

# John Pearson

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<http://pearsonlab.github.io>

## Education and Training

**Duke Institute for Brain Sciences** **January 2015 – present**

Assistant Research Professor. Theoretical and computational neuroscience, focused on applications of machine learning to large-scale neuroscience data.

**Duke University Medical Center** **February 2011 – December 2014**

Research Scientist in the Platt Lab, investigating decision-making in Parkinson's Disease and developing novel analysis methods for neuroscience data.

**Duke University Medical Center** **January 2008 – January 2011**

Postdoctoral Associate in the Platt Lab, investigating the neural bases of decision making in primates.

**Duke University Medical Center** **November 2005 – December 2007**

Postdoctoral Associate in the Raghavachari Lab, investigating the neural bases of numerical cognition via theoretical and computational modeling.

**Princeton University** **Fall 1999 – Spring 2004**

PhD in Physics: String theory and quantum gravity. Thesis: *Gravitons, Inflatons, Twisted Bits: A Noncommutative Bestiary*. Advisor: Herman Verlinde. National Science Foundation Graduate Research Fellow

**University of Kentucky** **Fall 1996 – Spring 1999**

BSc. in Physics and Mathematics. Summa Cum Laude. Finalist for the American Physical Society's Leroy Apker Undergraduate Research Award. Led both the Society of Physics Students and Math Club. Recruited speakers, organized and publicized meetings.

## Extramural Funding (current)

*Neural Circuit Mechanisms Mediating TMS and Oxytocin Effects on Social Cognition*  
NIMH R01-MH109728 (4/16 – 3/20; \$248,000) Co-Investigator

*Nonparametric Bayes Methods for Big Data In Neuroscience*  
NIH Big Data to Knowledge (BD2K) Initiative  
NIEHS K01-ES025442 (10/14 – 7/19; \$720,000) Principal Investigator

*Mechanisms of Parkinsonian Impulsivity in Human Subthalamic Nucleus*  
NINDS R21-NS084176 (4/14 – 3/17; \$275,000) Principal Investigator

*Transcranial Direct Current Stimulation (TDCS) as a Treatment for Acute Fear*  
NIMH R21-MH106772 (4/15 – 1/17; \$465,000) Co-Investigator

*Feedback-based learning in aging: Specific contributions of striatal and hippocampal systems*  
Scientific Research Network on Decision Neuroscience and Aging (SRNDNA)/NIA R24-AG039350-05  
(9/14 – 4/15; \$20,000) Co-Investigator

## Intramural Funding (competitive)

*Empirical and Neurobiological Foundations of Legal Decision-Making*

Duke Institute for Brain Sciences Incubator Award (7/13–7/15; \$80,000) Co-Investigator

## Peer-Reviewed Publications

### In prep, under review, and preprint:

**John M. Pearson**, Patrick T. Hickey, Shivanand P. Lad, Michael L. Platt, Dennis A. Turner  
*Individualized prediction of self-control decisions from local fields in human subthalamic nucleus*

Xin Chen, Jeffrey M. Beck and **John M. Pearson**

*Neuron's eye view: inferring features of complex stimuli from neural responses*

<http://arxiv.org/abs/1512.01408>

### In Press:

Emma Wu Dowd, **John M. Pearson**, and Tobias Egner

*Decoding working memory content from attentional biases*

Psychonomic Bulletin and Review (2016)

### Published:

Rene San Martin, Youngbin Kwak, **John M. Pearson**, Marty Woldorff, and Scott Huettel

*Altruistic traits are predicted by neural responses monetary outcomes for self versus charity*

Social Cognitive and Affective Neuroscience (2016)

Steve W.C. Chang, Nicholas A. Fagan, Koji Toda, Amanda V. Utevsky, **John M. Pearson**, and Michael L. Platt

*Neural mechanisms of social decision-making in the primate amygdala*

Proceedings of the National Academy of Sciences (2015) 112 (52), 16012-16017

Merideth A. Addicott, **John M. Pearson**, Nicole Kaiser, Michael L. Platt ML, Francis J. McClernon

