Jonathan D. Cohen
Curriculum Vitae

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SUMMARY

I am a cognitive neuroscientist, with over three decades of research experience in computational and mathematical modeling as well as empirical studies of human brain function and behavior, focusing on the neural mechanisms responsible for cognitive control and human intelligence, and how our growing understanding of these can be brought to bear in the design of computational architectures with more human-like cognitive capabilities. My work lies at the points of contact between neuroscience, psychology, computer science, mathematics, behavioral economics and psychiatry, and involves collaborations with investigators in each of these fields. I also have considerable experience in the coordination and administration of scientific research, as one of the two founding Co-Directors of the Princeton Neuroscience Institute, leading multi-institutional projects (NIHM Conte Center; Templeton Center Grant; NSF Convergence Accelerator grant; PNI-Intel Labs collaboration), and a number open source software development projects.

Theoretical contributions. Some of the contributions that have emerged from the theoretical work of my colleagues and I are: the first computationally-explicit models of how cognitive control may be implemented in the brain [4] and the role of prefrontal cortex in control [76]; the role of dopaminergic function in the gating and updating of information in prefrontal cortex [5,56], noradrenergic regulation of the explore/exploit tradeoff [55,103,127], and the interaction of these modulatory systems in adaptive regulation of exploration in reinforcement learning [111]; how these mechanisms may be disturbed in psychiatric disorders [8,53,110]; the role of anterior cingulate cortex in performance monitoring [61,102,182] and the optimal allocation of control [175,212]; mathematical analysis of optimal control of simple decision making processes [118,152]; normative approaches to understanding capacity constraints associated with working memory [68,143] and cognitive control [181,249,X,211]; and how the brain regulates the balance between flexible control-dependent and efficient automatic processing [218,X]. Increasingly, our work has come to focus on how these mechanisms contribute to higher cognitive functions and human intelligence, such as the control of memory, planning, and abstract reasoning [221,238,239,253], including ways in which the human brain achieves the flexibility of symbolic forms of computation [115,173,252,258] while preserving the efficiency of computation in neural networks, and how this can be used to inform research in machine learning and artificial intelligence [256,261,X].

Empirical and methodological contributions. The theoretical work summarized above has served as the foundation for a number of empirical and methodological contributions. Empirical contributions include: the first demonstrations in humans of sustained activity in PFC associated with working memory performance [15,34]; the distinction between the roles of dorsolateral PFC (in the regulatory functions of control) and anterior cingulate cortex (monitoring and evaluative functions of control [40,51,58,92]; and the role of the locus coeruleus / norepinephrine system in regulating the explore-exploit tradeoff [156,206]. We have also made influential contributions to advances in quantitative methods in cognitive neuroscience, including: the introduction of cluster size correction into the analysis of fMRI data [42]; the use of fMRI to directly study midbrain neuromodulatory nuclei [132]; the design of systems for realtime fMRI analysis [22,260] and closed-loop feedback designs [185,247]; and whole brain, full correlation analysis of fMRI data and its use in realtime analysis [X,178]. Finally, I have lead or co-lead several large software development projects, including: PsyScope, the first graphical environment for the design and execution of cognitive behavioral experiments; BrainIAK (in collaboration with Intel Labs), an open-source, python-based toolbox for the implementation and optimization of advanced methods of brain image analysis; PsyNeuLink, an open-source, python-based environment for the design and exchange of computational models of brain and cognitive function; SweetPea, a framework for specifying empirical experimental designs and machine learning training environments using factorial structure, and generating maximally unbiased sampling of trials; and a model description format for expressing models of brain and cognitive function as computational graphs in machine readable form for exchange across modeling environments.

BIOGRAPHICAL

Business Address: Princeton Neuroscience Institute
Princeton University
Princeton, New Jersey 08544

Birth Date: 10/5/55
Birth Place: New York City
Citizenship: U.S.A.

Business Phone: (609) 258-2696 (voice)

E-mail: jdc@princeton.edu
Home page: http://www.pni.princeton.edu/ncc/JDC

EDUCATION and TRAINING

UNDERGRADUATE:

1973-77	Yale University	B.A., 1977	Biology and Philosophy

GRADUATE:

1979-83	University of Pennsylvania	M.D., 1983	Medicine
1987-90	Carnegie Mellon University	Ph.D., 1990	Cognitive Psychology

POST-GRADUATE:

1983-89 Internship in General Medicine, Neurology and Psychiatry
Residency in Psychiatry
Stanford University School of Medicine

1985-87 NIMH Research Training Fellowship,
Department of Psychiatry and Behavioral Sciences
Stanford University School of Medicine

