Nicholas M. Timme

Curriculum Vitae

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Positions

2016 – Present **Post-Doctoral Researcher**: Indiana University – Purdue University Indianapolis
Advisor: Christopher Lapish

Education

2009 – 2015 **Ph.D.** Indiana University, Physics

2008 – 2009 **M.S.** Indiana University, Physics

2004 – 2008 **B.A.** Illinois Wesleyan University, Physics & Philosophy, Summa cum laude

Grants

2016 - 2018 **NIH T32: Training Grant on Genetic Aspects of Alcoholism (AA007462)**, Dr. Christine Czachowski (Principal Investigator), Dr. Christopher Lapish (Supervisor).

Publications†

2019 **N. M. Timme**, D. Linsenbardt, M. Timm, T. Galbari, E. Cornwell, and C. C. Lapish, Alcohol preferring P rats exhibit aversion resistant drinking of alcohol adulterated with quinine, accepted at Alcohol, bioRxiv: 689919. Citations: 0.

2019 D. N. Linsenbardt, **N. M. Timme**, and C. C. Lapish, Encoding of the intent to drink alcohol by the prefrontal cortex is blunted in rats with a family history of excessive drinking, eNeuro 6 (4): 2019. doi: 10.1523/ENEURO.0489-18.2019. Citations: 0.

2018 S. P. Faber, **N. M. Timme**, J. M. Beggs, and E. L. Newman, Computation is concentrated in rich clubs of local cortical networks, Network Neuroscience 3 (2): 2018. doi: 10.1162/netn_a_00069. Citations: 1.

2018 **N. M. Timme** and C. C. Lapish, A tutorial for information theory in neuroscience, eNeuro, 5 (3): 2018. doi: 10.1523/ENEURO.0052-18.2018. Citations: 3.

2018 S. S. Janetsian-Fritz, **N. M. Timme**, A. M. McCane, A. J. Baucum II, B. F. O'Donnell, and C. C. Lapish, Maternal deprivation induces alterations in cognitive and cortical function in adulthood, Translational Psychiatry, 8 (1): 2018. doi: 10.1038/s41398-018-0119-5. Citations: 4.

2016 **N. M. Timme***, N. Marshall*, N. Bennett, M. Ripp, E. Lautzenhiser, and J. M. Beggs, Criticality maximizes complexity in neural tissue, Frontiers in Physiology, 7 (425): 2016. doi: 10.3389/fphys.2016.00425. Citations: 18. * These authors contributed equally to this work.

2016 N. Marshall*, **N. M. Timme***, N. Bennett, M. Ripp, E. Lautzenhiser, and J. M. Beggs, Analysis of power laws, shape collapses, and neural complexity: new techniques and MATLAB support via the NCC toolbox, Frontiers in Physiology, 7 (250): 2016. doi: 10.3389/fphys.2016.00250. Citations: 24. * These authors contributed equally to this work.

2016 **N. M. Timme**, S. Ito, M. Myroshnychenko, S. Nigam, M. Shimono, F. C. Yeh, P. Hottowy, A. M. Litke, and J. M. Beggs, High-degree neurons feed cortical computations, PLoS Computational Biology, 12 (5): 2016. e1004858. doi: 10.1371/journal.pcbi.1004858. Citations: 37.

2016 S. Nigam, M. Shimono, S. Ito, F. C. Yeh, **N. Timme**, M. Myroshnychenko, C. C. Lapish, Z. Tosi, P. Hottowy, W. C. Smith, S. C. Masmanidis, A. M. Litke, O. Sporns, and J. M. Beggs, Rich-club organization in effective connectivity among cortical neurons, Journal of Neuroscience, 36 (3): 2016. doi: 10.1523/JNEUROSCI.2177-15.2016. Citations: 69.

2014 **N. Timme**, S. Ito, M. Myroshnychenko, F. C. Yeh, E. Hiolski, P. Hottowy, and J. M. Beggs, Multiplex networks of cortical and hippocampal neurons revealed at different timescales, PLoS One, 9 (12): 2014. e115764. doi: 10.1371/journal.pone.0115764. Citations: 22.