*Suboptimal foraging behavior: a new perspective on gambling*

Behavioral Neuroscience (2015)

Merideth A. Addicott, **John M. Pearson**, Brett Froeliger, Michael L. Platt ML, Francis J. McClernon

*Smoking automaticity and tolerance moderate brain activation during explore-exploit behavior*

Psychiatry Research: Neuroimaging 224:3 (2014) PMID: PMC4254500

Youngbin Kwak, **John Pearson**, and Scott A. Huettel

*Differential reward learning for self and others predicts self-reported altruism*

PLoS ONE 9(9): e107621 (2014) PMID: PMC4162622

**John M. Pearson**, Karli K. Watson, and Michael L. Platt

*Decision making: the neuroethological turn*

Neuron 82(5) (2014) PMID: PMC4065420

R. Becket Ebitz, **John M. Pearson**, and Michael L. Platt

*Pupil size and social vigilance in rhesus macaques*

Frontiers in Neuroscience 8:100 (2014) PMID: PMC4018547

Sarah M. Jones, **John M. Pearson**, Nicholas K. DeWind, David Paulsen, Ana-Maria Tenekedjieva, and Elizabeth M. Brannon

*Lemurs and macaques show similar numerical sensitivity*

Animal Cognition 17(3) (2014) 1435-9448, PMID: PMC3966981

**John M. Pearson**, Karli K. Watson, Jeffrey T. Klein, R. Becket Ebitz, and Michael L. Platt

*Individual differences in social information gathering revealed through Bayesian hierarchical models*  
Frontiers in Decision Neuroscience (2013) vol. 7 (00165), PMCID: PMC3771214

Tommy C. Blanchard, **John M. Pearson**, and Benjamin Y. Hayden  
*Post-reward delays and systematic biases in measures of animal temporal discounting*  
Proceedings of the National Academy of Sciences (2013) 110 (38), pp15491-15496, PMCID: PMC3780845

Jessica L. Yorzinski, Gail L. Patricelli, Jason S. Babcock, **John M. Pearson**, and Michael L. Platt  
*Through their eyes: selective attention in peahens during courtship*  
Journal of Experimental Biology (2013) vol 216(16), pp3035-46, PMID: 23885088

Steve W.C. Chang, Lauren J.N. Brent, Geoffrey K. Adams, Jeffrey T. Klein, **John M. Pearson**, Karli K. Watson, and Michael L. Platt  
*Neuroethology of primate social behavior*  
Proceedings of the National Academy of Sciences (2013) vol 110(supp. 2), pp 10339-10342, PMCID: PMC3690617

René San Martín, Lawrence G. Appelbaum, **John M. Pearson**, Scott A. Huettel, and Marty G. Woldorff  
*Rapid brain responses independently predict gain maximization and loss minimization during economic decision making*  
Journal of Neuroscience (2013) vol 33(16), pp 7011-7019, PMCID: 3683537

Merideth A. Addicott, **John M. Pearson**, Jessica Wilson, Michael L. Platt, and F. Joseph McClernon  
*Smoking and the bandit: A preliminary study of smoker and non-smoker differences in exploratory behavior measured with a multi-armed bandit task*  
Experimental and Clinical Psychopharmacology (2013) vol. 21(1), pp 66-73, PMID: 23245198

**John M. Pearson** and Michael L. Platt  
*Change detection, multiple controllers, and dynamic environments: Insights from the brain*  
Journal of the Experimental Analysis of Behavior (2013) vol. 99(1), pp 74-84, PMID: 23344989

Geoffrey K. Adams, Karli K. Watson, **John M. Pearson**, and Michael L. Platt  
*Neuroethology of Decision-making*  
Current Opinion in Neurobiology (2012) vol. 22(6), pp 982-989, PMCID: PMC3510321

Benjamin Y. Hayden, **John M. Pearson**, Michael L. Platt  
*Neuronal basis of sequential foraging decisions in a patchy environment*  
Nature Neuroscience (2011) vol. 14, pp 933-939, PMCID: PMC3553855