APPOINTMENTS and POSITIONS

ACADEMIC:

1989-2005	Assistant to Full Professor of Psychiatry Western Psychiatric Institute and Clinic University of Pittsburgh
1990-98	Assistant to Associate Professor of Psychology Carnegie Mellon University
1992-present	Director, Clinical Cognitive Neuroscience Laboratory University of Pittsburgh
1998-2005	Professor of Psychology, Princeton University
1999-2007	Founding Director, Center for the Study of Brain, Mind and Behavior Princeton University
2000-2008	Director, Program in Neuroscience Princeton University
2005-2012	Eugene Higgins Professor of Psychology, Princeton University
2005-2022	Founding Co-Director, Princeton Neuroscience Institute
2007-present	Director, Scully Center for the Neuroscience of Mind and Behavior
20012-present	Robert Bendheim and Lynn Bendheim Thoman Professor in Neuroscience Princeton University

HONORS and AWARDS

B.A. Cum Laude Distinction in the Biology Major Distinction in the Philosophy Major Yale University	1977
Miller Foundation Prize for Research in Psychiatry Department of Psychiatry and Behavioral Sciences Stanford University School of Medicine	1986
Annual Resident Research Award Northern California Psychiatric Society	1986
Joseph Zubin Memorial Fund Award for Research in Psychopathology	1993
Kempf Fund Award for Research Development in Psychobiological Psychiatry, American Psychiatric Association	2000
James McKeen Cattell Fund Sabbatical Fellowship Award	2003
Eugene Higgins Chaired Professorship, Princeton University	2005
Salmon Award Lecturer, New York Academy of Medicine	2006
Fellow, Association for Psychological Science	2007
Edward J. Sachar Award, Columbia University School of Medicine	2007
American Psychological Association Distinguished Scientific Contribution Award	2010
Fellow, American Association for the Advancement of Science	2012
William James Fellow Award, Association for Psychological Science	2018
Fellow, Cognitive Science Society	2019
Vannevar Bush Faculty Fellowship, Office of the Under Secretary of Defense for Research & Engineering	2021
Member, American Academy of the Arts & Sciences	2022
Lifetime Achievement Award, Society for Experimental and Cognitive Science, Division 3 of the American Psychological Association	2022

PUBLICATIONS

1. Peer-Reviewed Articles and Competitively-Reviewed Conference Papers

1. Cohen JD, Van Putten T, Marder S, Berger PA & Stahl SM (1987). Treatment of the symptoms of schizophrenia with piquindone, a new atypical neuroleptic. *Psychopharmacology Bulletin*, 23(3), 514-518.
2. Cohen JD, Van Putten T, Marder S, Berger PA & Stahl SM. (1987). The efficacy of piquindone, a new atypical neuroleptic, in the treatment of the positive and the negative symptoms of schizophrenia. *Journal of Clinical Psychopharmacology*, 7(5), 324-329.
3. Servan-Schreiber D, Printz H & Cohen JD (1989). The effect of catecholamines on performance: From unit to system behavior. In D. S. Touretzky (Ed.), *Advances in Neural Information Processing Systems 2*. San Mateo, CA: Morgan Kauffman. [Collected papers of the IEEE Conference on Neural Information Processing Systems - Natural and Synthetic, Denver, Nov. 27-Nov. 30, 1989.]
4. Cohen JD, Dunbar K & McClelland JL (1990). On the control of automatic processes: A parallel distributed processing model of the Stroop effect. *Psychological Review, 97*(3), 332-361.
5. Servan-Schreiber D, Printz H & Cohen JD (1990). A network model of catecholamine effects: Gain, signal-to-noise ratio, and behavior. *Science*, *249,* 892-895.
6. Servan-Schreiber D & Cohen JD (1991). Models of neuromodulation and information processing deficits in schizophrenia. *Revue Internationale de Psychopathologie, 1,* 113-134.
7. Servan-Schreiber D & Cohen JD (1991). Network models of neuromodulation and information processing deficits in schizophrenia. *Proceedings of the 12th Annual Meeting of the Cognitive Science Society*.
8. Cohen JD & Servan-Schreiber D (1992). Context, cortex and dopamine: A connectionist approach to behavior and biology in schizophrenia. *Psychological Review, 99*, 45-77.
9. Cohen JD, Servan-Schreiber D & McClelland JL (1992). A parallel distributed processing approach to automaticity. *American Journal of Psychology, 105*, 239-269.
10. Cohen JD, MacWhinney B, Flatt M & Provost J (1993). PsyScope: A new graphic interactive environment for designing psychology experiments. *Behavioral Research Methods, Instruments & Computers, 25*(2), 257-271.
11. Cohen JD, Noll DC & Schneider W (1993). Functional Magnetic Resonance Imaging: Overview and methods for psychological research. *Behavioral Research Methods, Instruments & Computers, 25*(2), 101-113.
12. Cohen JD & Servan-Schreiber D (1993). A theory of dopamine function and cognitive deficits in schizophrenia. *Schizophrenia Bulletin, 19*(1), 85-104.
13. Forman SD, Cohen JD & Johnson MH (1993). Frontal eye fields: Inhibition through competition. *Behavioral and Brain Sciences, 6*, 578.

