

Jordan John Williams

Assistant Professor

Department of Biomedical Engineering

Marquette University and the Medical College of Wisconsin

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Career Objectives To lead a cutting-edge academic research lab focused on: 1) developing viral-mediated peripheral optogenetic techniques and gene therapies to alleviate motor, sensory, and autonomic dysfunction, and 2) utilizing multi-scale neural recording to investigate the neural plasticity and network changes that occur during motor and brain-machine interface skill acquisition.

Research Interests Functional optical neuromuscular stimulation using virally mediated peripheral optogenetics in rodents and non-human primates
Screening of AAV libraries for utility in gene therapy aimed at spinal cord injury and motor diseases
Tissue clearing and whole sample imaging of optogenetic expression in peripheral nerves and spinal cord
Adaptive difficulty training algorithms and neural correlates of skill acquisition using brain-computer interfaces
Characterization of active control and idle states during brain-computer interface operation
Multi-scale neural signal correlations and differences related to state-dependent BCI decoding
Epidural electrocorticography applications to motor neurophysiology and brain-computer interfaces

Education Ph.D. Biomedical Engineering, December 2013
Washington University, Saint Louis, MO USA
Dissertation: “ECoG correlates of visuomotor transformation, neural plasticity, and application to a force-based brain-computer interface”
Thesis Advisor: Daniel Moran, PhD

M.D., December 2013
Washington University, Saint Louis, MO USA

B.S. Electrical Engineering (*summa cum laude*), May 2005
South Dakota State University, Brookings, SD USA

B.S. Engineering Physics (*summa cum laude*), May 2005
South Dakota State University, Brookings, SD USA

**Academic
Positions**

Assistant Professor, Departments of Biomedical Engineering
and Neurosurgery
Marquette University and the Medical College of Wisconsin
August 2019 – Present

Postdoctoral Scholar, Systems Neuroscience Institute
University of Pittsburgh, December 2013 – August 2019
Primary Mentor (2013 – 2019): Dr. Andrew B. Schwartz, Dept. of
Neurobiology, University of Pittsburgh
Co-Mentor (2016 – Present): Dr. Alberto L. Vazquez, Depts. of
Radiology and Bioengineering, University of Pittsburgh
Co-Mentor (2019 – Present): Dr. Leah Byrne, Dept. of
Ophthalmology, University of Pittsburgh
Postdoctoral Career Development Mentoring Team:
Dr. Peter L. Strick, Neurobiology, University of Pittsburgh
Dr. Douglas J. Weber, Bioengineering, University of
Pittsburgh/DARPA

**Grants and
Fellowships**

National Institute of Neurological Disorders and Stroke
NRSA Postdoctoral Fellowship Award (F32): 2015-2018
National Institute of Neurological Disorders and Stroke
NRSA Fellowship Award: 2011-2012
National Science Foundation IGERT Program Fellowship
(Cognitive, Computational, and Systems Neuroscience
Pathway): 2008-2010
Washington University in St. Louis Medical Scientist Training
Program Fellowship: 2005-2013

**Honors
and Awards**

Phi Kappa Phi Fellowship Award: 2005
SDSU College of Engineering Dean's List: 10 semesters (2000-
2005)
National Dean's List: 10 semesters (2000-2005)
Elks National Most Valuable Student Scholarship: 2000-2004
Barry M. Goldwater National Scholarship: 2004-2005
Tau Beta Pi Campbell Scholarship - National engineering honor
society scholarship: 2004-2005
National Dean's List Scholarship: 2004-2005

**Professional
Activities**

Professional Memberships:
Biomedical Engineering Society (BMES)
Institute of Electrical and Electronics Engineers (IEEE)
Society for Neuroscience (SfN)
Brain Computer Interface Society (BCI Society)
Engineering in Medicine and Biology Society (EMBS)

Phi Kappa Phi (National academic honor society)
Eta Kappa Nu (Electrical engineering honor society)
Tau Beta Pi (National engineering honor society)

Manuscript Reviewer:
Journal of Neural Engineering
Nature Scientific Reports

Department Service:
Marquette University / MCW:
BME Research Committee since August 2019 (Chair: Dr.
Mary Shimoyama)

Publications

J.J. Williams, A.M. Watson, A.L. Vazquez, A.B. Schwartz (2019).
Viral-mediated optical stimulation of peripheral motor nerves in
non-human primates. *Frontiers in Neuroscience*. July;13. doi:
<https://doi.org/10.3389/fnins.2019.00759>

J.J. Williams, A.B. Schwartz, A.L. Vazquez (2019). Prolonged
functional optical sensitivity in non-human primate motor nerves
following Cyclosporine-based immunosuppression and rAAV2-
retro mediated expression of ChR2. *Proceedings of the 9th International
IEEE EMBS Conference on Neural Engineering*.
doi:10.1109/NER.2019.8716978.

N.J. Michelson, A.L. Vazquez, J.R. Eles, J.W. Salatino, E.K. Purcell,
J.J. Williams, X.T. Cui, T.D. Kozai (2017). Multi-scale, multi-
modal analysis uncovers complex relationship at the brain tissue-
implant neural interface: New Emphasis on the Biological Interface.
Journal of Neural Engineering, April;15(3). doi:
<https://doi.org/10.1088/1741-2552/aa9dae>

J.J. Williams*, A.G. Rouse*, J.J. Wheeler, D.W. Moran (2016)
Spatial co-adaptation of cortical control columns in a micro-ECoG
brain-computer interface. *Journal of Neural Engineering*. Sept;13(5).
doi:1741-2552/13/5/056018. (* Co-first authors)

J.J. Williams, R.N. Tien, Y. Inoue, A.B. Schwartz (2016) Idle State
Classification using Spiking Activity and Local Field Potentials in a
Brain Computer Interface. *Proceedings of the 38th Annual International
Conference of the IEEE Engineering in Medicine and Biology Society*. doi:
10.1109/EMBC.2016.7591012.

