

PEDRAM MOHSENI

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EDUCATION:

- **Ph.D. in Electrical Engineering**, University of Michigan, Ann Arbor, MI Jan 2000 – Aug 2005

Dissertation Title: *Single-Chip Wireless Microsystems for Multichannel Neural Biopotential Recording*

Dissertation Advisor: *Professor Khalil Najafi*

I conducted my dissertation research on single-chip, battery-powered, standalone, bi-directional, wireless microsystems featuring the highest number of available input channels and the lowest power consumption reported at the time for neural biopotential recording applications. To develop such technology for implementation in experimental paradigms, I collaborated with the neurobiology research laboratories at the University of Pennsylvania and Johns Hopkins University School of Medicine to record neural biopotentials from an awake non-human primate. These systems can serve as valuable test vehicles to obtain a fundamental knowledge of the numerous trade-offs involved in designing integrated biomicrosystems with respect to their power consumption (or lifetime), operating voltage, choice of carrier frequency, number of recording channels, overall dimensions, weight, and level of integration.

- **M.S. in Electrical Engineering**, University of Michigan, Ann Arbor, MI Sep 1997 – Aug 1999

One year extra coursework in Electrical Engineering: Systems; University of Michigan, Ann Arbor, MI

- **B.S. in Electrical Engineering**, Sharif University of Technology, Tehran, IRAN Sep 1992 – Sep 1996

Senior Design Project Title: *Digital Filter Design Using TMS320C25 Digital Signal Processor*

PROFESSIONAL EXPERIENCE:

- **Professor**, Electrical Engineering and Computer Science (EECS) Department, Case Western Reserve University, Cleveland, OH Jul 2016 – Present

Secondary Appointment in Biomedical Engineering Dept, Case Western Reserve University 2016 – Present

- **Associate Professor**, EECS Department, Case Western Reserve Univ., Cleveland, OH Jul 2011 – Jun 2016

Secondary Appointment in Biomedical Engineering Dept, Case Western Reserve University 2011 – 2016

- **Assistant Professor**, EECS Department, Case Western Reserve Univ., Cleveland, OH Aug 2005 – Jun 2011

Secondary Appointment in Biomedical Engineering Dept, Case Western Reserve University 2009 – 2011

- **Graduate Student Research Assistant**, Center for Wireless Integrated MicroSystems (WIMS), EECS Department, University of Michigan, Ann Arbor, MI Sep 1998 – Aug 2005

- **Digital Signal Processing (DSP) Engineer**, Canopus Systems Inc., Ann Arbor, MI Jun 1998 – Dec 1998

- **Graduate Student Research Assistant**, Biomedical Ultrasonic Laboratory, Biomedical Engineering Department, University of Michigan, Ann Arbor, MI Jan 1998 – Jun 1998

- **Manager of microwave oven manufacturing and assembly line**, Butane Industrial Co., Tehran, IRAN
Sep 1996 – Sep 1997

RESEARCH INTERESTS:

Neuroengineering microsystems, Analog/mixed-signal/radio-frequency (RF) integrated circuits for neurotechnology, Low-power low-voltage interface circuits for micro/nano-scale sensors and systems, Biomedical microtelemetry, Wireless brain-machine interfaces, Wireless sensing/actuating systems, Point-of-care (POC) diagnostic platforms for personalized health

RESEARCH COLLABORATORS:

- Professor Randolph J. Nudo, Rehabilitation Medicine Dept, University of Kansas Medical Center
- Professor Paul A. Garris, Biological Sciences School, Illinois State University
- Professor Kevin L. Kilgore, Louis Stokes Cleveland Dept of Veterans Affairs Medical Center
- Professor Evi X. Stavrou, Hematology/Oncology Dept, Case Western Reserve University School of Medicine
- Professor Umut A. Gurkan, Mechanical and Aerospace Engineering Dept, Case Western Reserve University
- Professor Anirban Sen Gupta, Biomedical Engineering Dept, Case Western Reserve University
- Professor Dominique M. Durand, Biomedical Engineering Dept, Case Western Reserve University
- Professor Hillel J. Chiel, Biology Dept, Case Western Reserve University

HONORS, AWARDS, AND RECOGNITIONS:

- Selected for highlight in the Best of American Society of Hematology (ASH) 58th Annual Meeting & Exposition, San Diego, CA, December 5, 2016
- Selected for participation in the 58th ASH Annual Meeting & Exposition Press Program, San Diego, CA, December 3, 2016
- Nominated for John S. Diekhoff Award for Distinguished Graduate Student Teaching 2016
- EECS Mihajlo “Mike” Mesarovic Award for Extraordinary Impact 2013
- Nominated for Distinguished Lecturer Program (DLP) of Institute of Electrical and Electronics Engineers (IEEE) Circuits and Systems (CAS) Society 2013
- Nominated for Best Student Paper Award, IEEE Custom Integr. Cir. Conf. (CICC’13), San Jose, CA, September 23-25, 2013
- Winner of top prize in the first Annual Medical Device Entrepreneur’s Forum in conjunction with 58th Annual American Society of Artificial Internal Organs (ASAIO) Conference, San Francisco, CA, June 15, 2012
- IEEE Senior Member 2011 – Present
- Case School of Engineering Research Award 2011
- Featured Investigator of the Year, Advanced Platform Technology (APT) Center – A Veterans Affairs (VA) Research Center of Excellence, Cleveland, OH 2010
- NSF Faculty Early Career Development (CAREER) Award 2009
- EECS Faculty Research Award for Exceptional Achievement 2008
- Selected as one of top 100 scientists nationwide to attend National Academies-Keck Futures Initiative (NAKFI) Workshop on Smart Prosthetics: Exploring Assistive Devices for the Body and Mind, Irvine, CA, November 9-11, 2006
- Ranked 17th among >300,000 participants in National University Entrance Exam, IRAN 1992

PROFESSIONAL ACTIVITIES:

Associate Editor

- IEEE Solid-State Circuits Letters 2017
- IEEE Transactions on Neural Systems and Rehabilitation Engineering 2012 – Present

- IEEE Transactions on Circuits and Systems – Part II 2010 – 2012
- IEEE Transactions on Biomedical Circuits and Systems 2008 – Present

Guest Associate Editor

- IEEE Transactions on Biomedical Circuits and Systems – Special Issue on 2016 IEEE Int. Solid State Circuits Conference (ISSCC) June 2017
- IEEE Transactions on Neural Systems and Rehabilitation Engineering – Special Issue on “Closing the Loop via Advanced Neurotechnologies” July 2012
- IEEE Journal on Emerging and Selected Topics in Circuits and Systems – Special Issue on “Brain-Machine Interface” December 2011

Administrative Committee (AdCom) Member

- IEEE Engineering in Medicine and Biology Society (EMBS) representative to IEEE Sensors Council 2014 – Present

National Institutes of Health Panelist

- National Institutes of Health Emerging Technologies in Neuroscience Special Emphasis Panel ZRG1 ETTN-D (02), 2017
- National Institute of Neurological Disorders and Stroke Special Emphasis Panel ZNS1 SRB-G (06), 2016
- National Institute on Drug Abuse-Cutting Edge Basic Research Award (NIDA-CEBRA) Special Emphasis Panel ZDA1 SXM-M (13) S, 2016
- National Institute of Neurological Disorders and Stroke Special Emphasis Panel ZNS1 SRB-G (02), 2015
- National Institute on Drug Abuse-Exceptional Unconventional Research Enabling Knowledge Acceleration (EUREKA) for Neuroscience and Disorders of the Nervous System Special Emphasis Panel ZDA1 MXL-F (08), 2013
- National Institute on Drug Abuse-Cutting Edge Basic Research Award (NIDA-CEBRA) Special Emphasis Panel ZDA1 MXS-M (02), 2009

National Science Foundation Panelist

- Research to Aid Persons with Disabilities (RAPD) Unsolicited Panel, 2006

Tutorial Workshop Speaker

- IEEE Biomedical Circuits and Systems (BioCAS) Conf., Shanghai, China, October 17, 2016
- International Neurotechnology Consortium Workshop: Frontiers of Neurotechnology – Innovations and Translation, 36th Annu. Int. IEEE Eng. Med. Biol. Conf. (EMBC), Chicago, IL, August 26, 2014
- RF-Assisted Medicine, Int. Microwave Symp. (IMS), Seattle, WA, June 2, 2013
- Third Annual Workshop on Brain-Machine Interfaces, IEEE Int. Conf. Systems, Man, and Cybernetics (SMC), Anchorage, AK, October 10-11, 2011
- Implantable/Wearable Biomedical Circuits and Systems, Int. IEEE Eng. Med. Biol. Conf. (EMBC), Boston, MA, September 2, 2011
- RF Biomedical Electronics and Sensors, Int. Microwave Symp. (IMS), Baltimore, MD, June 5, 2011

