

Nathaniel Daw

Professor, Princeton Neuroscience Institute and Department of Psychology,
Princeton University
Princeton NJ 08544

updated 9/11/2015

Experience:

Affiliations:

Professor (2015-)
Princeton Neuroscience Institute and Department of Psychology
Princeton University

Associate professor (2012- 2015); Assistant professor (2007-2012)
Center for Neural Science and Department of Psychology; affiliated: Department of Computer Science
New York University

Royal Society USA research fellow (2003-2006)
Gatsby Computational Neuroscience Unit, University College London, UK

Visiting affiliations:

Visiting scientist (Spring 2013)
Neuroscience Institute and Department of Psychology
Princeton University

Visiting scientist (Fall 2012)
Department of Neurobiology
Weizmann Institute of Science

Education:

Carnegie Mellon University, Pittsburgh, PA (1997-2003)

Advisor: David S. Touretzky

M.S., May 2000 (Computer Science); Ph.D., Aug. 2003 (Computer Science with certification in Cognitive Neuroscience)

Thesis: "Reinforcement learning models of the dopamine system and their behavioral implications,"

Columbia University, New York, NY (1992-1996)

B.A., *summa cum laude*, June 1996 (Philosophy of Science)

Funding & Awards:

Funding (ongoing):

NIDA 1R01DA038891 (PI Daw; Co-PI Shohamy; 9/15/2014-6/30/2019)
"Computational and Neural Mechanisms of memory-guided decisions"

NINDS 1R01NS078784 (subcontract; PI Shohamy; Co-investigator Daw; 9/2011-9/2015)
"Goals vs. habits in the human brain: Cognitive and computational mechanisms"

McDonnell Foundation Scholar Award (Daw; 9/2011-9/2015)
"Dissecting learning: combining experimental and computational approaches"

Funding (completed):

NIMH 1R01MH087882 (PI Daw; Co-investigator Pesaran; 9/2009-5/2014)
"Reinforcement learning in multi-dimensional action spaces"

NIDA 1R01DA027794 (subcontract; PI Wager; Co-investigators Daw, Hart, Lindquist, Shohamy; 9/2009-9/2014)
"Learning to avoid pain: Computational mechanisms and application to methamphetamine abuse"

Human Frontiers Science Program Grant RGP0036/2009-C (PIs Nakamura, Daw, Cools; 12/2009-12/2012)
"Serotonin and decision making: Integrating interspecies experimental and computational approaches"

McKnight Scholar Award (Daw; 7/2009-7/2012)
"Decision making in structured, sequential tasks"

NARSAD Young Investigator Award (Daw; 1/2010-1/2012)
"Distinguishing associative processes for isolating psychiatric deficits"

US-Israel Binational Science Foundation Grant #200528 (PIs Joel, Rivka, O'Doherty, Daw; Daw added year 2; 10/2006-10/2009)
"Deficient procedural learning in obsessive compulsive disorder: A functional MRI study"

USA Research Fellowship, Royal Society (UK) (Daw; 2003-2006),
"Dopamine and the neural basis of decision-making"

Graduate Research Fellowship, National Science Foundation (Daw; 1998-2001)

Funding and awards to trainees, sponsored:

Junior Fellowship, Simons Society of Fellows (Y-Lan Boureau, 2014)

Douglas and Katharine Fryer Thesis Fellowship for best doctoral thesis (Dylan Simon, 2013)

Swiss National Science Foundation and Janggen-Poehn Foundation Fellowship for Prospective Researchers
PBSKP3_133357 (Mattia Rigotti, 2012)

NIMH Pre-Doctoral NRSA 1F31MH095501-01 (Aaron Bornstein, 2011).

Henry Wellcome Postdoctoral Fellowship (Steven Fleming, 2011; Claire Gillan, 2013)

Danish Agency for Science Technology and Innovation postdoctoral grant (Daniel Campbell-Meiklejohn, 2011)

Netherlands Organization for Scientific Research, Innovational Research Incentives Scheme Veni (Hanneke Den Ouden, 2011)

Swiss National Science Foundation Fellowship for Prospective Researchers PBSKP3-133357 (Mattia Rigotti, 2010)

Lundbeck Foundation grant (Daniel Campbell-Meiklejohn, 2010)

Awards:

Young Investigator Award, Society for Neuroeconomics (2012)

McDonnell Foundation Scholar Award in Understanding Human Cognition (2011)

McKnight Scholar Award (2009)

NARSAD Young Investigator Award (2009)

NIPS Outstanding Student Paper Award (2005)

Niv, Daw & Dayan, "How fast to work: Response vigor, motivation and tonic dopamine"

NIPS Outstanding Student Paper Award (2004)

Courville, Daw & Touretzky, "Similarity and discrimination in classical conditioning"

John Jay Scholar (1992)
Columbia University

Publications:

Journal articles:

1. Boureau, Y-L, Sokol-Hessner, P., and **Daw, N.D.** (in press) Deciding how to decide: self-control and meta-decision making. *Trends in Cognitive Science*.