2014 S. Ito, F. C. Yeh, E. Hiolski, P. Rydygier, D. Gunning, P. Hottowy, **N. Timme**, A. M. Litke, and J. M. Beggs, Large-scale, high-resolution multielectrode-array recording depicts functional network differences of cortical and hippocampal cultures, PLoS One, 9 (8): 2014. doi: 10.1371/journal.pone.0105324. Citations: 27.

2014 **N. Timme**, W. Alford, B. Flecker, and J. M. Beggs, Synergy, redundancy, and multivariate information measures: an experimentalist's perspective, Journal of Computational Neuroscience, 36 (2): 2014. doi: 10.1007/s10827-013-0458-4. Citations: 104.

2013 **N. Timme**, M. Baird, J. Bennett, L. Garrison, J. Fry, and A. Maltese, A Summer Math and Physics Program for High School Students: Student Performance and Lessons Learned in the Second Year, Physics Teacher, 51 (280): 2013. doi:10.1119/1.4801354. Citations: 5.

2012 J. M. Beggs and **N. Timme**, Being critical of criticality in the brain, Frontiers in Physiology, 3 (163): 2012. doi: 10.3389/fphys.2012.00163. Citations: 270.

2012 J. Bennett, J. Fry, **N. Timme**, and A. Maltese, Lessons learned from a summer preparatory program on foundations in physics and calculus, Journal of College Science Teaching, 41 (52): 2012. Citations: 2.

2009 **N. Timme** and A. Morrison, The mode shapes of a tennis racket and the effects of vibration dampers on those mode shapes, Journal of the Acoustical Society of America, 125 (6): 2009. Citations: 6.

† Total Citations: 592. Citation counts provided by Google Scholar as of August 2019.

Shared Data Sets

2016 **N. M. Timme, N. Marshall, N. Bennett, M. Ripp, E. Lautzenhiser, and J. M. Beggs**, Spontaneous spiking activity of thousands of neurons in rat hippocampal dissociated cultures, CRCNS.org: 2016. doi: 10.6080/K0PC308P.

2016 **S. Ito, F. C. Yeh, N. M. Timme, P. Hottowy, A. M. Litke, and J. M. Beggs**, Spontaneous spiking activity of hundreds of neurons in mouse somatosensory cortex slice cultures recorded using a dense 512 electrode array, CRCNS.org: 2016. doi: 10.6080/K07D2S2F.

Service

2018 - Present Member of the Research Society on Alcoholism's Animals in Research Committee

Skills

Computer	MATLAB, Microsoft Office, LaTEX, Unix, C, Prism
Electrophysiology	Awake-behaving rodent, multi-electrode array cell culture
Cell Culturing	Production and maintenance of dissociated neural cultures
Animal Behavior	Handling, training, and performing experimental tasks using rats. General addiction neuroscience.
Data Analysis	Information Theory, Network Analysis, Functional Connectivity, Effective Connectivity, Spike Sorting, Critical Systems, Neural Avalanches, Statistics

Research

2016 – Present **Post-Doctoral Research in Neuroscience**, Indiana University - Purdue University Indianapolis. I work with Dr. Christopher Lapish at Indiana University - Purdue University Indianapolis. We study information encoding and computations performed at the cellular level in awake behaving rodents, primarily in relation to alcohol use disorder. Specifically, we are interested in how groups of neurons work together to encode, transmit, and compute information in prefrontal cortex and other non-cortical structures.

2009 – 2015 **Graduate Research in Biophysics**, Indiana University. I worked with Dr. John Beggs at Indiana University. We studied the behavior of organic neural networks. Specifically, we were interested in questions regarding how information is represented and transformed in neural networks. In addition, we studied the role criticality plays in the functions of neural networks.