Special Session Organizer/Session Chair

- Session Organizer, Wearable Microelectronic Circuits and Systems, IEEE Int. Symp. Circ. Syst. (ISCAS), Florence, Italy, May 27-30, 2018
- Session Chair, Advanced Biomedical Systems, IEEE Int. Solid State Circ. Conf. (ISSCC), San Francisco, CA, February 11-15, 2018
- Session Organizer, Wireless Power and Data Transfer to Biomedical Implants, IEEE Int. Symp. Circ. Syst. (ISCAS), Baltimore, MD, May 28-31, 2017
- Session Chair, Biomedical Circuits and Systems, IEEE Custom Integr. Cir. Conf. (CICC), Austin, TX, May 1-3, 2017
- Session Organizer, Advanced Implantable Systems for Neural and Rehabilitation Engineering, Int. IEEE Eng. Med. Biol. Conf. (EMBC), Orlando, FL, August 16-20, 2016
- Session Organizer, Micro/Nanofabricated Devices for Biomedical Sensing and Diagnostics, Int. IEEE Eng. Med. Biol. Conf. (EMBC), Orlando, FL, August 16-20, 2016
- Session Organizer, Advanced Bioelectronics for Implantable/Wearable Applications, IEEE Int. Symp. Circ. Syst. (ISCAS), Montreal, Canada, May 22-25, 2016
- Session Chair, Advanced Bioelectronic Interfaces, Int. IEEE Eng. Med. Biol. Conf. (EMBC), Milan, Italy, August 25-29, 2015
- Session Chair, Stimulation and Monitoring Technologies, Int. IEEE Eng. Med. Biol. Conf. (EMBC), Milan, Italy, August 25-29, 2015
- Session Chair, Circuits for Biomedical Applications, IEEE Int. Symp. Circ. Syst. (ISCAS), Lisbon, Portugal, May 24-27, 2015
- Session Chair, Energy-Efficient Biosensing Systems, IEEE Custom Integr. Cir. Conf. (CICC), San Jose, CA, September 15-17, 2014
- Panel Co-Organizer, Wearable Electronics and Computing, IEEE Custom Integr. Cir. Conf. (CICC), San Jose, CA, September 15-17, 2014
- Panel Co-Organizer, Can Biomedical Electronics Start-ups Make Money?, IEEE Custom Integr. Cir. Conf. (CICC), San Jose, CA, September 23-25, 2013
- Session Chair, Low-Power Pulse-Based Radios, 2013 IEEE Radio-Frequency Integr. Cir. (RFIC) Symposium, Seattle, WA, June 2-4, 2013
- Session Chair, Biomedical and Sensors, IEEE Custom Integr. Cir. Conf. (CICC), San Jose, CA, September 9-12, 2012
- Session Chair, Stimulation Techniques and Devices, Int. IEEE Eng. Med. Biol. Conf. (EMBC), San Diego, CA, August 28-September 1, 2012
- Session Chair, Physiological Monitoring, Int. IEEE Eng. Med. Biol. Conf. (EMBC), San Diego, CA, August 28-September 1, 2012
- Session Chair, Low-Power Solutions for Wireless Sensor Applications, 2012 IEEE Radio-Frequency Integr. Cir. (RFIC) Symposium, Montreal, Canada, June 17-19, 2012
- Session Organizer, Neural Sensing and Applications, Int. IEEE Eng. Med. Biol. Conf. (EMBC), Minneapolis, MN, September 2-6, 2009
- Session Organizer, Advanced Neural Microsystems, IEEE Int. Symp. Circ. Syst. (ISCAS), Seattle, WA, May 18-21, 2008
- Session Organizer, Neuroengineering Circuits and Microsystems, IEEE Int. Symp. Circ. Syst. (ISCAS), New Orleans, LA, May 27-30, 2007

Technical Program Committee/Review Committee Member

- General Co-Chair, IEEE Biomedical Circuits and Systems (BioCAS) Conf., Cleveland, OH, October 2018
- Technical Program Committee Member, Imagers, MEMS, Medical & Display (IMMD) Subcommittee, IEEE Int. Solid State Circuits Conf. (ISSCC) 2017 – Present
- Technical Program Committee Co-Chair, IEEE Biomedical Circuits and Systems (BioCAS) Conf., Turin, Italy, October 19-21, 2017

- Special Session Co-Chair, IEEE Biomedical Circuits and Systems (BioCAS) Conf., Shanghai, China, October 17-19, 2016
- Technical Program Co-Chair, IEEE Forum on Emerging and Selected Topics in Circuits and Systems (IEEE CAS-FEST): Lab-on-CMOS Systems, Montreal, Canada, May 26, 2016
- Tutorials Co-Chair, IEEE Biomedical Circuits and Systems (BioCAS) Conf., Atlanta, GA, October 22-24, 2015
- Technical Program Subcommittee Chair, Biomedical, Actuators, MEMS, and Sensors (BAMS), IEEE Custom Integrated Circuits Conf. (CICC) 2015
- Panels Co-Chair, IEEE Custom Integrated Circuits Conf. (CICC) 2015 – Present
- Technical Program Subcommittee Co-Chair, Low-Power Transceivers: RFID, NFC, Zigbee, WPAN, WBAN, Biomedical, Sensor Nodes, IEEE Radio-Frequency Integrated Circuits (RFIC) Symposium 2013 – 2014
- Technical Program Committee Member, IEEE Custom Integrated Circuits Conf. (CICC) 2012 – Present
- Technical Program Committee Member, IEEE Radio-Frequency Integrated Circuits (RFIC) Symp. 2012 – 2015
- Technical Program Co-Chair, IEEE Forum on Emerging and Selected Topics in Circuits and Systems (IEEE CAS-FEST): Brain-Machine/Brain-Computer Interfaces (BMI/BCI), Rio de Janeiro, Brazil, May 15, 2011
- IEEE International Symposium on Circuits and Systems (ISCAS) Conference 2008 – Present
- IEEE Biomedical Circuits and Systems (BioCAS) Conference 2008 – Present
- Wearable Biomedical Sensors and Systems Technical Committee (WBSS-TC) in IEEE Engineering in Medicine and Biology Society (EMBS) 2015 – Present
- Biomedical Circuits and Systems Technical Committee (BioCAS-TC) in IEEE Circuits and Systems (CAS) Society 2007 – Present
- Analog Signal Processing Technical Committee (ASP-TC) in IEEE Circuits and Systems (CAS) Society 2007 – 2012

Technical Reviewer

- IEEE Journal of Solid-State Circuits 2002 – Present
- IEEE Transactions on Biomedical Circuits and Systems 2007 – Present
- IEEE Transactions on Biomedical Engineering 2004 – Present
- IEEE Transactions on Neural Systems and Rehabilitation Engineering 2007 – Present
- IEEE Transactions on Circuits and Systems 2005 – Present
- IEEE Sensors Journal 2004 – Present
- IEEE Journal of Microelectromechanical Systems 2007 – Present
- IEEE Electron Device Letters 2013 – Present
- IEEE Transactions on Microwave Theory and Techniques 2009 – Present

Professional Memberships

- Member of *IEEE* 1994 – Present
- Member of *IEEE Solid-State Circuits, Circuits & Systems, and Engineering in Medicine & Biology Societies*

PATENTS/INVENTION DISCLOSURES (*CWRU mentee co-author is underlined*):

Issued

- R. J. Nudo, **P. Mohseni**, D. Guggenmos, and M. Azin, *Methods and Associated Neural Prosthetic Devices for Bridging Brain Areas to Improve Function*, U.S. Patent No. 9,533,150 (Continuation) Awarded on January 3, 2017
- R. J. Nudo, **P. Mohseni**, D. Guggenmos, and M. Azin, *Methods and Associated Neural Prosthetic Devices for Bridging Brain Areas to Improve Function*, U.S. Patent No. 9,008,780 Awarded on April 14, 2015

Pending

- **P. Mohseni**, M. Suster, U. Gurkan, and M. Bakhshiani, *Sensor Apparatus, Systems and Methods of Making Same*, Inter. Application No. PCT/US17/13797 Filed on January 17, 2017
- **P. Mohseni**, M. Suster, U. Gurkan, and M. Bakhshiani, *Sensor Apparatus, Systems and Methods of Making Same*, U.S. Non-Provisional Application No. 14/728,642 Filed on June 2, 2015
- R. J. Nudo, **P. Mohseni**, D. Guggenmos, and M. Azin, *Methods and Associated Neural Prosthetic Devices for Bridging Brain Areas to Improve Function*, Inter. Application No. PCT/US2012/42381 Filed on June 14, 2012

Filed

- **P. Mohseni**, P. A. Garris, and B. Bozorgzadeh, *Methods and Associated Neural Prosthetic Devices for Control of Brain Neurochemistry*, U.S. Provisional Application No. 62/174,904 Filed on June 12, 2015
- H. Chiel, H. Martin, **P. Mohseni**, H. Baskaran, and C. Mastrangelo, *An Artificial Synapse for Sensing and Controlling Chemical and Electrical Activity in the Brain*, Invention Disclosure, Case Western Reserve University, July 2006

PUBLICATIONS/PRESENTATIONS (*CWRU mentee co-author is underlined*):

Book Chapter

- [BC2] D. P. Covey, K. E. Bennet, C. D. Blaha, **P. Mohseni**, K. H. Lee, and P. A. Garris, *Technological Evolution of Wireless Neurochemical Sensing with Fast-Scan Cyclic Voltammetry*, in *Integrated Microsystems and Nanotechnology* (K. Iniewski, ed.), pp. 147-164, Boston, MA: Artech House, 2011.
- [BC1] **P. Mohseni**, *Integrated Circuits for Neural Interfacing: Neurochemical Recording*, in *VLSI Circuits for Biomedical Applications* (K. Iniewski, ed.), pp. 179-190, Norwood, MA: Artech House, 2008.