2. Zhang, H., **Daw, N.D.**, and Maloney, L.T. (2015) Human representation of visuo-motor uncertainty as mixtures of orthogonal basis distributions. *Nature Neuroscience* 18: 1152-1158.
3. Constantino, S., and **Daw, N.D.** (2015) Learning the opportunity cost of time in a patch foraging task. *Cognitive, Affective and Behavioral Neuroscience* epub ahead of print
4. Worbe, Y., Savulich, G., **Daw, N.D.**, Emilio, F.-E., Robbins, T.W., Voon, V., and Palminteri, S. (2015) Valence-dependent influence of serotonin depletion on model-based choice strategy. *Molecular Psychiatry* epub ahead of print.
5. Gillan, C.M., Otto, A.R., Phelps, E.A., and **Daw, N.D.** (2015) Model-based learning protects against forming habits. *Cognitive, Affective and Behavioral Neuroscience* 15: 523-536.
6. Doll, B.B., Duncan, K.D., Simon, D.A., Shohamy, D.S., and **Daw, N.D.**, (2015) Model-based choices involve prospective neural activity. *Nature Neuroscience* 18:767-72.
7. Huys, Q.J., **Daw, N.D.**, and Dayan, P. (2015) Depression: A decision theoretic analysis. *Annual Reviews of Neuroscience* 8:1-23.
8. Roy, M., Shohamy, D., **Daw, N.D.**, Jepma, M., Wimmer, G.E., and Wager, T.D., (2014) Representation of aversive prediction errors in the human periaqueductal gray. *Nature Neuroscience* 17:1607-12.
9. Wimmer, G.E., Braun, E.K., **Daw, N.D.**, and Shohamy, D. (2014) Episodic memory encoding interferes with reward learning and decreases striatal prediction errors. *Journal of Neuroscience* 34:14901-12.
10. Otto, A.R., Skatova, A., Madlon-Kay, S., and **Daw, N.D.**, (2014) Cognitive Control Predicts Use of Model-Based Reinforcement-Learning. *Journal of Cognitive Neuroscience* 27, 319–333.
11. **Daw, N.D.** and Dayan, P. (2014) The algorithmic anatomy of model-based evaluation. *Philosophical Transactions of the Royal Society B* 369: 20130478.
12. Voon, V., Derbyshire, K., Ruck, C., Irvine, M., Worbe, Y., Enander, J., Schrieber, L., Gillan, C., Fineberg, N., Sahakian, B., Robbins, T., Harrison, N., Wood, J., **Daw, N.D.**, Dayan, P., Grant, J., and Bullmore, E., (2015) Disorders of compulsivity: a common bias towards learning habits. *Molecular Psychiatry* 20:345-352.
13. Doll, B., Shohamy, D., and **Daw, N.D.**, (2014) Multiple memory systems as substrates for multiple decision systems. *Neurobiology of Learning and Memory* 117:4-13.
14. Otto, A.R., Raio, C.M., Chiang, A., Phelps, E.A., and **Daw, N.D.**, (2013) Working-memory capacity protects model-based learning from stress. *Proceedings of the National Academy of Sciences* 110:20941-6.
15. Bornstein, A.M., and **Daw, N.D.**, (2013) Cortical and hippocampal correlates of deliberation during model-based decisions for rewards in humans. *PLoS Computational Biology* 9:e1003387.
16. Fleming, S., Maloney, L., and **Daw, N.D.**, (2013) The irrationality of categorical perception. *Journal of Neuroscience* 33:19060-70.
17. Den Ouden, H., **Daw, N.D.**, Fernandez, G., Elshout, J., Rijpkema, M., Hoogman, M., Franke, B., and Cools, R., (2013) Dissociable effects of dopamine and serotonin on reversal learning. *Neuron* 80:1090-100.
18. Skatova, A, Chan, P.A., and **Daw, N.D.** (2013) Extraversion differentiates between model-based and model-free strategies in a reinforcement learning task. *Frontiers in Human Neuroscience* 7:525.
19. Rigotti, M., Barak, O., Warden, M.R., Wang, X., **Daw, N.D.**, Miller, E.K., and Fusi, S. (2013) The importance of mixed selectivity in complex cognitive tasks. *Nature*: 497:585-90.
20. Zhang, H., **Daw, N.D.**, and Maloney, L.T. (2013) Testing whether humans have an accurate model of their own motor uncertainty in a speeded reaching task. *PLoS Computational Biology* 9: e1003080.
21. Otto, A.R., Gershman, S.J., Markman, A.M, and **Daw, N.D.** (2013) The curse of planning: Dissecting multiple reinforcement learning systems by taxing the central executive. *Psychological Science* 24:751-761.
22. Madlon-Kay, S., Pesaran, B., and **Daw, N.D.** (2013) Action selection in multi-effector decision making. *Neuroimage* 70:66-79.
23. Landy, M., Trommershauser, J., and **Daw, N.D.** (2012) Dynamic estimation of task-relevant variance in movement under risk. *Journal of Neuroscience* 32:12702-11.

