
Conference
Presentations &
Seminars**

1. Functional effects of sensory neuroprosthesis in individuals with lower limb amputation, 42nd Annual International Conferences of the IEEE Engineering in Medicine and Biology Society (EMBC 2020), Montreal, QB via *EMBS Virtual Academy*, July 20-24, 2020.
2. Restoring sensation in lower-limb amputees using neural interface technology, 2019 American Orthotic & Prosthetic Association (AOPA) National Assembly, San Diego, CA, September 28, 2019.
3. Sensory restoration in people with lower-limb amputation: the first step toward a sensory-enabled prosthesis, State of Science Symposium in Henry M. Jackson Foundation for the Advancement of Military Medicine, Bethesda, MD, May 17, 2019.

4. Restoring natural sensation to lower limb amputees, DARPA HAPTIX program meeting, Charleston, SC, February 21, 2018.
5. Peripheral neural interface technology to restore sensation in lower limb amputees, University of Texas Dallas, Richardson, TX, December 1, 2016.
6. Restoring natural sensation in lower limb amputees, Neural Engineering Center at CWRU, Cleveland, OH, October 28, 2016.
7. Microelectrode arrays for neuronal recordings. Electrical Engineering Department, George Mason University, Fairfax, VA, May 27, 2015.
8. Amyloid beta modulation of neuronal network activity *in vitro*. Unit of Clinical and Transnational Neuroscience, National Institute of Aging (NIA), Baltimore, MD, March 26, 2015.
9. Assessing the biocompatibility and stability of novel materials for chronic cortical implants. Louis Stokes Cleveland Veterans Affairs Medical Center, Cleveland, OH, March 3, 2015.

Awards

- 1st Place award among postdoctoral research presentations at Research ShowCASE, CWRU S'17 & S'18
- Provost Dissertation Fellowship, GMU SU'15
- Graduate Research Fellowship, Dept. Bioengineering, GMU F'10 - S'15
- Graduate Students Travel Award, GMU SU'14
- Volgenau School of Engineering Academic Fellowship, GMU F'11 - S'12
- Oak Ridge Institute for Science and Education (ORISE) Fellowship SU'10

Teaching & Mentorship

Teaching & Lectures:

- ECE 334: Linear Electronics Lab, Dept. Electrical Eng., GMU F'09 & S'10
- “Materials for neuronal interfaces *in vitro*,” BENG 341: Introduction to Biomaterials, Bioengineering Dept., GMU (Guest lecture). Jul. '13
- “Microelectrode arrays and their applications in neuroscience,” NEUR 410: Current Topics in Neuroscience, Dept. of Psychology, GMU (Guest lecture) Nov. '11
- Analytic Geometry and Calculus II, Dept. Civil Engineering, FUM F'03 - F'04

Mentorship:

APT Center, Louis Stokes Cleveland VA Medical Center:

- Vikram Abbaraju, Junior in EE '21 -
 - Project: Design an embedded interface between a robotic prosthesis and external stimulator unit
- Eileen Petros, Junior in BME '20 -
 - Project: Chronic stability of nerve cuff electrodes in lower-limb amputees
 - Received VA APT Wen Ko Summer Internship at VA APT Center SU'20
- Evan Vesper, BS/MS student '19 -
 - Project: Exploring the interactions of sensory stimulation with local and spinal reflex activity
 - Received the prestigious Goldwater Scholarship in 2020 base on his research activity.

- Received VA APT Wen Ko Summer Internship at VA APT Center SU'19
- Kevin Cheng, MS student '18 - '19
 - Project: Investigated neural mechanisms of stimulation-induced proprioception in lower limb amputees
 - Published a first-author conference paper (4-page) Proceedings of 9th International IEEE/EMBS Conference on Neural Engineering.
 - Next position: Research Associate at CWRU
- Natalie Bick, Senior in BME SU' 18
 - Project: Analyzing changes in Center of Pressure in lower-limb amputees using sensory neuroprosthesis
 - Next position: PhD student at University of Pittsburgh
- Neha Anilkumar, MS student S'17
 - Project: Interfacing pressure insole sensors to an external controller system
 - Next position: Quality engineer at Freudenberg Medical
- Alexandra Wolkoff, Junior in BME SU'17
 - Project: Analysis of kinematic data from overground walking in lower-limb amputees
 - Received VA APT Wen Ko Summer Internship SU'17
 - Next position: Graduate student of Engineering Management at Johns Hopkins University

Neural Engineering Lab., GMU:

- Thao Tran, Junior in BME
 - Received Undergraduate Research Scholars Program (URSP) award S'15
 - Co-author on the article published in *Sensors and Actuators B: Chemical* - 2016
 - Next position: Patent Examiner at USPTO
- Susheela Meyyappan, Senior in BME
 - Received URSP award S'13
 - Co-author on the article published in *Brain Research* - 2015
 - Next position: Student Trainee at US Naval Research Laboratory

Co-Mentorship with Ronald Triolo:

- Daekyoo Kim, Postdoctoral Scholar '20 -
- Suzhou Li, PhD student in BME '19 -
- Breanne Christie, PhD student in BME (*Graduated with PhD*) '16 - '19