Refereed Journal Publications – Pending Review

- [J30] D. Maji, M. De La Fuente, E. Kucukal, U. D. S. Sekhon, A. H. Schmaier, A. Sen Gupta, U. A. Gurkan, M. T. Nieman, E. X. Stavrou, **P. Mohseni**, and M. A. Suster, “Assessment of whole blood coagulation with a microfluidic dielectric sensor,” *J. Thrombosis and Haemostasis*, January 2018, *revision to be reviewed*.
- [J29] R. Erfani, F. Marefat, A. M. Sodagar, and **P. Mohseni**, “Modeling and characterization of capacitive elements with tissue as dielectric material for wireless powering of neural implants,” *IEEE Trans. Neural Syst. Rehab. Eng.*, December 2017, *under review*.
- [J28] A. Alizadeh, H. R. Bahrami, M. Maleki, N. H. Tran, and **P. Mohseni**, “On the coexistence of nanonetworks: Sensing techniques for molecular communications,” *IEEE Trans. Molecular Biol. Multi-Scale Comm.*, June 2017, *under review*.

Refereed Journal Publications – In Press

- [J27] S. Shahdoost, S. B. Frost, D. J. Guggenmos, J. Borrell, C. Dunham, S. Barbay, R. J. Nudo, and **P. Mohseni**, “A brain-spinal interface (BSI) system-on-chip (SoC) for closed-loop cortically-controlled intraspinal microstimulation,” *J. Analog Integr. Circ. Sig. Process.*, December 2017, *accepted for publication*.
- [J26] H. Zamani, H. R. Bahrami, P. Chalwadi, P. A. Garris, and **P. Mohseni**, “C-FSCV: Compressive fast-scan cyclic voltammetry for brain dopamine recording,” *IEEE Trans. Neural Syst. Rehab. Eng.*, October 2017, *accepted for publication*.

- [J25] D. Maji, M. A. Suster, E. Kucukal, U. D. S. Sekhon, A. Sen Gupta, U. A. Gurkan, E. X. Stavrou, and **P. Mohseni**, “ClotChip: A microfluidic dielectric sensor for point-of-care assessment of hemostasis,” *IEEE Trans. Biomed. Circ. Syst.*, August 2017, *accepted for publication*.
- [J24] R. Erfani, F. Marefat, A. M. Sodagar, and **P. Mohseni**, “Modeling and experimental validation of a capacitive link for wireless power transfer to biomedical implants,” *IEEE Trans. Circ. Syst. – Part II: Exp. Briefs*, August 2017, *accepted for publication*.

Refereed Journal Publications – Published

- [J23] S. Shahdoost, R. J. Nudo, and **P. Mohseni**, “Generation of stimulus triggering from intracortical spike activity for brain-machine-body interfaces (BMBIs),” *IEEE Trans. Neural Syst. Rehab. Eng.*, vol. 25, no. 7, pp. 998-1008, July 2017.
- [J22] M. A. Suster, N. H. Vitale, D. Maji, and **P. Mohseni**, “A circuit model of human whole blood in a microfluidic dielectric sensor,” *IEEE Trans. Circ. Syst. – Part II: Exp. Briefs*, vol. 63, no. 12, pp. 1156-1160, December 2016 (**Invited paper from 2016 IEEE Int. Symp. Circ. Syst. – Late Breaking News**).
- [J21] B. Bozorgzadeh, D. Schuweiler, M. Bobak, P. A. Garris, and **P. Mohseni**, “Neurochemostat: A neural interface SoC with integrated chemometrics for closed-loop regulation of brain dopamine,” *IEEE Trans. Biomed. Circ. Syst.*, vol. 10, no. 3, pp. 654-667, June 2016.
- [J20] M. Bakhshiani, M. A. Suster, and **P. Mohseni**, “A 9MHz–2.4GHz fully integrated transceiver IC for a microfluidic-CMOS platform dedicated to miniaturized dielectric spectroscopy,” *IEEE Trans. Biomed. Circ. Syst.*, vol. 9, no. 6, pp. 849-861, December 2015 (**Invited paper from 2015 IEEE Int. Solid State Circuits Conf.**).
- [J19] A. Ebrazeh and **P. Mohseni**, “30pJ/b, 67Mbps, centimeter-to-meter range data telemetry with an IR-UWB wireless link,” *IEEE Trans. Biomed. Circ. Syst.*, vol. 9, no. 3, pp. 362-369, June 2015.
- [J18] K. Limnusun, H. Lu, H. J. Chiel, and **P. Mohseni**, “A bidirectional neural interface SoC with an integrated spike recorder, microstimulator, and low-power processor for real-time stimulus artifact rejection,” *J. Analog Integr. Circ. Sig. Process.*, vol. 82, no. 2, pp. 457-470, February 2015.
- [J17] M. Bakhshiani, M. A. Suster, and **P. Mohseni**, “A broadband sensor interface IC for miniaturized dielectric spectroscopy from MHz to GHz,” *IEEE J. Solid-State Circuits*, vol. 49, no. 8, pp. 1669-1681, August 2014 (**Invited paper from 2013 IEEE Custom Integr. Circ. Conf.**).
- [J16] K. Limnusun, H. Lu, H. J. Chiel, and **P. Mohseni**, “Real-time stimulus artifact rejection via template subtraction,” *IEEE Trans. Biomed. Circ. Syst.*, vol. 8, no. 3, pp. 391-400, June 2014.
- [J15] B. Bozorgzadeh, D. P. Covey, C. D. Howard, P. A. Garris, and **P. Mohseni**, “A neurochemical pattern generator SoC with switched-electrode management for single-chip electrical stimulation and 9.3 μ W, 78pA_{rms}, 400V/s FSCV sensing,” *IEEE J. Solid-State Circuits*, vol. 49, no. 4, pp. 881-895, April 2014 (**Invited paper from 2013 IEEE Symp. VLSI Circuits**).
- [J14] D. J. Guggenmos, M. Azin, S. Barbay, J. D. Mahnken, C. Dunham, **P. Mohseni**, and R. J. Nudo, “Restoration of function after brain damage using a neural prosthesis,” *Proc. Natl. Acad. Sci. USA (PNAS)*, vol. 110, no. 52, pp. 21177-21182, December 2013.
- [J13] **P. Mohseni** and M. Ghovanloo, “Guest Editorial: Closing the Loop via Advanced Neurotechnologies,” *IEEE Trans. Neural Syst. Rehab. Eng.*, vol. 20, no. 4, pp. 407-409, July 2012.
- [J12] M. Sawan, **P. Mohseni**, P. Sajda, and J. C. Sanchez, “Guest Editorial: Brain-Machine Interface,” *IEEE J. Emerging Selected Topics Circ. Syst.*, vol. 1, no. 4, pp. 437-439, December 2011.
- [J11] M. Azin, D. J. Guggenmos, S. Barbay, R. J. Nudo, and **P. Mohseni**, “A miniaturized system for spike-triggered intracortical microstimulation in an ambulatory rat,” *IEEE Trans. Biomed. Eng.*, vol. 58, no. 9, pp. 2589-2597, September 2011.