24. Kovach, C.K.*, **Daw N.D.***, Rudrauf, D., Tranel, D., O'Doherty, J.P., and Adolphs, R. (2012) Anterior prefrontal cortex contributes to action selection through tracking of recent reward trends. *Journal of Neuroscience* 32: 8434-42.
25. Seymour, B., **Daw, N.D.**, Roiser, J., Dayan, P. and Dolan, R.J. (2012) Serotonin selectively modulates reward value in human decision making. *Journal of Neuroscience* 32:5833-42.
26. Wimmer, G.E., **Daw, N.D.***, and Shohamy, D.* (2012) Generalization of value in reinforcement learning by humans. *European Journal of Neuroscience* 35:1092-1104.
27. Bornstein, A.M., and **Daw, N.D.** (2012) Dissociating hippocampal and striatal contributions to sequential prediction learning. *European Journal of Neuroscience* 35: 1011-1023.
28. Roesch, M., Esber, G., Li, J., **Daw, N.D.**, and Schoenbaum, G. (2012) Surprise! Neural correlates of Pearce-Hall and Rescorla-Wagner coexist within the brain. *European Journal of Neuroscience* 35: 1190-1200.
29. Gustafson, N., and **Daw, N.D.** (2011) Grid cells, place cells, and geodesic generalization for spatial reinforcement learning. *PLoS Computational Biology* 7:e1002235.
30. Li, J. Schiller, D., Schoenbaum, G., Phelps, E.A. and **Daw, N.D.** (2011) Differential roles of human striatum and amygdala in associative learning. *Nature Neuroscience* 14:1250-1252.
31. Li, J., and **Daw, N.D.** (2011) Signals in human striatum are appropriate for policy update rather than value prediction. *Journal of Neuroscience* 31:5504-5511.
32. Simon, D.A., and **Daw, N.D.** (2011) Neural correlates of forward planning in a spatial decision task in humans. *Journal of Neuroscience* 31:5526-5539.
33. **Daw, N.D.**, Gershman, S.J., Seymour, B., Dayan, P., and Dolan, R.J. (2011) Model-based influences on humans' choices and striatal prediction errors. *Neuron* 69:1204-1215.
34. Cools, R., Nakamura, K., and **Daw, N.D.** (2011) Serotonin and dopamine: Unifying affective, activational, and decision functions, *Neuropsychopharmacology* 36:98-113.
35. Beeler, J.A., **Daw, N.D.**, Frazier, C.R.M, and Zhuang, X. (2010), Tonic dopamine modulates exploitation of reward learning *Frontiers in Behavioral Neuroscience* 4:170.
36. Gläscher, J., **Daw, N.D.**, Dayan, P., and O'Doherty, J.P. (2010), States versus rewards: Dissociable neural prediction error signals underlying model-based and model-free reinforcement learning, *Neuron* 66:585-595.
37. Schönberg, T., O'Doherty, J.P., Joel, D., Inzelberg, R., Segev, Y., and **Daw, N.D.** (2010) Selective impairment of prediction error signaling in human dorsolateral but not ventral striatum in Parkinson's disease patients: evidence from a model-based fMRI study, *Neuroimage* 49:772-81.
38. Gershman, S.J., Pesaran, B., and **Daw, N.D.** (2009) Human reinforcement learning subdivides structured action spaces by learning effector-specific values, *Journal of Neuroscience* 29:13524-13531.
39. Bodi, N., Keri, S., Nagi, H., Moustafa, A., Myers, C., **Daw, N.D.**, Dibo, G., Takats, A., Berecz, D., and Gluck, M.A. (2009) Reward learning and the novelty seeking personality: A between and within-subjects study of the effects of dopamine agonists on young Parkinson's patients, *Brain* 132: 2385-2395.
40. Den Ouden H.E.M., Friston K.J., **Daw, N.D.**, McIntosh, A.R., and Stephan, K.E. (2009) A dual role for prediction error in associative learning, *Cerebral Cortex* 19:1175-1185.
41. Dayan, P., and **Daw, N.D.** (2008) Decision theory, reinforcement learning, and the brain, *Cognitive, Affective, and Behavioral Neuroscience* 8:429-453.
42. **Daw, N.D.*** and Shohamy, D.* (2008) The cognitive neuroscience of motivation and learning, *Social Cognition* 26: 593-620.
43. Wittmann, B.*, **Daw, N.D.***, Seymour, B., and Dolan, R. (2008) Striatal activity underlies novelty-based choice in humans, *Neuron* 58: 967-973.
44. Schönberg, T., **Daw, N.D.**, Joel, D., and O'Doherty, J.P. (2007) Reinforcement learning signals in the human striatum distinguish learners from non-learners during reward-based decision making, *Journal of Neuroscience* 27:12860-12867.