J.J. Williams, R.N. Tien, Y. Inoue, A.B. Schwartz (2016)
Detecting and utilizing the idle state in an intracortical brain-
computer interface. *Proceedings of the International BCI Meeting 2016*.

May 30-June 3, 2016, Pacific Grove, California. doi: 10.3217/978-3-85125-467-9-62.

J.J. Williams, A.G. Rouse, J.J. S. Thongpang, J.C. Williams, D.W. Moran (2013) Differentiating closed-loop cortical intention from rest: Building an asynchronous electrocorticographic BCI. *Journal of Neural Engineering*. Aug;10(4). doi:1741-2552/10/4/046001.

A.G. Rouse, **J.J. Williams**, J.J. Wheeler, D.W. Moran (2013) Cortical adaptation to a chronic micro-electrocorticographic brain computer interface. *Journal of Neuroscience*. Jan 23;33(4):1326-30.

J.J. Williams (2013) ECoG correlates of visuomotor transformation, neural plasticity, and application to a force-based brain-computer interface. Ph.D. dissertation, Washington University in St. Louis. ProQuest Publications.

T.M. Pearce, **J.J. Williams**, S.P. Kruzel, M.J. Gidden, J.C. Williams (2005) Dynamic control of extracellular environment in in vitro neural recording systems. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*. Jun;13(2):207-12.

Manuscripts

J.J. Williams, R.N. Tien, Y. Inoue, A.B. Schwartz (2018) Optimizing dynamic brain-computer interface difficulty toward standardized training and improved skill acquisition. Manuscript in preparation.

J.J. Williams, A.L. Vazquez (2018). Optogenetically driven electromyographic response characteristics and modulation strategies for peripheral motor stimulation. Manuscript in preparation.

J.J. Wheeler, **J.J. Williams**, K.J. Otto, J.C. Williams, D.W. Moran (2018) Time-varying electrical characteristics of micro- to milli-scale platinum, iridium oxide, and PEDOT electrodes in chronic epidural cortical implants. Manuscript submitted and under review.

Oral Presentations

J.J. Williams, A.L. Vazquez, A.M. Watson, A.B. Schwartz (2018) Viral-mediated optogenetic stimulation of peripheral motor activity in macaques. (Selected poster for podium presentation) Gordon Research Conference on Neuroelectronic Interfaces. March 25-30, Galveston, TX.

J.J. Williams, A.L. Vazquez, A.B. Schwartz (2017) Peripheral motor optogenetics toward restoration of volitional control of

native musculature. *Center for the Neural Basis of Cognition Postdoc Seminar Series*. October 12, 2017, Pittsburgh, PA.

J.J. Williams, R.N. Tien, Y. Inoue, A.B. Schwartz (2015)
Engineered Learning toward improved brain-machine interface and rehabilitation training. *Society for Neuroscience Abstracts* (Nanosymposium Presentation). October 17-21, Chicago, IL.

Abstracts

J.J. Williams, A.L. Vazquez, A.M. Watson, A.B. Schwartz (2018)
Viral-mediated optogenetic stimulation of peripheral motor activity in macaques. *Gordon Research Conference on Neuroelectronic Interfaces*. March 25-30, Galveston, TX.

J.J. Williams, A.L. Vazquez, A.M. Watson, A.B. Schwartz (2017)
Peripheral optogenetic stimulation of motor function in non-human primates toward restoration of volitional motor control in a brain-machine interface. *Society for Neuroscience Abstracts*, November 11-15, Washington, D.C.

J.J. Williams, A.L. Vazquez, C. Wirblich, M.J. Schnell, A.B. Schwartz (2016)
Virus, opsin, and immunomodulation approaches for optogenetic control of peripheral motor function. *Society for Neuroscience Abstracts*, November 12-16, San Diego, California.

J.J. Williams, R.N. Tien, A.B. Schwartz (2014)
Psychophysical, neural, and learning curve metrics toward optimizing training with a Brain-Computer Interface. *Society for Neuroscience Abstracts*, November 15-19, Washington, D.C.

J.J. Williams, A.G. Rouse, J.J. Wheeler, J.C. Williams, D.W. Moran (2011)
Decoding attention in a micro-ECoG based brain computer interface system. *Society for Neuroscience Abstracts*, November 12-16, Washington, D.C.

J.J. Williams, A.G. Rouse, J.J. Wheeler, J.C. Williams, D.W. Moran (2010)
Evaluation of impedance, signal quality, and neural plasticity characteristics in a chronic micro-ECoG device. *Society for Neuroscience Abstracts*, November 13-17, San Diego, California.

J.J. Williams, A.G. Rouse, J.C. Williams, D.W. Moran (2009)
 μ ECoG correlates of physical and end-effector movement characteristics in a joystick dissociation task. *Society for Neuroscience Abstracts*, October 17-21, Chicago, Illinois.

August 2019