- [J10] M. Azin, D. J. Guggenmos, S. Barbay, R. J. Nudo, and **P. Mohseni**, “A battery-powered activity-dependent intracortical microstimulation IC for brain-machine-brain interface,” *IEEE J. Solid-State Circuits*, vol. 46, no. 4, pp. 731-745, April 2011 (**Invited paper from 2010 IEEE Symp. VLSI Circuits**).
- [J9] M. Roham, D. P. Covey, D. P. Daberkow, E. S. Ramsson, C. D. Howard, B. A. Heidenreich, P. A. Garris, and **P. Mohseni**, “A wireless IC for time-share chemical and electrical neural recording,” *IEEE J. Solid-State Circuits*, vol. 44, no. 12, pp. 3645-3658, December 2009 (**Invited paper from 2009 IEEE Int. Solid State Circuits Conf.**).
- [J8] J. M. Bledsoe, C. J. Kimble, D. P. Covey, C. D. Blaha, F. Agnesi, **P. Mohseni**, et al., “Development of the wireless instantaneous neurotransmitter concentration system for intraoperative neurochemical monitoring using fast-scan cyclic voltammetry,” *J. Neurosurgery*, vol. 111, pp. 712-723, October 2009.
- [J7] K. H. Lee, C. D. Blaha, P. A. Garris, **P. Mohseni**, et al., “Evolution of deep brain stimulation: Human electrometer and smart devices supporting the next generation of therapy,” *J. Neuromodulation: Technology at the Neural Interface*, vol. 12, no. 2, pp. 85-103, April 2009.
- [J6] M. Roham, J. M. Halpern, H. B. Martin, H. J. Chiel, and **P. Mohseni**, “Wireless amperometric neurochemical monitoring using an integrated telemetry circuit,” *IEEE Trans. Biomed. Eng.*, vol. 55, no. 11, pp. 2628-2634, November 2008.
- [J5] M. Roham, D. P. Daberkow, E. S. Ramsson, D. P. Covey, S. Pakdeeronachit, P. A. Garris, and **P. Mohseni**, “A wireless IC for wide-range neurochemical monitoring using amperometry and fast-scan cyclic voltammetry,” *IEEE Trans. Biomed. Circ. Syst.*, vol. 2, no. 1, pp. 3-9, March 2008 (**Invited paper from 2007 IEEE Int. Symp. Circ. Syst.**).
- [J4] **P. Mohseni**, K. Najafi, S. J. Eliades, and X. Wang, “Wireless multichannel biopotential recording using an integrated FM telemetry circuit,” *IEEE Trans. Neural Syst. Rehab. Eng.*, vol. 13, no. 3, pp. 263-271, September 2005.
- [J3] **P. Mohseni** and K. Najafi, “A 1.48-mW low-phase-noise analog frequency modulator for wireless biotelemetry,” *IEEE Trans. Biomed. Eng.*, vol. 52, no. 5, pp. 938-943, May 2005.
- [J2] **P. Mohseni** and K. Najafi, “A fully integrated neural recording amplifier with DC input stabilization,” *IEEE Trans. Biomed. Eng.*, vol. 51, no. 5, pp. 832-837, May 2004.
- [J1] **P. Mohseni**, K. Nagarajan, B. Ziaie, K. Najafi, and S. B. Crary, “An ultralight biotelemetry backpack for recording EMG signals in moths,” *IEEE Trans. Biomed. Eng.*, vol. 48, no. 6, pp. 734-737, June 2001.

Refereed Conference Publications – Submitted

- [C67] G. Kalantar, S. K. Mukhopadhyay, F. Marefat, **P. Mohseni**, and A. Mohammadi, “WAKE-BPAT: Wavelet-based adaptive Kalman filtering for blood pressure estimation via fusion of pulse arrival times,” *IEEE Int. Conf. Acoustics, Speech, Signal Proc. (ICASSP)*, Calgary, Alberta, CA, April 15-20, 2018.

Refereed Conference Publications – Accepted

None

Refereed Conference Publications – Published

- [C66] R. Erfani, F. Marefat, A. M. Sodagar, and **P. Mohseni**, “Transcutaneous capacitive wireless power transfer (C-WPT) for biomedical implants,” in *Proc. IEEE Int. Symp. Circuits and Systems (ISCAS)*, pp. 2561-2564, Baltimore, MD, May 28-31, 2017.

- [C65] H. Zamani, H. Bahrami, P. A. Garris, and **P. Mohseni**, “On the use of compressive sensing (CS) for brain dopamine recording with fast-scan cyclic voltammetry (FSCV),” in *Proc. IEEE Int. Symp. Circuits and Systems (ISCAS)*, pp. 310-313, Baltimore, MD, May 28-31, 2017.
- [C64] E. Kucukal, D. Maji, M. A. Suster, **P. Mohseni**, and U. A. Gurkan, “Monitoring blood coagulation using a surface-functionalized microfluidic dielectric sensor,” in *Proc. 12th Annu. IEEE Int. Conf. Nano/Micro Engineered Molecular Syst. (NEMS)*, pp. 752-755, Los Angeles, CA, April 9-12, 2017.
- [C63] H. Zamani, H. Bahrami, and **P. Mohseni**, “On the use of compressive sensing (CS) exploiting block sparsity for neural spike recording,” in *Proc. IEEE Biomedical Circuits and Systems Conf. (BioCAS)*, pp. 228-231, Shanghai, China, October 17-19, 2016.
- [C62] S. Shahdoost, S. Frost, D. Guggenmos, J. Borrell, C. Dunham, S. Barbay, R. Nudo, and **P. Mohseni**, “A miniaturized brain-machine-spinal cord interface (BMSI) for closed-loop intraspinal microstimulation,” in *Proc. IEEE Biomedical Circuits and Systems Conf. (BioCAS)*, pp. 364-367, Shanghai, China, October 17-19, 2016.
- [C61] F. Marefat, R. Erfani, K. L. Kilgore, and **P. Mohseni**, “Minimally invasive muscle-based recording of photoplethysmogram toward chronic implantation,” in *Proc. IEEE Biomedical Circuits and Systems Conf. (BioCAS)*, pp. 388-391, Shanghai, China, October 17-19, 2016.
- [C60] D. Maji, M. A. Suster, E. Kucukal, U. A. Gurkan, E. X. Stavrou, and **P. Mohseni**, “A PMMA microfluidic dielectric sensor for blood coagulation monitoring at the point-of-care,” in *Proc. 38th Annu. Int. IEEE Eng. Med. Biol. Conf. (EMBC)*, pp. 291-294, Orlando, FL, August 16-20, 2016.
- [C59] H. Zamani, C. Chen, X. Tang, **P. Mohseni**, and S. Mandal, “A current-controlled transceiver IC for structural health monitoring,” in *Proc. IEEE Int. New Circuits and Systems (NEWCAS) Conf.*, Vancouver, Canada, June 26-29, 2016.
- [C58] M. Bakhshiani, M. A. Suster, and **P. Mohseni**, “A palmtop platform for miniaturized dielectric spectroscopy from MHz to GHz,” in *Proc. IEEE Int. New Circuits and Systems (NEWCAS) Conf.*, Vancouver, Canada, June 26-29, 2016.
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- [C27] K. Limnusun, H. Lu, H. J. Chiel, and **P. Mohseni**, “FPGA implementation of an IIR temporal filtering technique for real-time stimulus artifact rejection,” in *Proc. IEEE Biomed. Circuits and Systems Conf. (BioCAS)*, pp. 49-52, San Diego, CA, November 10-12, 2011.
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- [C14] M. Azin, E. T. Urban, III, R. J. Nudo, and **P. Mohseni**, “Implantable microsystems for anatomical rewiring of cortical circuitry,” *38th Neural Interfaces Conf. (NIC)*, Cleveland, OH, June 16-18, 2008.
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- [C5] **P. Mohseni** and K. Najafi, “A battery-powered 8-channel wireless FM IC for biopotential recording applications,” in *Dig. Tech. Papers IEEE Int. Solid State Circuits Conf. (ISSCC)*, pp. 560-561, San Francisco, CA, February 6-10, 2005.

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- [C1] **P. Mohseni**, K. Nagarajan, B. Ziaie, K. Najafi, and S. B. Crary, "Robotics at the interface of microsystems technology and biology: Biobotics," in *Proc. Int. Adv. Robotics Program Workshop Micro-Robots, Micro-Machines, and Systems*, pp. 78-82, Institute for Problems in Mechanics, Russia Academy of Sciences, Moscow, Russia, November 24-25, 1999.