* *These authors contributed equally to these articles and ordering was determined arbitrarily.*

45. Seymour, B., **Daw, N.D.**, Dayan, P., Singer, T., and Dolan, R. (2007) Differential encoding of losses and gains in the human striatum, *Journal of Neuroscience* 27:4826-4831.
46. Niv, Y., **Daw, N.D.**, and Dayan, P. (2007) Tonic dopamine: Opportunity costs and the control of response vigor, *Psychopharmacology* 191:507-520.
47. Dayan, P., Niv, Y., Seymour, B., and **Daw, N.D.** (2006) The misbehavior of value and the discipline of the will, *Neural Networks* 19:1153-1160.
48. **Daw, N.D.***, O'Doherty, J.P.*, Dayan, P., Seymour, B., and Dolan, R.J. (2006) Cortical substrates for exploratory decisions in humans, *Nature* 441:876-879.
49. Courville, A.C.*, **Daw, N.D.***, and Touretzky, D.S. (2006) Bayesian theories of conditioning in a changing world, *Trends in Cognitive Sciences*: 10:294-300.
50. **Daw, N.D.**, Courville, A.C., and Touretzky, D. (2006) Representation and timing in theories of the dopamine system, *Neural Computation* 18:1637-1677.
51. **Daw, N.D.**, Niv, Y., and Dayan, P. (2005) Uncertainty-based competition between prefrontal and dorsolateral striatal systems for behavioral control, *Nature Neuroscience* 8:1704-1711.
52. McClure, S.M., **Daw, N.D.**, and Montague, P.R. (2003) A computational substrate for incentive salience, *Trends in Neurosciences* 26:423-428.
53. **Daw, N.D.**, and Touretzky, D.S. (2002) Long-term reward prediction in TD models of the dopamine system, *Neural Computation* 14:2567-2583.
54. **Daw, N.D.**, Kakade, S., and Dayan, P. (2002) Opponent interactions between serotonin and dopamine, *Neural Networks* 15:603-616.
55. Cardinal, R., **Daw, .D.**, Robbins, T.W., and Everitt, B.J. (2002) Local analysis of behavior in the adjusting delay task for assessing choice of delayed reinforcement, *Neural Networks* 15:617-634.

Conference proceedings (full length articles, competitively peer-reviewed):

1. Simon, D.A., and **Daw, N.D.** (2011) Environmental statistics and the trade-off between model-based and TD learning in humans *Advances in Neural Information Processing Systems* 24.
2. **Daw, N.D.**, and Courville, A.C. (2007) The pigeon as particle filter, *Advances in Neural Information Processing Systems* 20.
3. Niv, Y., **Daw, N.D.**, and Dayan, P. (2005) How fast to work: Response vigor, motivation and tonic dopamine, *Advances in Neural Information Processing Systems* 18.
4. Courville, A.C., **Daw, N.D.**, and Touretzky, D.S. (2004), Similarity and discrimination in classical conditioning: A latent variable account, *Advances in Neural Information Processing Systems* 17:313-320.
5. Courville, A.C., **Daw, N.D.**, Gordon, G.J., and Touretzky, D.S. (2003) Model uncertainty in classical conditioning, *Advances in Neural Information Processing Systems* 16:977-984.
6. **Daw, N.D.**, Courville, A.C., and Touretzky, D.S. (2003) Timing and partial observability in the dopamine system, *Advances in Neural Information Processing Systems* 15:99-106.
7. **Daw, N.D.**, Courville, A.C., and Touretzky, D.S. (2002) Dopamine and inference about timing, *Proceedings of the Second International Conference on Development and Learning*, pp. 271-276, IEEE Computer Society.
8. Touretzky, D.S., **Daw, N.D.**, and Tira-Thompson, E.J. (2002) Combining configural and TD learning on a robot, *Proceedings of the Second International Conference on Development and Learning*, pp. 47-52, IEEE Computer Society.
9. **Daw, N.D.**, and Touretzky, D.S. (2001) Operant behavior suggests attentional gating of dopamine system inputs, *Neurocomputing* 38-40:1161-1167.
10. **Daw, N.D.**, and Touretzky, D.S. (2000) Behavioral results suggest an average reward TD model of the dopamine system, *Neurocomputing* 32:679-684.

Commentaries, invited reviews, and book chapters:

1. Shohamy, D., and **Daw, N.D.** (2015) Integrating memories to guide decisions. *Current Opinion in Behavioral*

Sciences 5:85-90.