2007 – 2008 **Undergraduate Research in Acoustics**, Illinois Wesleyan University. I worked with Dr. Andrew Morrison to study the vibrational behavior of carbon fiber plates and a tennis racket. I completed my honors thesis in physics as part of this research.

2007 **Research Experience for Undergraduates (REU) Participant**, Kansas State University. I worked with Dr. Itzik Ben-Itzhak to study laser-ion interactions.

2006 – 2007 **Undergraduate Research in Philosophy of Mind**, Illinois Wesleyan University. I worked with Dr. Leonard Clapp to study issues related to phenomenal experience. I completed my honors thesis in philosophy as part of this research.

2006 **Undergraduate Research in Astronomy**, Illinois Wesleyan University. I worked with Dr. Linda French to perform comet and asteroid data analysis.

2005 **Undergraduate Research in Optical Physics**, Illinois Wesleyan University. I worked with Dr. Gabe Spalding on an optical tweezer system.

2005 **Undergraduate Research in Optical Physics**, Illinois Wesleyan University. I worked with Dr. William Brandon to study magneto-optics.

Honors & Awards

2015 **William Koss Memorial Award**, Indiana University Physics Department, $2,500. Awarded to the most outstanding graduate student in physics.

2013 **John H. Edwards Fellowship**, Indiana University College of Arts and Sciences, $20,000. Awarded to support graduate students in the College of Arts and Sciences based on outstanding academic performance, research, and character.

2012 **Mabel La Duke Lauder Award**, Indiana University College of Arts and Sciences, $2,500. Awarded to support novel research in science.

2009 **Graduate Assistantships in Areas of National Need Recipient (Teaching)**, Indiana University Physics Department, $28,000. Awarded to support Physics Department associate instructors.

2008 **Phi Kappa Phi Fellowship**, Phi Kappa Phi Honor Society, $5,000. Awarded to support future graduate or professional school students.

2008 **Phi Kappa Phi Commencement Award**, Illinois Wesleyan University, $2,500. Awarded by faculty members based on expected performance in graduate school.

2008 **Honors Thesis in Physics**, Illinois Wesleyan University. The Vibrational Behavior of a Cured Carbon Fiber Plate and a Tennis Racket

2008 **Honors Thesis in Philosophy**, Illinois Wesleyan University. Physicalism and Phenomenal Experience: An Investigation of Phenomenal Experience Using the Mereological Structure of Events

2004 - 2008 **Dean's List**, Illinois Wesleyan University. All semesters. Awarded based on semester GPA.

Travel & Conference Awards

2019 **Junior Investigator Travel Award**, Research Society on Alcoholism, $400. Awarded to support postdoc travel to the annual RSA conference

2018 **Junior Investigator Travel Award**, Research Society on Alcoholism, $400. Awarded to support postdoc travel to the annual RSA conference

2017 **PLOS Early Career Travel Award**, PLOS, $500. Awarded to support opportunities for early career researchers to present their work and participate in the scientific dialogue at a conference.

2017 **Junior Investigator Travel Award**, Research Society on Alcoholism, $300. Awarded to support postdoc travel to the annual RSA conference.

2017 **Travel Award**, Statistical Analysis of Neuronal Data Workshop, $600. Awarded to support postdoc travel to the Sand8 workshop.

2015 **Travel Award**, Indiana University College of Arts and Sciences, $500. Awarded to support graduate student travel to conferences.

2015 **Traveling Scholar Award**, Conference on Complex Systems 2015, $350. Awarded to support graduate student travel to the conference.

2015 **Shirley Chan Student Travel Award**, APS March Meeting 2015, $400. Declined due to an unforeseen family obligation.

2013 **Poster Award**, Society for Neuroscience Indianapolis Chapter Meeting, $100, 2nd Place.

Presentations

2019 **N. M. Timme**, Using information theory and modeling to unravel the decision to drink in alcohol use disorder, Society for the Quantitative Analysis of Behavior, May 23rd – 24th, 2019, Chicago, IL. Invited, but declined due to an unforeseen family obligation.