Conference/Workshop Presentations (Presenter name is italicized)

- [P14] *S. P. Ahuja*, *M. A. Suster*, *D. Maji*, U. D. S. Sekhon, J. Martin, A. Sen Gupta, and **P. Mohseni**, "Assessment of a novel dielectric microsensor for monitoring coagulation factor therapy in children with hemophilia with and without inhibitors," *59th American Society of Hematology (ASH) Annu. Meeting Expo.*, Atlanta, GA, December 9-12, 2017.
- [P13] *E. X. Stavrou*, *M. A. Suster*, *D. Maji*, E. Kucukal, U. D. S. Sekhon, A. H. Schmaier, A. Sen Gupta, U. A. Gurkan, and **P. Mohseni**, "A miniaturized microfluidic dielectric sensor for point-of-care assessment of blood coagulation," *58th American Society of Hematology (ASH) Annu. Meeting Expo.*, San Diego, CA, December 3-6, 2016.
- [P12] *S. Shahdoost*, S. Frost, D. Guggenmos, C. Dunham, J. Borrell, S. Barbay, V. Tolosa, R. Nudo, and **P. Mohseni**, "A miniaturized brain-machine-spinal cord interface (BMSI) for closed-loop intraspinal microstimulation," *Minnesota Neuromod. Symp.*, Minneapolis, MN, April 14-15, 2016.
- [P11] *M. A. Suster*, U. A. Gurkan, E. Stavrou, and **P. Mohseni**, "Toward a miniaturized dielectric coagulometer for point-of-care monitoring of blood coagulation disorders," *Napa Institute Workshop on Enabling Future Health Care: the Role of Micro and Nano Technologies*, Napa, CA, August 23-26, 2015.
- [P10] *S. Shahdoost*, R. J. Nudo, and **P. Mohseni**, *Student Research Preview (SRP) Session, IEEE Int. Solid State Circuits Conf. (ISSCC)*, San Francisco, CA, February 22, 2015.
- [P9] *M. Bakhshiani*, *M. A. Suster*, and **P. Mohseni**, *Student Research Preview (SRP) Session, IEEE Int. Solid State Circuits Conf. (ISSCC)*, San Francisco, CA, February 9, 2014.
- [P8] *D. J. Guggenmos*, C. Dunham, *M. Azin*, S. Barbay, J. D. Mahnken, **P. Mohseni**, and R. J. Nudo, "Neurophysiological effects of activity-dependent stimulation following a controlled cortical impact to primary motor cortex of the rat," *Program No. 79.12, 2013 Neuroscience Meeting Planner*, San Diego, CA, Society for Neuroscience, November 2013. Online.
- [P7] *D. J. Guggenmos*, *M. Azin*, S. Barbay, **P. Mohseni**, and R. J. Nudo, "Activity-dependent stimulation drives functional recovery after traumatic brain injury in the rat," *Program No. 682.16, 2012 Neuroscience Meeting Planner*, New Orleans, LA, Society for Neuroscience, October 2012. Online.
- [P6] *D. J. Guggenmos*, *M. Azin*, S. Barbay, **P. Mohseni**, and R. J. Nudo, "A wireless microsystem for activity-dependent stimulation of cortico-cortical networks," *Program No. 818.11, 2010 Neuroscience Meeting Planner*, San Diego, CA, Society for Neuroscience, November 2010. Online.
- [P5] *M. Azin*, D. J. Guggenmos, M. Nishibe, S. Barbay, *R. J. Nudo*, and **P. Mohseni**, "Implantable microsystems for anatomical rewiring of cortical circuitry," *Military Health Research Forum (MHRF)*, Kansas City, MO, August 31-September 3, 2009.

- [P4] *D. J. Guggenmos, S. Barbay, P. Mohseni, and R. J. Nudo, "A comparison of monopolar and bipolar electrodes for use in intracortical microstimulation," Program No. 101.23, 2008 Neuroscience Meeting Planner, Washington, DC, Society for Neuroscience, November 2008. Online.*
- [P3] *P. Mohseni, H. J. Chiel, and H. B. Martin, "Wireless recording of chemical and electrical neural activity in intact behaving animals," The National Academies Keck Futures Initiative Workshop on Smart Prosthetics: Exploring Assistive Devices for the Body and Mind, Irvine, CA, November 9-11, 2006.*
- [P2] *P. Mohseni and K. Najafi, "Single-chip wireless microsystems for multichannel neural biopotential recording," NIH-NINDS Neural Interfaces Workshop, Bethesda, MD, August 21-23, 2006.*
- [P1] *P. Mohseni and K. Najafi, "Bi-directional wireless microsystems for biomedical in vivo recording applications," SIGDA Ph.D. Forum at 40th Design Automation Conf. (DAC), Anaheim, CA, June 3, 2003.*

Invited Presentations (Seminars, Workshops)

- [IP29] *P. Mohseni, "Brain Sensing ICs," CICCx: IC Insights, Austin, TX, May 2, 2017.*
- [IP28] *P. Mohseni, "A miniaturized brain-machine-brain interface (BMBI) for restoration of function after brain injury," Center for Bioelectronic Medicine Seminar Series, Feinstein Institute for Medical Research, Long Island, NY, February 24, 2017.*
- [IP27] *P. Mohseni, "A miniaturized brain-machine-brain interface (BMBI) for restoration of function after brain injury," Dept of Electrical and Computer Engineering, The Ohio State University, Columbus, OH, February 12, 2016.*
- [IP26] *P. Mohseni, "Integrated systems for high-fidelity sensing and manipulation of brain neurochemistry," Integrated Systems Seminar Series, Ming-Hsieh Dept of Electrical Engineering, University of Southern California, Los Angeles, CA, November 21, 2014.*
- [IP25] *P. Mohseni, "A closed-loop brain prosthesis for functional recovery after TBI," International Neurotechnology Consortium Workshop: Frontiers of Neurotechnology – Innovations and Translation, 36th Annu. Int. IEEE Eng. Med. Biol. Conf. (EMBC), Chicago, IL, August 26, 2014.*
- [IP24] *P. Mohseni, "A miniaturized brain-machine-brain interface (BMBI) for restoration of function after brain injury," Cleveland Functional Electrical Stimulation (FES) Center Seminar Series, Cleveland, OH, April 2, 2014.*
- [IP23] *P. Mohseni, "A miniaturized brain-machine-brain interface (BMBI) for restoration of function after brain injury," Institute for Neural Computation (INC) & Institute of Engineering in Medicine (IEM) Neuroengineering Seminar Series, University of California-San Diego, San Diego, CA, November 4, 2013.*
- [IP22] *P. Mohseni, "Wireless real-time monitoring of brain neurochemistry," RF-Assisted Medicine Workshop, Int. Microwave Symp. (IMS), Seattle, WA, June 2, 2013.*
- [IP21] *P. Mohseni, "Real-time sensing of brain neurochemistry," Implantable and Bioelectronics Systems Workshop, Medical Design and Manufacturing (MD&M) Conf., Minneapolis, MN, November 1, 2012.*
- [IP20] *P. Mohseni, "Circuits and systems for real-time neurochemical sensing and activity-dependent intracortical microstimulation," Solid-State Electronics Laboratory (SSEL) Seminar Series, Dept of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor, MI, January 25, 2012.*
- [IP19] *P. Mohseni, "Circuits and systems for real-time neurochemical sensing and activity-dependent microstimulation in the brain," School of Electrical, Computer and Energy Engineering, Arizona State University, Tempe, AZ, October 27, 2011.*
- [IP18] *P. Mohseni, "A miniaturized system for spike-triggered intracortical microstimulation in a brain-machine-brain interface," 3rd Annu. Workshop Brain-Machine Interfaces, IEEE Int. Conf. Systems, Man, and Cybernetics (SMC), Anchorage, AK, October 10-11, 2011.*