2. Shohamy, D., and **Daw, N.D.** (2014) Habits and reinforcement learning, in Gazzaniga, M., ed., *The Cognitive Neurosciences* 5th ed.
3. **Daw, N.D.** and Tobler, P (2013) Value learning through reinforcement: The basics of dopamine and reinforcement learning, in Glimcher, P. and Fehr, E., eds., *Neuroeconomics: Decision making and the brain*, 2nd edition, Elsevier.
4. **Daw, N.D.**, (2013) Advanced reinforcement learning, in Glimcher, P., and Fehr, E., eds., *Neuroeconomics: Decision making and the brain*, 2nd edition, Elsevier.
5. **Daw, N.D.**, and O'Doherty, J.P. (2013) Multiple systems for value learning in Glimcher, P. and Fehr, E., eds., *Neuroeconomics: Decision making and the brain*, 2nd edition, Elsevier.
6. Doll, B.B, Simon, D.A., and **Daw, N.D.** (2012) The ubiquity of model-based reinforcement learning, *Current Opinion in Neurobiology*, 22:1075-81.
7. **Daw, N.D.** (2012) Model-based reinforcement learning as cognitive search: neurocomputational theories, in: Todd, P.M., and Robbins, T.R., eds., *Cognitive Search: Evolution, Algorithms and the Brain*, MIT Press.
8. Gershman, S., and **Daw, N.D.** (2012) Perception, action and utility: the tangled skein, in: Rabinovich, M., Friston, K., and Varona, P., (eds.) *Principles of Brain Dynamics*, MIT Press.
9. Simon, D.A. and **Daw, N.D.** (2011) Dual-system learning models and drugs of abuse in: Ahmed, S., and Gutkin, B., eds. *Computational Neuroscience of Addiction*, Springer-Verlag.
10. Bornstein, A., and **Daw, N.D.** (2011) Multiplicity of control in the basal ganglia: Computational roles of striatal subregions, *Current Opinion in Neurobiology* 21:374-80.
11. **Daw, N.D.** (2011) Trial-by-trial data analysis using computational models, in: Delgado M., Phelps E.A., and Robbins T.W. (eds.) *Decision Making, Affect, and Learning, Attention and Performance XXIII*, Oxford University Press.
12. Constantino, S.M., and **Daw, N.D.**, (2010) A closer look at choice, *Nature Neuroscience* 13:1153-1154.
13. **Daw, N.D.**, and Frank, M.J. (2009) Reinforcement learning and higher level cognition: Introduction to the special issue, *Cognition* 113:259-6.
14. Becker, S., and **Daw, N.D.** (2009) Computational cognitive neuroscience: Preface to the special issue, *Brain Research* 1299:1-2.
15. Dayan, P., **Daw, N.D.**, and Y Niv. (2009) Theoretical and computational neuroscience: Learning, action, inference and neuromodulation, chapter in L. Squire, ed., *Encyclopedia of Neuroscience*, Amsterdam: Elsevier.
16. Balleine, B.W., **Daw, N.D.**, and O'Doherty, J.P. (2008) Multiple forms of value learning and the function of dopamine, chapter in Glimcher, P.W. et al., eds., *Neuroeconomics*, Amsterdam: Elsevier.
17. **Daw, N.D.**, Courville, A.C., and Dayan, P. (2008) Semi-rational models of conditioning: The case of trial order, chapter in N. Chater & M. Oaksford, eds., *The Probabilistic Mind: Prospects for Rational Models of Cognition*, Oxford: Oxford University Press.
18. **Daw, N.D.**, (2007) Dopamine: at the intersection of reward and action *Nature Neuroscience* 10: 1505-1507.
19. **Daw, N.D.**, and Doya, K. (2006) The computational neurobiology of learning and reward, *Current Opinion in Neurobiology* 16:199-204.
20. **Daw, N.D.**, Niv, Y., and Dayan, P. (2006) Actions, values, policies and the basal ganglia, chapter in E. Bezdard, ed., *Recent Breakthroughs in Basal Ganglia Research*, New York: Nova Science Publishers, pp. 111-130.
21. Niv, Y., **Daw, N.D.**, and Dayan, P. (2006) Choice values, *Nature Neuroscience* 9:987-988.
22. **Daw, N.D.**, and Dayan, P. (2004) Matchmaking, *Science* 304:1753-1754.

Talks and seminars:

Invited:

Advances in Memory Systems symposium, NYU (29 May 2015)

Association for Psychological Science convention, New York (22 May 2015)
Workshop on Perception and Choice, Columbia University (8 May 2015)
Behavioral and Cognitive Neuroscience Colloquium, CUNY (27 Mar 2015)
Okinawa Institute of Science and Technology, Japan (19 Mar 2015)
Workshop on hippocampus and decisions, COSYNE, Snowbird (10 Mar 2015)
Department of Psychology, Princeton (10 Feb 2015)
Grand Rounds, Department of Psychiatry, Columbia University (28 Jan 2015)
Brain Meeting, Wellcome Trust Centre for Neuroimaging, UCL (5 Dec 2014)
Swiss Computational Neuroscience Seminar, Bern (30 Oct 2014)
Center for the Neural Basis of Cognition 20th Anniversary Celebration (18 Oct 2014)
International Workshop on Neuroeconomics: Recent Advances and Future Directions, Erice (June 20, 2014)
Fourth Symposium on the Biology of Decision Making, Paris (May 26, 2014)
Cognitive Science 2.0: Implications for Intelligence Analysis, intelligence agencies briefing, Maryland (May 9 2014)
Psychology Department seminar series, Hunter College (2 Apr 2014)
Workshop on Computational Psychiatry, COSYNE, Snowbird (3 Mar 2014)
Winter Conference on Neural Plasticity, Vieques (24 Feb 2014)
Cognitive Brown Bag, Princeton University (19 Feb 2014)
Functional MRI speaker series, University of Michigan (11 Feb 2014)
Implications of Bayesian Cognitive Modeling for the Intelligence Community (13 Dec 2013)
Interfacing Models with Brain Signals to Investigate Cognition, Irvine (7 Nov 2013)
Learning to Attend, Attending to Learn, San Diego (6 Nov 2013)
First Conference on Reinforcement Learning and Decision Making, Princeton (26 Oct 2013)
First Conference on Computational Psychiatry, Miami (22 Oct 2013)
Department of Neurobiology and Behavior, SUNY Stony Brook, (19 Sep 2013)
Society for Mathematical Psychology, Potsdam (6 Aug 2013)
Emotion Club, UCL (6 June 2013)
Seminar on Parallel Distributed Processing, Princeton University (31 May 2013)
Theoretical Neuroscience Seminar, Columbia University (10 May 2013)
Neuroscience Seminar, Cold Spring Harbor Laboratory (6 May 2013)
Kavli Futures Symposium on Neuroeconomics and Urban Big Data, New Paltz, NY (22 April 2013)
Conference on Theoretical Organizational Models, New York (19 April 2013)
Swartz Symposium on Neural Circuits for Decision Making and Reinforcement Learning, Yale (12 April 2013)
Princeton Neuroscience Institute Seminar, Princeton (11 April 2013)
Advances in Memory Systems Symposium, NYU (4 April 2013)
Tamagawa/Caltech meeting on Reward and Decision Making, Hawaii (8 March 2013)
International Conference on Applications of Neuroimaging to Alcoholism, Yale (18 Feb 2013)
Department of Neurobiology symposium, Weizmann Institute of Science, Rehovot, Israel (4 Dec 2012)
Department of Neurobiology symposium, University of Haifa, Israel (19 Nov 2012)
Symposium on model-based decision making, Comprehensive Brain Science Network meeting, Sendai, Japan (27 July, 2012)
Society for Philosophy and Psychology, Annual Meeting, Boulder CO (22 June, 2012)