2018 **N. M. Timme**, From neural cultures to rodent models of disease: examples of information theory analyses of effective connectivity, computation, and encoding, CNS 2018 Information Theory Workshop, July 18th, 2018, Seattle, WA. Invited.

2015 **N. Timme**, S. Ito, M. Myroshnychenko, F. C. Yeh, P. Hottowy, A. Litke, J. M. Beggs, Hub neurons contribute more to computation, Conference on Complex Systems, September 28th, 2015, Phoenix, AZ.

2015 **N. Timme**, Multivariate transfer entropy reveals degree dependent computation in networks of cortical slice culture neurons, Neurons, Circuits and Behavior Seminar, University of Oregon, April 28th, 2015, Eugene, OR. Invited.

2010 **N. Timme**, Vibration damping in a tennis racket, 159th Meeting of the Acoustical Society of America, April 19th – 23rd, 2010, Baltimore, MD. Invited, but declined.

Posters

2019 **N. M. Timme**, D. Linsenbardt, M. Timm, T. Galbari, E. Cornwell, and C. C. Lapish, Neural encoding in medial prefrontal cortex during aversion resistant drinking in rodent models of alcohol use disorder, Society for Neuroscience Annual Meeting, October 19th – 23rd, 2019, Chicago, IL.

2019 **N. M. Timme**, D. Linsenbardt, M. Timm, T. Galbari, E. Cornwell, and C. C. Lapish, Examining the role of medial prefrontal cortex in aversion resistant drinking in alcohol preferring P rats, Research Society on Alcoholism Annual Meeting, June 22nd – 26th, 2019, Minneapolis, MN.

2019 E. C. Cornwell, T. J. Galbari, B. Ma, C. C. Lapish, and **N. M. Timme**, Exploring alcohol consumption levels by alcohol preferring P rats and Wistars in a simple limited access task,

Indiana Chapter of the Society for Neuroscience Annual Meeting, March 22nd, 2019, Indianapolis, IN.

2018 **N. M. Timme**, D. N. Linsenbardt, and C. C. Lapish, Using information theory and a Bayesian model to examine the factors that influence the decision to consume alcohol in a rodent model of alcoholism, Organization for Computational Neuroscience Annual Meeting, July 13th – 18th, 2018, Seattle, WA.

2018 **N. M. Timme**, D. N. Linsenbardt, and C. C. Lap**ish**, A Bayesian model to explore the factors that influence the decision to drink in rodents, Research Society on Alcoholism Annual Meeting, June 16th – 20th, 2018, San Diego, CA.

2018 **N. M. Timme**, D. N. Linsenbardt, and C. C. Lapish, Alcohol cue and drinking intent encoding is diminished in the prefrontal cortex of alcohol preferring rats, Alcohol and the Nervous System Gordon Research Conference, March 4th – 9th, 2018, Galveston, TX.

2018 **N. M. Timme**, D. N. Linsenbardt, and C. C. Lapish, Using a Bayesian model to explore the behavioral factors that influence the decision to consume alcohol in rodents, Alcohol and the Nervous System Gordon Research Seminar, March 3rd – 4th, 2018, Galveston, TX.

2017 **N. Timme**, D. N. Linsenbardt, and C. C. Lapish, Alcohol consumption related decision-making encoding is altered in the prefrontal cortex of alcohol preferring rats, Society for Neuroscience Annual Meeting, November 11th – 15th, 2017, Washington, DC. Dynamic Poster.

2017 **N. Timme**, D. N. Linsenbardt, and C. C. Lapish, To drink or not to drink: altered decision-making related information encoding in the prefrontal cortex of alcohol preferring rats, Research Society on Alcoholism Annual Meeting, June 24th – 28th, 2017, Denver, CO.