**Staff
Management &
Training**

Name & Position	Year	My Role
Jillian Vala, Biomedical Engineer	'21 -	Manager
James Huang, Electrical Engineer	'19 -	Co-Manager
William Rasper, Biomedical Engineer	'20	Co-Manager
Diana Suciu, Biomedical Engineer	'19 - '20	Co-Manager
Nithya Kanagasegar, Lab Manager	'18 - '19	Co-Manager
Alex Roman, Electrical Engineer	'18 - '19	Co-Manager
Elizabeth Doolittle, Engineer & Regulatory Coordinator	'17 - '18	Co-Manager

Professional Service

Conference Service:

- Co-Moderator, Mini-Symposium on Technologies to Restore Sensory Feedback after Lower-Limb Amputation, 10th International IEEE/EMBS Conference on Neural Engineering (NER'21) May 4-6, '21
- Organizer and Moderator, Mini-Symposium on Recent Advances in Sensory Neuroprostheses, 42nd Annual International Conferences of the IEEE Engineering in Medicine and Biology Society (EMBC 2020) July 20-24, '20
- Program Committee Member, *International Conference on Biomedical Electronics and Devices* '17 - '20

STEM outreach activities:

- Interactive STEM workshop for 10th and 11th graders, Accelerated Learning Program under W.E.B. DuBois Scholars Institute, held at Princeton University, NJ
 - Taught how electrical circuits play a role in our world by teaching students to build a flashlight and a wind turbine Mar. 2, '19
 - Taught engineering design process by teaching students how to design an electric car Mar. 3, '18
 - Taught basic electrical circuits concepts through repairing and adapting toys for children with disabilities Mar. 4, '17
- Co-hosted (with Dr. Nathalia Peixoto) lab visits and provided hands-on experience to promote STEM education:
 - Centerville High School Math Club (24 students) Apr. 9, '15
 - MasonU: underrepresented student populations in K-8 schools (35 students) Mar. 7, '14
 - Bioengineering and Robotics for 8th graders (43 students) Oct. 18, '13
 - Girl Scouts (4th and 5th grade) (15 students) Nov. 5, '13

Served as a judge in the following events:

- Research ShowCASE undergraduate poster presentation, Case Western Reserve University Apr. 15, '16 & Apr. 20, '18
- IEEE Region 2 Student Activities Conference, Cleveland State University Apr. 9, '16
- Support of Undergraduate Research & Creative Endeavors (SOURCE) poster session, Case Western Reserve University Dec. 4, '15
- Northern Virginia Regional Science and Engineering Fair - Works of students in Grades 7 through 12 from schools in Alexandria, Arlington, and Falls Church City, VA March 1, '14

Served as reviewer:

- Disability and Rehabilitation (DARE) Program at the National Science Foundation (SNF) '20
- VA Merit Review Award Program (Internal Reviewer at Cleveland VA) '18 -
- VA SPiRE Program (Internal Reviewer at Cleveland VA) '17 -
- Initial IRB reviewer at VA Northeast Ohio Healthcare System '20 -

Invited manuscript reviewer:

- Nature Scientific Reports
- PLOS ONE
- Journal of Neural Engineering
- Journal of NeuroEngineering and Rehabilitation
- IEEE Transactions on Neural Systems & Rehabilitation Engineering
- IEEE Transactions on Biomedical Engineering
- Journal of Rehabilitation and Assistive Technologies Engineering
- Prosthesis
- ACS Applied Materials & Interfaces
- Neurocomputing
- IEEE Engineering in Medicine and Biology Conference (EMBC)
- Neuromodulation
- Acta Biomaterialia
- Journal of Neuroscience Methods
- Journal of Rehabilitation Research and Development
- Molecules
- Electronics
- Micromachines
- Neuropsychiatric Disease and Treatment
- 2D Materials
- Biotechnology Letters
- International Conference on Biomedical Electronics and Devices

Committee and other service assignments:

- Associate Editor, *International Journal of Biosensors and Bioelectronics* '18 -
- Member of CWRU Postdoc Association Leadership Committee '16 - '18
- Member of CWRU Faculty Senate Committee on Graduate Studies '17 - '18
- Member of CWRU Faculty Senate Committee on University Library '18

Media Coverage

- Sensory prosthetic projects presented at the 2nd annual VA Research Day on the Hill Jun. 20, '19
- On small business: story on international students in the STEM field. Washington Post (J.D. Harrison) Apr. 21, '13
- Mason Professors Win Virginia Center of Aging Grant. Connection Newspapers (M. Campbell) Oct. 5, '14
- Cultured neuronal networks on microelectrode arrays as a platform for screening potential Alzheimer's drugs. ALTTOX: methods for non-animal testing (Sherry Ward) Aug. 5, '16

Memberships

- Institute of Electrical and Electronics Engineers (IEEE) 8 years
- IEEE Engineering in Medicine and Biology Society (EMBS) 4 years
- IEEE Young Professionals 4 years
- Society for Neuroscience (SfN) 8 years