Sixteenth International Conference on Cognitive and Neural Systems, Boston (1 June, 2012)
Affective Brain Lab Online Talk Series, University College London (29 May, 2012)
Science Meeting, Sackler Institute for Developmental Psychobiology, New York (10 May, 2012)
Meeting on Canonical Neural Computation, Florence (May 3, 2012)
Center for Molecular and Behavioral Neuroscience Colloquium, Rutgers Newark (11 April, 2012)
Department of Neuroscience seminar series, Johns Hopkins University School of Medicine (Apr 5, 2012)
Neural and Behavioral Science Seminar Series, SUNY Downstate, New York (Oct 19, 2011)
Army Research Office Workshop on Augmenting Human Choice, Evanston (Sep 29, 2011)
John B. Pierce Laboratory, Yale (Sep 19, 2011)
Workshop on the Psychophysiology and Neuroscience of Experience-Based Decisions, Technion, Haifa (Jun 16, 2011)
Cognitive Systems Area/Imaging Center talk series, University of Texas, Austin (Apr 22, 2011)
IRCS/Computational Neuroscience Seminar, University of Pennsylvania (Nov 5, 2010)
Neuroeconomics Seminar Series, Duke (Oct 21, 2010)
Symposium on Machine Learning and the Brain, APA Annual Convention, San Diego (Aug 12, 2010)
Cognitive Neuroscience Seminar, Taub and Sergievsky Institutes, Columbia University, NY (June 24, 2010)
Emotion Club, Wellcome Trust Centre for Neuroimaging, UCL (May 27, 2010)
Gatsby Computational Neuroscience Unit, UCL (May 25, 2010)
Symposium on "Dopamine and Adaptive Memory," Cognitive Neuroscience Society Meeting, Montreal (Apr 20, 2010)
5th Barbados Workshop on Reinforcement Learning, Bellairs Institute (Apr 7, 2010)
COSYNE workshop on "Decision Making: Beyond the Basics," Salt Lake City (March 2, 2010)
COSYNE workshop on "Is Optimality Reaching a Dead End," Salt Lake City (March 1, 2010)
Batsheva Seminar on Reward and Decision Making in the Brain, Jerusalem (Feb 16, 2010)
Workshop on "Goal-directed decision-making", Princeton (Oct 24, 2009)
Donders Centre for Neuroimaging, Nijmegen (Aug 28, 2009).
Institute for Empirical Research in Economics, University of Zurich (Aug 25, 2009).
Gordon Research Conference on Catecholamines (Aug. 11 2009).
Janelia Farm (July 30 2009).
IARPA workshop on "Integrated Cognitive Architectures for Understanding Sensemaking," DC (July 22 2009).
Medical Department, Brookhaven National Laboratory (July 16 2009).
First Symposium on "The Biology of Decision Making," Bordeaux (June 10 2009).
Workshop on "Future of cognitive science," UC Merced (May 29 2009).
Computational Neuroscience Research Seminar Series, University of Chicago (May 5 2009)
BCS colloquium, MIT (3 April 2009).
Psychology department colloquium, Rutgers University (27 March 2009)
Science Focus Day, NYU (23 March 2009)
CELEST Science of Learning Seminar, Boston University (21 Nov, 2008).
Workshop on "Open problems in the neuroscience of decision making," Okinawa, Japan (Oct 2008).
Conference on Addiction Research, Kunming, China (Oct 2008).
MURI workshop on "Statistical learning and transfer of learning," Washington DC (Oct 2008).
International Symposium on Attention & Performance, Vermont (14 July 2008).