**John M. Pearson**, Sarah R. Heilbronner, David L. Barack, Benjamin Y. Hayden, Michael L. Platt  
*Posterior cingulate cortex: adapting behavior to a changing world*  
Trends in Cognitive Sciences (2011) vol. 15(4), pp 143-151, PMCID: PMC3153841

Benjamin Y. Hayden, Sarah R. Heilbronner, **John M. Pearson**, Michael L. Platt  
*Surprise signals in anterior cingulate cortex: neuronal encoding of unsigned reward prediction errors driving adjustment in behavior*  
The Journal of Neuroscience (2011) vol. 31 (11), pp 4178-4187, PMCID: PMC3070460

**John M. Pearson**, Benjamin Y. Hayden, Michael L. Platt  
*Explicit information reduces discounting behavior in monkeys*  
Frontiers in Psychology (2010) vol. 1, article 237, PMCID: PMC3153841

**John M. Pearson**, Jamie D. Roitman, Elizabeth M. Brannon, Michael L. Platt, Sridhar Raghavachari  
*A physiologically-inspired model of numerical classification based on graded stimulus coding*  
 Frontiers in Behavioral Neuroscience (2010) vol. 4 (0), 12pp, PMID: PMC2814553

**John M. Pearson**, Benjamin Y. Hayden, Sridhar Raghavachari, Michael L. Platt  
*Neurons in posterior cingulate cortex signal exploratory decisions in a dynamic multi-option choice task*  
 Current Biology (2009) vol. 19 (18), pp 1-6, PMID: PMC3515083

Benjamin Y. Hayden, **John M. Pearson**, and Michael L. Platt  
*Fictive learning signals in anterior cingulate cortex*  
 Science (2009) vol. 324 (5929) p. 948-950. PMID: PMC3096846  
 New York Times: "In that tucked tail, real pangs of regret?" <http://www.benhayden.com/pub/nytimes.pdf>

**John M. Pearson**  
*Gravitons, Inflatons, Twisted Bits: A Noncommutative Bestiary*  
 PhD Thesis (accepted, May 2004)

In the following, authors are listed in alphabetical order, as is conventional in physics:

**John Pearson**, Marcus Spradlin, Diana Vaman, Anastasia Volovich, Herman Verlinde  
*Tracing the String: BMN correspondence at Finite  $J^2/N$*   
 hep-th/0210102; JHEP **0305** (2003) 022

Shamit Kachru, **John Pearson**, Herman Verlinde  
*Brane/Flux Annihilation and the String Dual of a Non-Supersymmetric Field Theory*  
 hep-th/0112197; JHEP **0206** (2002) 021

Eric Braaten, **John Pearson**  
*Semiclassical Corrections to the Oscillation Frequencies of a Trapped Bose-Einstein Condensate*  
 cond-mat/9808088; Phys. Rev. Lett. **82**, 255-258 (1999)

## Chapters and Previews

Michael L. Platt and **John M. Pearson**  
*Dopamine: Context and Counterfactuals*  
 Proceedings of the National Academy of Sciences (2016) 113 (1), 22-23

**John M. Pearson** and Michael L. Platt  
*Dopamine: Burning the candle at both ends*  
 Neuron (2013) vol. 79 (5), pp 831-833

Geoffrey K. Adams, Karli K. Watson, **John M. Pearson**, and Michael L. Platt  
*Neuroethology of Decision Making*  
 Evolution and the Mechanisms of Decision Making, Hammerstein and Stevens, eds. (2012)

**John M. Pearson** and Michael L. Platt  
*Dynamic decision making in the brain*  
 Nature Neuroscience (2012) vol. 15(3), pp 341-342

**John M. Pearson**, Benjamin Y. Hayden, Michael L. Platt  
*A role for posterior cingulate cortex in policy switching and cognitive control*  
 in *Neural Basis of Motivational and Cognitive Control*  
 Attention and Performance XXIV, Mars, Sallett, Rushworth, and Yeung eds. (2011)