- [IP17] **P. Mohseni**, “Wireless integrated systems for chemical and electrical neural recording: Challenges in high-site-density brain monitoring,” *RF Biomedical Electronics and Sensors Workshop, Int. Microwave Symp. (IMS)*, Baltimore, MD, June 5, 2011.
- [IP16] **P. Mohseni**, “Toward closing the loop: Circuits and systems for real-time neurochemical sensing and activity-dependent intracortical microstimulation,” *Berkeley Sensor and Actuator Center (BSAC) Seminar Series, University of California-Berkeley*, Berkeley, CA, April 26, 2011.
- [IP15] **P. Mohseni**, “Integrated circuits and systems for brain neuromonitoring and microstimulation,” *Neural Prosthesis Seminar Series, Case Western Reserve University*, Cleveland, OH, January 15, 2010.
- [IP14] **P. Mohseni**, “A wireless integrated microsystem for time-share chemical and electrical neural recording,” *Dept of Electrical Engineering, Sharif University of Technology*, Tehran, Iran, March 8, 2009.
- [IP13] **P. Mohseni**, “Wireless integrated devices for brain monitoring,” *CMOS Emerging Technologies Workshop*, Vancouver, BC, Canada, August 6, 2008.
- [IP12] **P. Mohseni**, “Wireless integrated devices for brain monitoring and stimulation,” *Dept of Electrical and Computer Engineering, University of Texas-Austin*, Austin, TX, March 20, 2008.
- [IP11] **P. Mohseni**, “Single-chip wireless microsystems for recording neuroelectrical and neurochemical activity,” *Dept of Biomedical Engineering, University of California-Irvine*, Orange County, CA, February 22, 2007.
- [IP10] **P. Mohseni**, “Single-chip wireless microsystems for multichannel neural biopotential recording,” *Neuroengineering Now @ University of Texas-Dallas*, Dallas, TX, June 26, 2006.
- [IP9] **P. Mohseni**, “Single-chip wireless microsystems for multichannel neural biopotential recording,” *Cleveland Functional Electrical Stimulation (FES) Center Seminar Series*, Cleveland, OH, October 12, 2005.
- [IP8] **P. Mohseni**, “Wireless FM microsystems-on-chip for multichannel biological-electronic interfacing,” *Dept of Electrical Engineering, University of Hawaii*, Honolulu, HI, April 7, 2005.
- [IP7] **P. Mohseni**, “Wireless FM microsystems-on-chip for multichannel biological-electronic interfacing,” *Dept of Electrical Engineering, Columbia University*, New York City, NY, March 30, 2005.
- [IP6] **P. Mohseni**, “Wireless FM microsystems-on-chip for multichannel biological-electronic interfacing,” *NSF-ERC Weekly Seminar Series, Center for Wireless Integrated MicroSystems (WIMS), University of Michigan*, Ann Arbor, MI, March 22, 2005.
- [IP5] **P. Mohseni**, “Wireless FM microsystems-on-chip for multichannel biological-electronic interfacing,” *School of Electrical Engineering and Computer Science, Oregon State University*, Corvallis, OR, March 14, 2005.
- [IP4] **P. Mohseni**, “Wireless FM microsystems-on-chip for multichannel biological-electronic interfacing,” *Dept of Electrical and Computer Engineering, University of Minnesota*, Minneapolis, MN, March 7, 2005.
- [IP3] **P. Mohseni**, “Wireless FM microsystems-on-chip for multichannel biological-electronic interfacing,” *Dept of Electrical Engineering, University of Washington*, Seattle, WA, February 24, 2005.
- [IP2] **P. Mohseni**, “Wireless FM microsystems-on-chip for multichannel biological-electronic interfacing,” *Dept of Electrical Engineering and Computer Science, Case Western Reserve University*, Cleveland, OH, February 15, 2005.
- [IP1] **P. Mohseni**, “A multichannel wireless FM transmitter for biomedical neural recording applications,” *NSF-ERC Weekly Seminar Series, Center for Wireless Integrated MicroSystems (WIMS), University of Michigan*, Ann Arbor, MI, October 29, 2002.

RESEARCH GRANTS:

Active Support (Amount shown is Total Direct + Indirect)

Miniaturized Dielectric Coagulometry for Monitoring Anticoagulation

PI Mohseni/Co-I Suster/Co-I Stavrou

Source of Support: Louis Stokes Cleveland Dept of Veterans Affairs Medical Center

Total Award Amount: \$142,113
Total Award Period Covered: 7/1/2017 – 4/30/2018

A Dielectric Microsensor for Comprehensive Assessment of Blood Coagulation at the Point-of-Care
17GRNT33661005 (PI Suster/Co-I Mohseni/Co-I Sen Gupta/Co-I Stavrou)

Source of Support: American Heart Association

Total Award Amount: \$153,248

Total Award Period Covered: 7/1/2017 – 6/30/2019

A Closed-Loop Neural Prosthesis for Restoration of Function after Traumatic Brain Injury

W81XWH-16-1-0503 (PI Mohseni/Co-PI Nudo)

Source of Support: DOD/USAMRMC (United States Army Medical Research and Materiel Command)

Total Award Amount: \$1,654,757 (\$777,394 is issued by CWRU to Co-PI Nudo as subaward)

Total Award Period Covered: 9/1/2016 – 8/31/2019

Electronic Aids to Bridge Damaged Spinal Cord Pathways

PI Mohseni

Source of Support: Kansas University Endowment Association

Total Award Amount: \$1,104,269

Total Award Period Covered: 5/1/2011 – 8/31/2018

Completed Support (Amount shown is Total Direct + Indirect)

A Dielectric Coagulometer for Comprehensive Assessment of Blood Coagulation at the Point-of-Care

PI Suster/Co-PI Mohseni

Source of Support: Advanced Platform Technology (APT) Center – Steven Garverick Innovation Incentive Program

Total Award Amount: \$28,748

Total Award Period Covered: 9/1/2016 – 8/31/2017

A Miniaturized Dielectric Blood Coagulometer for Monitoring Anticoagulation at the Point-of-Care

PI Mohseni/Co-PI Suster

Source of Support: Case-Coulter Translational Research Partnership (CCTRP) Pilot Program

Total Award Amount: \$21,032

Total Award Period Covered: 5/16/2016 – 11/16/2016

A Closed-Loop Microsystem for Neuromodulation of Reward Circuitry

DA036331 (PI Mohseni/PI Garriss)

Source of Support: NIH-NIDA (National Institute on Drug Abuse)

Total Award Amount: \$388,912 (\$180,000 is issued by CWRU to Co-PI Garriss as subaward)

Total Award Period Covered: 7/1/2013 – 6/30/2015 (No-cost extension until 6/30/2016)

A Brain-Machine-Brain Interface for Rewiring of Cortical Circuitry after Traumatic Brain Injury

W81XWH-10-1-0741/0742 (PI Mohseni/PI Nudo)

Source of Support: DOD/USAMRMC (United States Army Medical Research and Materiel Command)

Total Award Amount: \$1,484,611 (\$738,273 for PI Mohseni – Separate budget is issued for each PI)

Total Award Period Covered: 9/1/2010 – 8/31/2014 (No-cost extension until 8/31/2015)

CAREER: A Wireless Implantable Microsystem with Ultra Wideband Communication Capability for High-Density Brain Monitoring

DBI-0844957 (PI Mohseni)

Source of Support: NSF-CAREER Award

Total Award Amount: \$674,937

Total Award Period Covered: 6/15/2009 – 5/31/2014 (No-cost extension until 5/31/2015)

Neurochemical Pattern Generation with Smart Electrical Stimulation

EB014539 (PI Mohseni/PI Garris)

Source of Support: NIH-NIBIB (National Institute of Biomedical Imaging and Bioengineering)

Total Award Amount: \$163,242 (\$50,400 is issued by CWRU to Co-PI Garris as subaward)

Total Award Period Covered: 4/1/2012 – 3/31/2014 (No-cost extension until 3/31/2015)

Anatomical Rewiring of Cortical Circuitry for Functional Recovery after Stroke

09BGIA2280495 (PI Mohseni/Co-I Nudo)

Source of Support: American Heart Association

Total Award Amount: \$131,983 (\$60,000 is issued by CWRU to Co-I Nudo as subaward)

Total Award Period Covered: 7/1/2009 – 6/30/2011

IDBR Collaborative Research: Wireless Integrated Devices for Brain Monitoring and Stimulation

DBI-0754733/0754615 (PI Mohseni/PI Garris)

Source of Support: NSF-IDBR (Instrument Development for Biological Research)

Total Award Amount: \$682,225 (\$392,566 for PI Mohseni – Separate budget is issued for each PI)

Total Award Period Covered: 3/15/2008 – 3/14/2011 (No-cost extension until 2/29/2012)

A Wireless Implanted Device for Brain Monitoring in Support of Addiction Research

DA025809 (PI Mohseni/PI Garris)

Source of Support: NIH-NIDA (National Institute on Drug Abuse)

Total Award Amount: \$313,750 (\$142,500 is issued by CWRU to Co-PI Garris as subaward)

Total Award Period Covered: 9/1/2008 – 8/31/2010

Implantable Microsystems for Anatomical Rewiring of Cortical Circuitry: A New Approach for Brain Repair

W81XWH-08-1-0168 (PI Mohseni/Co-I Nudo)

Source of Support: DOD/USAMRMC (United States Army Medical Research and Materiel Command)

Total Award Amount: \$204,388 (\$75,206 is issued by CWRU to Co-I Nudo as subaward)

Total Award Period Covered: 3/1/2008 – 8/31/2009 (No-cost extension until 6/30/2010)

Development of Next Generation “Smart” Deep Brain Stimulators

92373-003 (PI Mohseni)

Source of Support: Mayo Clinic, Rochester, MN

Total Award Amount: \$25,000

Total Award Period Covered: 1/1/2008 – 12/31/2008

PRESS RELEASE AND COVERAGE IN LOCAL & POPULAR PRESS:

- MIT Technology Review, *Meet the guys who sold “Neuralink” to Elon Musk without even realizing it*, April 4, 2017
- Advanced Platform Technology (APT) Center Press Release, *VA-APT investigators license new blood clotting sensor technology to Cleveland-based company, XaTek Inc.*, December 7, 2016
- The Daily (Digital News of Case Western Reserve University), *Filling need for fast and accurate assessment of blood’s ability to clot*, December 5, 2016
- American Society of Hematology (ASH) Press Release, *Handheld device offers rapid, comprehensive assessment of blood clotting*, December 3, 2016
- Press Coverage in Science Daily, newswise.com, Hematology News, Hematology Oncology, Medical Design Technology (MDT), and WVIZ/PBS Ideas Program December 2016
- The Daily (Digital News of Case Western Reserve University), *Prosthesis research to help TBI and stroke patients receives \$1.65 million in Department of Defense funding*, October 25, 2016
- Inc., *How Implantable Brain Chips Could Change Medicine Forever*, March 29, 2016
- IEEE Spectrum Human OS Blog, *Implantable Chip Measures and Adjusts Dopamine Levels in Mouse Brain*, March 25, 2016
- EE Times, *18 Views of ISSCC: Thin and Light Innovations*, San Francisco, CA, February 26, 2015

- The Daily (Digital News of Case Western Reserve University), *CWRU selected to host 2018 IEEE BioCAS Conference*, October 31, 2014
- Congressionally Directed Medical Research Programs (CDMRP) Media Center, Department of Defense, *A brain-machine-brain interface for re-wiring of cortical circuitry after traumatic brain injury*, March 6, 2014
- Kurzweil Accelerating Intelligence (KurzweilAI), *Neural prosthesis restores normal behavior after brain injury*, December 11, 2013
- Reuters, *Scientists restore functionality in brain-damaged rats*, December 10, 2013
- Gizmag, *Scientists treat disabled rats by “bridging the gap” in their brains*, December 10, 2013
- IEEE Spectrum Tech Talk, *Neural Prosthetic is a “Bridge” over Damaged Brain Areas*, December 9, 2013
- Press Coverage in Science Daily, Medical Daily, Science Codex, Live Science, Med India, Medical News Today (UK), Scientific Computing, Memphis Sun, Wichita Eagle, Kansas City Kansan, Lawrence Journal–World, Yahoo! UK and Ireland, Yahoo! Canada December 2013
- Case Western Reserve University Press Release, *Neural prosthesis restores behavior after brain injury*, December 9, 2013
- Case Western Reserve University Press Release, *Brain implant aims to stifle drug highs*, July 29, 2013
- The Daily (Digital News of Case Western Reserve University), *Brain implant aims to stifle drug highs*, July 29, 2013
- The Daily (Digital News of Case Western Reserve University), *Engineering faculty member Pedram Mohseni presents research in Seattle, Japan*, July 3, 2013
- The Daily (Digital News of Case Western Reserve University), *Pedram Mohseni takes top honors with business plan to commercialize brain injury recovery technology*, June 27, 2012
- Interview with *Marketplace Tech Report*, American Public Media’s Marketplace Radio Program, September 29, 2010
- National Public Radio (NPR) Website, *Microelectronic circuitry may restore healthy brain function after injury*, September 28, 2010
- Interview with Michael Bhardwaj, Canadian Broadcasting Corporation (CBC), September 28, 2010
- Case Western Reserve University Press Release, *Rewiring a damaged brain: Microelectronic circuitry may guide axon growth*, September 27, 2010
- APT Center Press Release, *Dr. Pedram Mohseni receives \$738,000 from US Army Medical Research and Materiel Command to develop brain-machine-brain interface*, September 9, 2010
- Case Western Reserve University Press Release, *Pushing through brain barriers: Case Western Reserve University scientist building nimble tools to monitor brain works*, October 21, 2009
- APT Center Press Release, *Dr. Pedram Mohseni receives \$675,000 to develop brain signal recorder as part of National Science Foundation (NSF) Faculty Early Career Development (CAREER) Award*, October 14, 2009
- Interview with *Plasma Program on Radio Javan*, Tehran, IRAN, February 23, 2009
- EE Times, *Wireless implants aid medical research*, San Francisco, CA, February 13, 2009
- Mayo Clinic Press Release, *Mayo Clinic develops new deep brain stimulation sensor to measure chemical levels in the brain*, September 12, 2008

ACADEMIC TEACHING:

- | | |
|--|-------------|
| • EECS 426: MOS Integrated Circuit Design (3 Credits); Enrollment = 12 | Fall 2017 |
| • EECS 245: Electronic Circuits (4 Credits); Enrollment = 78 | Spring 2017 |
| • EECS 426: MOS Integrated Circuit Design (3 Credits); Enrollment = 9 | Fall 2016 |
| • EECS 245: Electronic Circuits (4 Credits); Enrollment = 82 | Spring 2016 |
| • EECS 426: MOS Integrated Circuit Design (3 Credits); Enrollment = 12 | Fall 2015 |
| • EECS 245: Electronic Circuits (4 Credits); Enrollment = 73 | Spring 2015 |
| • EECS 426: MOS Integrated Circuit Design (3 Credits); Enrollment = 5 | Fall 2014 |
| • EECS 245: Electronic Circuits (4 Credits); Enrollment = 69 | Spring 2014 |
| • EECS 426: MOS Integrated Circuit Design (3 Credits); Enrollment = 7 | Fall 2013 |
| • EECS 245: Electronic Circuits (4 Credits); Enrollment = 51 | Spring 2013 |
| • EECS 426: MOS Integrated Circuit Design (3 Credits); Enrollment = 6 | Fall 2012 |

- EECS 245: Electronic Circuits (4 Credits); Enrollment = 58 Spring 2012
- EECS 523: Advanced Neural Microsystems (3 Credits); Enrollment = 2 Spring 2012
- EECS 426: MOS Integrated Circuit Design (3 Credits); Enrollment = 8 Fall 2011
- EECS 245: Electronic Circuits (4 Credits); Enrollment = 71 Spring 2011
- EECS 426: MOS Integrated Circuit Design (3 Credits); Enrollment = 6 Fall 2010
- EECS 245: Electronic Circuits (4 Credits); Enrollment = 59 Spring 2010
- EECS 523: Advanced Neural Microsystems (3 Credits); Enrollment = 3 Spring 2010
- EECS 426: MOS Integrated Circuit Design (3 Credits); Enrollment = 12 Fall 2009
- EECS 245: Electronic Circuits (4 Credits); Enrollment = 56 Spring 2009
- EECS 344: Electronic Analysis and Design (3 Credits); Enrollment = 15 Fall 2008
- EECS 523: Advanced Neural Microsystems (3 Credits); Enrollment = 3 Fall 2008
- EECS 344: Electronic Analysis and Design (3 Credits); Enrollment = 9 Spring 2008
- EECS 523: Advanced Neural Microsystems (3 Credits); Enrollment = 5 Fall 2007
- EECS 344: Electronic Analysis and Design (3 Credits); Enrollment = 28 Spring 2007
- EECS 600: Advanced Neural Interfaces (3 Credits); Enrollment = 7 Fall 2006
- EECS 344: Electronic Analysis and Design (3 Credits); Enrollment = 17 Spring 2006
- EECS 600: Advanced Neural Interfaces (3 Credits); Enrollment = 7 Fall 2005

POST-DOCTORAL FELLOWS MENTORED:

- Michael A. Suster, Ph.D. 2011 – Present

GRADUATE STUDENTS MENTORED:

Former Students

- Shahab Shahdoost, Ph.D.
Graduation Date: January 2018
Dissertation Title: A Miniaturized Brain-Machine-Spinal Cord Interface (BMSI) for Closed-Loop Intraspinal Microstimulation
Current Position: Senior Engineer, Medtronic, Independence, OH
- Mehran Bakhshiani, Ph.D.
Graduation Date: August 2015
Dissertation Title: A Miniaturized Self-Sustained Microfluidic-CMOS Platform for Broadband Dielectric Spectroscopy
Current Position: Senior Engineer, Qualcomm, San Diego, CA
- Ali Ebrazeh, Ph.D.
Graduation Date: August 2015
Dissertation Title: An Energy-Efficient Impulse Radio Ultra Wideband (IR-UWB) Transceiver for High-Rate Biotelemetry
Current Position: Senior Engineer, Qualcomm, San Diego, CA
- Bardia Bozorgzadeh, Ph.D.
Graduation Date: August 2015
Dissertation Title: Integrated Microsystems for High-Fidelity Sensing and Manipulation of Brain Neurochemistry
Current Position: Senior Engineer, Qualcomm, San Diego, CA
- Kanokwan Limnusun, Ph.D.
Graduation Date: May 2015

Dissertation Title: A Bidirectional Neural Interface Microsystem with Spike Recording, Microstimulation, and Real-Time Stimulus Artifact Rejection Capability
Current Position: Hardware Engineer, Rockwell Automation, Cleveland, OH