Club Neuron, New York Medical College (25 June 2008).
Neuroscience of Social Decision Making series, Princeton University (21 May 2008).
National Academy study panel on "Opportunities in neuroscience for future Army applications" (12 Feb 2008).
Cognitive lunch, Columbia University (4 Feb 2008).
Workshop on Neural Mechanisms of the Social Mind, Machida, Tokyo (8 Dec 2007).
Theoretical Neuroscience Seminar Series, Columbia University (9 Nov 2007).
Mathematical Biology Seminar Series, New Jersey Institute of Technology (23 Oct 2007).
Champalimaud workshop on serotonin, Lisbon (6 Oct 2007).
Neurofinance Symposium, Swiss Banking Institute, University of Zurich (7 July 2007).
Association for Psychological Science, annual convention, Washington, DC (25 May 2007).
Swartz Theoretical Neurobiology series, Yale University (18 May 2007).
Brain, Mind and Society series, California Institute of Technology (8 March 2007).
Symposium on "Is reinforcement learning coming of cognitive age?" Psychonomic Society, Houston, TX (16 Nov 2006).
Symposium on "Basal ganglia, dopamine and learning," meeting of the Pavlovian Society, Philadelphia PA (16 Sept 2006).
Workshop on "The probabilistic mind: prospects for rational models of cognition," London, UK (28 June 2006).
Symposium on statistical learning and brain plasticity, Center for Visual Science, University of Rochester (2 June, 2006).
Workshop on associative learning and reinforcement learning, Society for the Study of Artificial Intelligence and the Simulation of Behaviour meeting, Bristol, UK (3 April 2006).
Neuroeconomics workshop series, Stanford University, Palo Alto, CA (3 March 2006).
School of Computing and Technology, University of Sunderland, Sunderland, UK (6 Feb. 2006).
London Judgement and Decision Making group (24 Jan. 2006).
Workshop on models of behavioral learning, NIPS meeting, Whistler, BC (10 Dec. 2005).
Neuroeconomics seminar series, NYU, New York (8 Nov. 2005).
Brain Meeting, UCL/Wellcome Dept. of Imaging Neuroscience, London, UK (22 July 2005).
Workshop on Basal Ganglia, Dopamine and Learning, Jerusalem, Israel (27 June 2005).
Annual meeting, Society for Neuroeconomics, Kiawah Island, SC (17 Sept. 2004).
Centre for Cognitive Neuroscience and Cognitive Systems, University of Kent, Canterbury UK (15 July 2004).
Workshop on Dopamine and Memory: Integrating Computational and Empirical Approaches, Newark, NJ (March 2003).

Contributed:

Panel on hippocampus and model-based processing, Eastern Psychological Association, New York (2 Mar 2013)
Symposium on Using models and fMRI, Cognitive Science Society (23 July 2011)
Minisymposium on Model based neuroimaging and decision neuroscience, SFN (17 Nov 2010)
Advances in Neural Information Processing Systems, Vancouver, spotlight (6 Dec 2007).
Minisymposium on Serotonin and Decision Making, Society for Neuroscience, San Diego (6 Nov 2007).
Gatsby Foundation Workshop on motivation and action selection in conditioned behavior, London, UK (20 June 2005).
Computational and Systems Neuroscience COSYNE, Salt Lake City, Utah (20 Mar. 2005).
Second International Conference on Development and Learning, Cambridge, MA (June 2002).

Computational Neuroscience CNS*02 meeting, Chicago, IL, featured contributed talk (July 2002).

Computational Neuroscience CNS*99 meeting, Pittsburgh, PA, featured contributed talk (July 1999).

Teaching, training & service:

Courses taught (NYU):

Math tools for neural science and psychology G80.2207/G89.2211 (Fall 2008, Fall 2011, Fall 2013, Fall 2014, Fall 2015)

Neuroeconomics and decision making (former title: Decision making, neural and behavioral basis) V80.0302/V89.0300 (Fall 2007, Spring 2009, Spring 2011, Spring 2014)

Neuroeconomics G80.3410/G89.3394 (Spring 2010, Neurl-GA 3042/Psych-GA 3404 Spring 2012, Spring 2015)

Cognitive neuroscience V89.0025 (Fall 2009)

Reinforcement learning G80.3042/G89.3406 (Spring 2008)

Courses taught (summer schools and other visiting teaching):

Tutorial on brain and behavior, 2nd Multidisciplinary Conference on Reinforcement Learning and Decision Making, Edmonton (2015)

Workshop on computational models and fMRI, Scientific Research Network on Decision Neuroscience and Aging conference, Miami (2015)

FENS-Hertie Winter School on the neuroscience of decision making, Obergurgl, Austria (2015)

MBL Methods in Computational Neuroscience, Woods Hole (2014)

PhD Program in Neuroscience, Champalimad Center, Portugal (2012)

MPS-UCL symposium and advanced course on computational psychiatry and aging research, Ringberg Castle (2012)

Brains and Minds: The perceptual and computational bases of higher cognitive processes, Central European University (2011)

Reinforcement learning in humans and other animals, NIPS tutorial, Vancouver (2010)

Animal learning and decision making minicourse, Weizmann Institute (Summer 2010, with Y. Niv)

Reinforcement learning, Hebrew University ICNC (Spring 2009, with H. Bergman and Y. Niv)

EU Advanced Course in Computational Neuroscience, Freiburg, Germany (2008, 2009)

PhD Program in Neuroscience, Gulbenkian Institute for Science, Portugal (2008, 2009)

PhD Program in Computational Biology, Gulbenkian Institute for Science, Portugal (2007)

IPAM summer school: Probabilistic Models of Cognition, UCLA (2007)

Okinawa Computational Neuroscience Course, Okinawa, Japan (2005, 2007)

Cognitive Neuroscience Course, Organization for Human Brain Mapping (2006, 2007)

First Summer School in Neuroeconomics, Stanford (2006).