2017 **N. Timme**, D. N. Linsenbardt, M. Myroshnychenko, and C. C. Lapish, Improvements to information theory analysis techniques throughout neuroscience with MATLAB support, Statistical Analysis of Neuronal Data Workshop, May 31st – June 2nd, 2017, Pittsburgh, PA.

2016 **N. Timme**, D. N. Linsenbardt, M. Myroshnychenko, and C. C. Lapish, Improvements to information theory analysis techniques throughout neuroscience with MATLAB support, Society for Neuroscience Annual Meeting, November 11th – 16th, 2016, San Diego, CA.

2015 **N. Timme**, S. Ito, M. Myroshnychenko, F. C. Yeh, E. Hiolski, A. Litke, J. M. Beggs, High degree neurons tend to contribute more and process less information in cortical networks, Cosyne, March 5th - 8th, 2015, Salt Lake City, UT.

2014 **N. Timme**, S. Ito, M. Myroshnychenko, F. C. Yeh, E. Hiolski, A. Litke, J. M. Beggs, Synergy and redundancy in timescale dependent multiplex networks of hippocampal neurons, Society for Neuroscience Annual Meeting, November 15th - 19th, 2014, Washington, DC.

2014 **N. Timme**, S. Ito, M. Myroshnychenko, F. C. Yeh, E. Hiolski, A. Litke, J. M. Beggs, Synergy and redundancy in timescale dependent multiplex networks of hippocampal neurons, Society for Neuroscience Indianapolis Chapter Meeting, October 10th, 2014, Indianapolis, IN.

2014 **N. Timme**, S. Ito, M. Myroshnychenko, F. C. Yeh, E. Hiolski, A. Litke, J. M. Beggs, Multiplex networks of cortical and hippocampal neurons revealed at different timescales, Computational Neuroscience, July 26th - 31st, 2014, Québec City, Canada.

2013 **N. Timme**, S. Ito, M. Myroshnychenko, F. C. Yeh, E. Hiolski, A. Litke, J. M. Beggs, Transfer entropy reveals time scale dependent networks and hubs in hippocampal and cortical cultures, Society for Neuroscience Indianapolis Chapter Meeting, October 18th, 2013, Indianapolis, IN.

Outreach

2010 – 2014 **Foundations in Science and Mathematics**.
Along with fellow Indiana University Physics graduate students Jake Bennett, Jason Fry,

and Lance Garrison, I created a summer program for high school students in Bloomington, Indiana to help them prepare for their upcoming high school math and physics courses. We have had more than 350 participants over five summers. The program continued following our graduation.
- Program Website: http://www.indiana.edu/~fsm/
- Grants Obtained: Indiana Space Consortium (2011: $2,600; 2012: $9,600; 2013: $5,000; 2014: $5,000)

2010 – 2014 **WonderLab Museum of Health, Science, and Technology**.
Along with faculty from Indiana University, WonderLab employees, and an Indiana University Computer Science graduate student, I worked to create an interactive brain wave exhibit for children.

Teaching Experience

Physics I Discussion, Non-Calculus, 9 Sections, Indiana University

Physics I Laboratory, Non-Calculus, 4 Sections, Indiana University

Physics I Discussion, Calculus, 5 Sections, Indiana University

Physics I Laboratory, Calculus, 2 Sections, Indiana University

Physics II Discussion, Non-Calculus, 2 Sections, Indiana University

Physics II Laboratory, Non-Calculus, 4 Sections, Indiana University

Physics II Discussion, Calculus, 2 Sections, Indiana University

Physics II Laboratory, Calculus, 2 Sections, Indiana University

Physics in the Modern World, Grading, 1 Section, Indiana University

Honor Societies

Phi Kappa Phi

Phi Beta Kappa

Phi Sigma Tau, Philosophy Honor Society, Illinois Wesleyan University Chapter President Fall 2005 to Spring 2008

Pi Mu Epsilon, Mathematics Honor Society

Alpha Lambda Delta, Freshman Honor Society, Executive Board Member

Phi Eta Sigma, Freshman Honor Society