

Ohio Wesleyan University
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Christian G. Fink

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EDUCATION

University of Michigan, Ann Arbor, MI
Ph.D. in Physics 2012
M.S.E. Electrical Engineering: Systems 2012
(signal processing emphasis)
M.S. in Physics 2011
Taylor University, Upland, IN
B.S. in Physics, summa cum laude 2007

TEACHING EXPERIENCE

Ohio Wesleyan University, *Department of Physics* 2013-present
Assistant Professor of Physics and Neuroscience

- PHYS 115/116: Principles of Physics
 - Algebra-based introductory physics course emphasizing applications of fundamental physics concepts to biological systems.
- PHYS 300.3: Digital Signal Processing
 - Upper-division physics course exploring fundamental data analysis techniques, including discrete Fourier analysis and image processing.
- PHYS 330: Biophysics of the Brain
 - Upper-division physics course covering computational modeling of brain function.
- PHYS 375: Digital Electronics
 - Upper-division physics course in which students build a computer on a breadboard as they work through the second half of *The Art of Electronics*.
- NEUR 323: Computational Neuroscience
 - Upper-level neuroscience course which introduces neuroscience majors to computer programming, with applications to modeling of neural systems and analysis of neural data.

RESEARCH EXPERIENCE

Assistant Professor, *Department of Physics* 2013-present
Ohio Wesleyan University, Delaware, OH

- Use computational modeling to investigate the biophysics of how brain rhythms are generated, especially pathological rhythms associated with epilepsy.

Graduate Research Assistant, *Department of Physics* 2008-2012

University of Michigan, Ann Arbor, MI
Advisors: Victoria Booth and Michal Zochowski
Dissertation: "Using Phase Response Curves to Understand Neuronal Synchronization and Sleep."

- Used dynamical systems theory to computationally investigate the synchronization of neuronal networks.

AWARDS & GRANTS

NSF REU grant (co-PI): “Interdisciplinary Scientific Computation at Ohio Wesleyan University,” \$250,188, May 2017-Aug. 2019

NIH R01 grant (co-PI): “Characterizing High Frequency Oscillations as an epilepsy biomarker with Big Data tools,” \$1.25 million (direct cost), Sept. 1, 2015-Aug. 31, 2020 (my share of grant totals \$45,000)

Kent M. Terwilliger Memorial Thesis Prize (best doctoral dissertation in University of Michigan physics department), 2013

NSF XSEDE supercomputing allocation (200,000 computer-hours), 2012

Winner of KLA-Tencor image processing challenge, 2011

National Science Foundation Graduate Research Fellowship, 2009-2012

Regents’ Fellowship, University of Michigan physics department, 2008

PUBLICATIONS (mentored undergraduate students underlined)

Fink CG (2017). “Resource Letter Ph-B1: The Physics of the Brain,” *American Journal of Physics* (under review).

Fink CG (2017). “An Interactive Simulation Program for Exploring Computational Models of Auto-Associative Memory,” *Journal of Undergraduate Neuroscience Education* (accepted).

Fink CG (2017). “An Algebra-Based Introductory Computational Neuroscience Course with Lab,” *Journal of Undergraduate Neuroscience Education*, 5(2), A117-A121.

Shtrahman L, Maruyama D, Olariu E, Fink CG, and Zochowski M (2017). “Understanding spatial and temporal patterning of astrocyte calcium transients via interactions between network transport and extracellular diffusion,” *Physical Biology*, 016001.

Mofakham S, Fink CG, Booth V, and Zochowski M (2016). “Interplay between excitability type and distributions of neuronal connectivity determines network synchronization,” *Physical Review E*, 94(4), 042427.

Gliske S, Stacey WC, Lim E, Holman K, and Fink CG (2016). “Emergence of narrowband high frequency oscillations from asynchronous, uncoupled neural firing,” *International Journal of Neural Systems*, 27 (1), 1650049.

Fink CG (2016). “Simulating synchronization in neuronal networks,” *American Journal of Physics*, 84(6), pp. 467-473.

Fink CG, Gliske S, Catoni N, and Stacey WC (2015). “Network mechanisms generating abnormal and normal hippocampal High Frequency Oscillations: A computational analysis,” *eNeuro*, 2(3): 0024.