Predoctoral research trainees, completed:

Samuel Gershman (2007-8; co-advised with Bijan Pesaran)

Seth Madlon-Kay (2009-2012)

Patricia Chan (2012-2013; co-advised with Todd Gureckis)

Doctoral trainees, completed:

Dylan Simon (NYU Cognition & Perception, 2007-2012)

Aaron Bornstein (NYU Cognition & Perception, 2007-2013)

Nicholas Gustafson (NYU CNS, 2007-2013)

Doctoral trainees, ongoing:

Sara Constantino (NYU Cognition & perception, 2009-present)

Oliver Vikbladh (NYU CNS, 2013-present)

Evan Russek (NYU CNS, 2013-present)

Postdoctoral trainees, completed:

Jian Li (2007-2012; co-advised with Elizabeth Phelps)

Daniel Campbell-Meiklejohn (2011-2013)

Hanneke Den Ouden (2011-2013; co-advised with Roshan Cools)

Mattia Rigotti (2010-2013; co-advised with Stefano Fusi)

Stephen Fleming (2011-2015)

Y-Lan Boureau (2012-2015)

Postdoctoral trainees, ongoing:

Bradley Doll (2011-present; co-advised with Daphna Shohamy)

Ross Otto (2012-present)

Peter Sokol-Hessner (2013-present; co-advised with Elizabeth Phelps)

Claire Gillan (2013-present; co-advised with Elizabeth Phelps)

Doctoral theses examined:

Brian Lau (reader; advisor: Paul Glimcher, 2007)

Shei-Wei Wu (thesis committee chair; advisor: Laurence Maloney, 2008)

Annemieke Apergis-Schoute (reader; advisor: Liz Phelps, 2008)

Tari Awipi (reader; advisor: Lila Davachi, 2009)

Peter Sokol-Hessner (reader; advisor: Liz Phelps, 2010)

Robb Rutledge (reader; advisor: Paul Glimcher, 2010)

Stephanie Lazzaro (thesis committee member, advisor: Paul Glimcher, 2011)

Catherine Hartley (thesis committee chair, advisor: Liz Phelps, 2011)

Katherine Duncan (reader; advisor: Lila Davachi, 2011)

Deep Ganguli (thesis committee member, advisor: Eero Simoncelli, 2012)

Eric DeWitt (thesis committee chair, advisor: Paul Glimcher, 2012)

John McDonnell (reader; advisor: Todd Gureckis, 2013)

Brandi Marsh (SUNY Downstate, 2013)

Joshua Sanders (CSHL, 2013)

Lauren Grattan (reader; advisor: Paul Glimcher, 2013)

Doug Markant (reader; advisor: Todd Gureckis, 2013)

Tamas Madarasz (thesis committee member, advisor: Joe Ledoux, 2015)

Mel Win Khaw (thesis committee chair, advisor: Paul Glimcher, 2015)

Departmental service (NYU):

CBI steering committee (academic years 2008-10; 2013-15)

CBI pilot token review committee (2011-13)

CNS colloquium committee (2007-present)

Psychology education & undergraduate honors committee (academic year 2007-8)

Psychology personnel and awards committee (academic year 2008-9)

CNS faculty search committee (Learning & Memory, academic year 2008-9)

Psychology faculty search committee (Cognition & Perception, academic year 2011-12)

University service (NYU):

Committee on Information Technology and Library Services (2014-15)

Dean's Undergraduate Research Fellowship selection committee (2014-15)

Phi Beta Kappa selection committee (2009-15)

Editorial service:

Associate editor, *Cognitive, Affective and Behavioral Neuroscience* (2015-)

Consulting editor, *Behavioral Neuroscience* (2013-)

Co-editor, special issue of *Brain Research* on computational cognitive neuroscience (2009)

Co-editor, special issue of *Cognition* on reinforcement learning and higher cognition (2009)

Organizational service:

Co-director, Advanced Summer Institute in Neuroeconomics, Shanghai (July 2015)

Co-organizer, Symposium on Advances in Memory Systems (NYU, March 2015)

Co-organizer, Rumelhart Symposium in honor of Peter Dayan, Cognitive Science Society, Sapporo (August 2012)

Co-organizer, Workshop on Computations, Decisions, and Movement, Germany (May 2010).

Area chair (Cognitive Science & Neuroscience), Neural Information Processing Systems (NIPS) 2008 & 2009.

Organizing committee, Computational Cognitive Neuroscience Conference (CCNC; 2007-present)

Co-organizer, "Machine learning meets human learning" workshop, NIPS 2008 meeting.

Co-organizer, "Motivation and action selection in conditioned behaviour," Gatsby Foundation Workshop, June 2005, London

Co-organizer, "Reinforcement learning and the brain: Beyond the dopamine system," workshop, NIPS 2004 meeting