- Meysam Azin, Ph.D.
Graduation Date: May 2011
Dissertation Title: A Battery-Powered Multichannel Microsystem for Activity-Dependent Intracortical Microstimulation
Current Position: Senior Staff Engineer, Qualcomm, San Diego, CA
- Masoud Roham, Ph.D.
Graduation Date: January 2010
Dissertation Title: Wireless Multichannel Microsystems for Time-Share Chemical and Electrical Neural Recording
Current Position: Senior Staff Engineer, Qualcomm, San Diego, CA
- Kanokwan Limnuson, M.S.
Graduation Date: August 2008
Thesis Title: Interface Electronics for Peripheral Nerve Recording and Signal Processing
- Chia-Wei Soong, M.S.
Graduation Date: August 2008
Thesis Title: Hardware Implementation of a Stimulus Artifact Rejection Algorithm in Closed-Loop Neuroprostheses

Current Students

- Nicholas Vitale Degree: Ph.D. Start Date: Spring 2018 Expected Graduation Date: Summer 2021
- Mac Russell Degree: M.S. Start Date: Summer 2017 Expected Graduation Date: Summer 2018
- Reza Erfani Degree: Ph.D. Start Date: Spring 2015 Expected Graduation Date: Summer 2020
- Fatemeh Marefat Degree: Ph.D. Start Date: Spring 2015 Expected Graduation Date: Summer 2020
- Hossein Zamani Degree: Ph.D. Start Date: Spring 2015 Expected Graduation Date: Summer 2020
- Debnath Maji Degree: Ph.D. Start Date: Fall 2014 Expected Graduation Date: Spring 2020

UNDERGRADUATE STUDENTS MENTORED:

- Sagar Ramesh Kumashi
Electronics and Electrical Communication Engineering Dept, Indian Institute of Technology (IIT) Kharagpur
Summer Intern May – Jul 2017
- Nicholas Vitale
EECS Dept, Case Western Reserve University
Undergraduate Research Volunteer Jan 2015 – Aug 2016
- Brecken Blackburn
School of Electrical and Computer Engineering, Cornell University
Summer Intern Jun 2014 – Aug 2014

- Thomas Hampton
EECS Dept, Case Western Reserve University
Undergraduate Research Volunteer Jan 2014 – Aug 2014
- Calvin Eiber, B.S.
Biomedical Engineering Dept, Case Western Reserve University
Graduation Date: January 2011
Senior Design Project Title: An Eigenface-Based Approach to Visual Prosthesis
- Raymond Gallagher, B.S.
EECS Dept, Case Western Reserve University
Graduation Date: January 2007
Senior Design Project Title: VLSI Implementation of an Efficient Algorithm for Artifact Rejection in Closed-Loop Deep Brain Stimulation
- Anthony Roshetsky, B.S.
EECS Dept, Case Western Reserve University
Graduation Date: May 2006
Senior Design Project Title: VLSI Implementation of an Efficient Algorithm for Artifact Rejection in Closed-Loop Deep Brain Stimulation

DOCTORAL DISSERTATION COMMITTEE MEMBERSHIPS:

- Thomas Eggers, Biomedical Engineering Dept 2018
- Yazan Dweiri, Biomedical Engineering Dept 2015
- Tina Vrabc, Biomedical Engineering Dept 2015
- Steve Majerus, Electrical Engineering and Computer Science Dept 2014
- Chia-Wei Soong, Electrical Engineering and Computer Science Dept 2013
- Daniel Howe, Electrical Engineering and Computer Science Dept 2013
- Grant McCallum, Electrical Engineering and Computer Science Dept 2011
- Allison Hess, Electrical Engineering and Computer Science Dept 2011
- Noppasit Laotaveerungrueng, Electrical Engineering and Computer Science Dept 2010
- Amita Patil, Electrical Engineering and Computer Science Dept 2009
- Paras Samsukha, Electrical Engineering and Computer Science Dept 2008
- Adam Boger, Biomedical Engineering Dept 2008

LEADERSHIP/SERVICE (DEPT, SCHOOL, UNIVERSITY):

- Chairman of EECS Faculty Search Committee Spring 2018
- Committee Member for Case School of Engineering A. W. Smith Undergraduate Scholarship Spring 2015
- EECS Executive Council Member 2014 – 2015
- Chairman of EECS Faculty Search Committee Spring 2014
- Advisory Committee Member for Case School of Engineering Initiative on Wireless Health/Wearable Computing 2013 – Present
- EECS Department Faculty Coordinator for Case School of Engineering Initiative on Wireless Health 2012 – Present
- Committee Member for Case School of Engineering Strategic Hiring Initiative on Human Health 2011 – 2012
- Chairman of EECS Department Graduate Committee 2011 – 2014
- Chairman of EECS Faculty Search Committee Spring 2010
- Case School of Engineering Research Administration Assessment Group Member 2009 – 2011
- EECS Faculty Member in Case School of Engineering Graduate Education Committee 2009 – 2011
- Faculty Advisor for Undergraduate Level 2006 – Present
- Electrical Engineering Faculty Member in EECS Department Graduate Committee 2006 – Present

EXPERIENCE:

Ph.D. Research

University of Michigan, Ann Arbor, MI

I conducted my thesis research on multichannel, bi-directional, wireless microsystems for a variety of biomedical recording applications. Wireless single- and multi-channel telemetric systems have always been of great interest to researchers in both biology and neurophysiology communities due to their advantage of simultaneously recording and transmitting one or more physiological parameters. Although the emergence of high-quality surface mount devices in the past has remarkably facilitated the implementation of such systems, the majority of the current recording microsystems still have either prohibitively large dimensions and weight, or high power consumption that makes them impractical for general-purpose low-power applications. Combining application-specific integrated circuit (ASIC) design techniques with micromachined neural recording electrode technology has the potential to significantly reduce the overall dimensions, weight, and power consumption of such systems, offering low-power multichannel radio-telemetry recording devices that can be used in closed-loop neuroprostheses to study the peripheral and central nervous systems at the cellular level. My research was focused on the design, implementation, testing, and thorough performance characterization of bi-directional wireless FM recording microsystems-on-chip to remotely monitor seven input biopotentials in the VHF band of 94 to 98MHz selected among a total of 28 available sites via a second wireless ASK link in the MF band of 0.3 to 3MHz. These miniature, standalone, battery-powered, telemetric devices incorporated high-performance analog/mixed-signal/RF circuit blocks, featured the lowest power consumption reported, and served as test vehicles to obtain a fundamental knowledge and understanding of the numerous trade-offs and limitations involved in designing such systems with respect to their power consumption (or lifetime), operating voltage, choice of carrier frequencies, number of recording channels, overall dimensions, weight, and level of integration. This research project was supervised by Professor Khalil Najafi, and was conducted in collaboration with the neurobiology research laboratories at the University of Pennsylvania and Johns Hopkins University School of Medicine.

Digital Signal Processing (DSP) Engineer

Canopus Systems Inc., Ann Arbor, MI

During the summer and fall of 1998, I held a part-time position as a digital signal processing (DSP) engineer in Canopus Systems Inc., Ann Arbor, MI. This was part of collaboration between Canopus Systems Inc. and the research group of Professor Khalil Najafi at the University of Michigan in commercializing all-silicon micro-electro-mechanical-system (MEMS)-based inertial sensors for space applications. Under the supervision of Dr. Navid Yazdi, I was responsible for developing signal processing algorithms for the multistage decimation and filtering of highly oversampled output of $\Delta\Sigma$ converters in microgravity (μg) microaccelerometer systems. After performing a thorough literature search, a decimation algorithm comprising of a sinc^3 filter stage followed by finite impulse response (FIR) digital lowpass filter and 4-point averaging stages was implemented in time domain using MATLAB (*MathWorks Inc., MA*). The feasibility of hardware implementation of this decimation algorithm employing field programmable gate arrays (FPGA) was initially investigated. A strategic decision was made to realize the decimation process in software. DSP processors such as TMS320CXX family (*Texas Instruments Inc., TX*) and DSP56600 family (*Motorola Inc., IL*) were selected as suitable candidates for this purpose.

REFERENCES:

- 1- Khalil Najafi
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- 2- Kensall D. Wise
William Gould Dow Distinguished University Professor Emeritus
J. Reid and Polly Anderson Professor of Manufacturing Technology
University of Michigan, Electrical Engineering and Computer Science Department
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- 3- Mohamad Sawan
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- 4- Nitish V. Thakor
Provost's Chair Professor
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National University of Singapore, Electrical and Computer Engineering Department
Johns Hopkins University School of Medicine, Biomedical Engineering Department
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- 5- Hoi-Jun Yoo
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- 7- Sayfe Kiaei
Motorola Chair Professor in Analog and RFIC
Director, NSF Connection One Center
Arizona State University, School of Electrical, Computer, and Energy Engineering
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- 8- Euisik Yoon
Professor
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- 9- Ramesh Harjani
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10- Timothy Denison
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