Leone MJ, Schurter BN, Letson B, Booth V, Zochowski M, and Fink CG (2015). “Synchronization properties of heterogeneous neuronal networks with mixed excitability type,” *Physical Review E*, 91(3), 032813.

Fink CG, Zochowski M, and Booth V (2013). “Neural network modulation, dynamics, and plasticity.” *Global Conference on Signal and Information Processing (GlobalSIP), 2013 IEEE*, pp. 843-846.

Fink CG, Murphy GG, Booth V, and Zochowski M (2013). “A dynamical role for acetylcholine in synaptic renormalization.” *PLoS Computational Biology*, 9(3): e1002939.

Fink CG, Booth V, and Zochowski M (2012). "Effects of the frequency dependence of phase response curves on network synchronization." Chapter 19 in *Phase Response Curves in Neuroscience: Theory, Experiment, and Analysis* (Springer).

Fink CG, Booth V, and Zochowski M (2011). "Cellularly-driven differences in network synchronization propensity are differentially modulated by firing frequency." *PLoS Computational Biology*, 7(5): e1002062.

STUDENT PROJECTS MENTORED

- "Computational Modeling of Seizure Propagation," Momi Afelin and Joe Emerson, summer 2017 (REU).
- "Identifying Influential Nodes in Weighted, Directed Networks," Kelly Fullin, summer 2017 (REU).
- "Identifying 'Influential Seizers' Based on Structure of the Macaque Connectome," Viesulas Sliupas, 2016-2017 (senior research).
- "Investigating Asynchrony in the Generation of Brain Rhythms," Eugene Lim, 2015-2016 (senior research).
- "Shaking Up Our Understanding of Epilepsy," Kate Holman, summer 2015 (REU).
- "Design of a Brain-Controlled Video Game," Jason Kim, 2014-2015 (senior research).
- "Synchronization in Scale-Free Neuronal Networks," Brandon Schurter, summer 2014 (REU).
- "Optimal Desynchronization of Neural Networks," Benjamin Letson, 2013-2014 (senior research).
- "Synchronization in Scale-Free Neuronal Networks," Michael Leone, summer 2013 (REU).

PROFESSIONAL DEVELOPMENT

- Snailfest workshop, Emory University, 2016
- Teaching Circle, Ohio Wesleyan, 2014-present
- LGBTQ ally training, University of Michigan, 2012
- Center for Research on Learning and Teaching spring seminar, University of Michigan, 2012
- NEURON summer course, Institute for Neural Computation, University of California-San Diego, 2012

Affiliations:

- American Physical Society
- Faculty for Undergraduate Neuroscience
- Organization for Computational Neuroscience
- Society for Neuroscience

SERVICE

- Chair of Ohio Wesleyan neuroscience program (2017-present)
- Started peer mentorship program in Ohio Wesleyan physics department (2016)
- Ohio Wesleyan Committee on Admissions and Financial Aid (2015-present)
- Ohio Wesleyan neuroscience/psychology new faculty search committee (2014-2015)
- Ohio Wesleyan neuroscience/mathematics new faculty search committee (2014-2015)
- Ohio Wesleyan cross country faculty partner (2014-present)
- Interim chair of Ohio Wesleyan neuroscience program (Spring 2014)

COMMUNITY OUTREACH

- Led "Physics Demo Day" at Willis Middle School, Delaware, OH (2013-2017)
- Co-founded tutoring program for elementary-school children in central Detroit (2011-2012)
- Participated in annual "Physics Demo Day" at Slauson Middle School, Ann Arbor, MI (2009-2012)

STUDENT TALKS

- "The Curious Conundrum of Consciousness," Ohio Wesleyan Women in Science, October 2014, and I³ Lecture, September 2016
- "How to Succeed in Graduate School," Ohio Wesleyan REU, June 2013 & 2014
- "From Spikes to Sight: How the Human Brain Processes Information," Kalamazoo College,

March 2011

**INVITED
TALKS**

"How Synchrony Can Help Explain the Mystery of Sleep," Oberlin College, Oberlin, OH,
March 13, 2014

"Acetylcholine and synaptic homeostasis," Organization for Computational Neuroscience,
Decatur, GA, July 22, 2012

"A bottom-up approach to understanding network dynamics," Organization for Computational
Neuroscience, Decatur, GA, July 26, 2012