**John M. Pearson** and Michael L. Platt

*Confidence and corrections: how we make and un-make up our minds*

Neuron (2009) vol. 63 (6), pp 724-726

## **Invited and Conference Talks**

*Dynamic control models for strategic interaction*

Nanosymposium on reward-based decision-making

Society for Neuroscience, 2016

*VinDsl.jl: Fast and Furious Statistical Modeling*

JuliaCon 3

Cambridge, MA, June 2016

*Mining the Brain in an Age of Big Data*

Shanghai Neuroeconomics Colloquium

Shanghai, China, May 2015

*Mining the Brain in an Age of Big Data*

Duke Center for Cognitive Neuroscience

Durham, NC, October 2014

*Data Analysis in an Age of Individual Differences*

Duke Clinical Research Institute

Durham, NC, September 2013

*Giving In: The neuroscience of Self-Control*

Brain Awareness Week

Alamance Community College

Graham, NC, March 2013

*Toward a neurobiology of foraging: Five (not-so) easy pieces*

Neuroscience of Foraging CoSyne Workshop

Snowbird, Utah, March 2013

*A Neuro-Economic Approach to Mental Disorders*

CNS Summit 2012

Boca Raton, Florida, November 2012

*Impulse Control Disorders in Parkinson's Disease*

Duke University Brain Awareness Week Public Lecture

Durham, North Carolina, March 2012

*The Cingulate Cortex in Foraging Control*

Winter Conference on Brain Research

Snowbird, Utah, February 2012

*Tracking Dynamic Environments in Cingulate Cortex*

Cold Spring Harbor Laboratory, May 2009

*Single neurons in CGp predict explore/exploit decisions in a dynamic foraging task*  
Society for Neuroeconomics Annual Meeting, Park City, Utah, September 2008

## Popular Press

**John Pearson**

*Coaxing Order From Chaos*

Duke Magazine (Sep-Oct 2009) vol. 95 (5)

**John Pearson**

*Let It Ride: The Neuroscience of Risk*

Duke Magazine (Nov-Dec 2008) vol. 94 (6)

**John Pearson** and Michael Platt

*Decision Making in the Brain: Eavesdropping on Neurons*

Mind Matters (Scientific American mind and brain blog) (Aug 5, 2008)

<http://www.scientificamerican.com/article.cfm?id=decision-making-in-brain>

## Teaching and Mentoring

**Duke University**

**Spring 2009 – Present**

- Instructor (2012, 2014, 2015, 2016): Computational methods. Bootcamp for incoming neuroscience graduate students.
- Developed and taught (Summer 2011, Fall 2011, Spring 2017) a 12-session introduction to Matlab course for Duke graduate students and postdocs across the brain sciences.
- Currently supervising a senior thesis project.
- Mentored nine undergraduates and three graduate students in four separate research projects. Taught data collection and analysis techniques, assigned and led discussions of published research relevant to the projects, guided preparation of scientific posters and presentations.
- Jointly supervised one senior thesis in the Economics department. Worked with student to develop a research question, build mathematical models of data, and translate scientific findings to a non-neuroscience audience.
- Guest-lectured to students in graduate Theoretical Neuroscience course and Neuroscience 132 (Decision Neuroscience). Delivered a series of summer lectures to graduate students and postdocs on computational models of reinforcement learning.

**Princeton University**

**2002 – 2004**

- PHY 111: Contemporary Physics (“Physics for Poets”): 4 semesters. Led weekly laboratory and homework review sessions; conducted supplementary help sessions; graded tests and homework.
- PHY 529: General Relativity: 1 semester. Graded graduate student homework and produced formatted solutions to problem sets.

## Honors and Awards

National Science Foundation Graduate Research Fellowship (1999-2002)

First Year Graduate Science Fellowship (1999-2000)  
Princeton University

Finalist, Leroy Apker Award (1999)  
American Physical Society

Special Award for Research by an Undergraduate (1999; inaugural recipient)  
Physics Department, University of Kentucky