14. Schneider W, Noll DC & Cohen JD (1993). Functional topographic mapping of the cortical ribbon in human vision with conventional MRI scanners. *Nature, 365,* 150-153.
15. Cohen JD, Forman SD, Braver TS, Casey BJ, Servan-Schreiber D & Noll DC (1994). Activation of prefrontal cortex in a non-spatial working memory task with functional MRI. *Human Brain Mapping, 1*, 293-304.
16. Cohen JD & Huston TA (1994). Progress in the use of parallel distributed processing models for understanding attention and performance. In Umiltà C. and Moscovitch M. (Eds.), *Attention and Performance XV: Conscious and Nonconscious Information Processing*. Cambridge, MA: MIT Press, pp. 453-476.
17. Cohen JD, Romero RD, Servan-Schreiber, D & Farah MJ (1994). Mechanisms of spatial attention: The relation of macrostructure to microstructure in parietal neglect. *Journal of Cognitive Neuroscience, 6*(4), 377-387.
18. Armony JL, Servan-Schreiber D, Cohen JD & LeDoux JE (1995). An anatomically-constrained neural network model of fear conditioning. *Behavioral Neuroscience, 109*(2), 246-256.
19. Braver TS, Cohen JD & Servan-Schreiber D (1995). A computational model of prefrontal cortex function. *Advances in Neural Information Processing Systems, 7*.
20. Carter CS, Mintun M & Cohen JD (1995). Interference and facilitation effects during selective attention: An [150]-H20 PET study of Stroop task performance. *NeuroImage, 2*, 264-272.
21. Casey BJ, Cohen JD, Jezzard P, Turner R, Noll DC, Trainor R, Giedd J, Pannier L, Kaysen D & Rapoport JL (1995). Activation of prefrontal cortex in children during a non-spatial working memory task with functional MRI. *NeuroImage, 2*, 221-229.
22. Forman SD, Cohen JD, Fitzgerald M, Eddy WF, Mintun MA & Noll DC (1995). Improved assessment of significant activation in functional magnetic resonance imaging (fMRI): Use of a cluster-size threshold. *Magnetic Resonance in Medicine, 33*, 636-647.
23. Noll DC, Cohen JD, Meyer CH & Schneider W (1995). Spiral k-space MR imaging of cortical activation. *Journal of Magnetic Resonance Imaging, 45*, 49-56.
24. Barch D, Cohen JD, Servan-Schreiber D, Steingard S, Steinhauer S & van Kammen D (1996). Semantic priming in schizophrenia: An examination of spreading activation using word pronunciation and multiple SOAs. *Journal of Abnormal Psychology, 105*, 592-601.
25. Cohen JD, Braver TS & O'Reilly RC (1996). A computational approach to prefrontal cortex, cognitive control, and schizophrenia: Recent developments and current challenges. *Philosophical Transactions of the Royal Society of London Series B (Biological Sciences), 351*(1346), 1515-1527.
26. Servan-Schreiber D, Cohen JD & Steingard S (1996). Schizophrenic deficits in the processing of context: A test of a theoretical model. *Archives of General Psychiatry, 53*, 1105-1112.
27. Armony JL, Servan-Schreiber D, Cohen JD & LeDoux JE (1997). Computational modeling of emotion: Explorations through the anatomy and physiology of fear conditioning. *Trends in Cognitive Sciences, 1*, 28-34.

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32. Carter CS, Mintun M, Nichols T & Cohen JD (1997). Anterior cingulate gyrus dysfunction and selective attention dysfunction in schizophrenia: An 15OH20 PET study during Stroop task performance. *American Journal of Psychiatry, 154*, 1670-1675.
33. Casey BJ, Trainor RJ, Orendi JL, Schubert AB, Nystrom, LE, Giedd J, Castellanos X, Haxby J, Noll DC, Cohen JD, Forman SD, Dahl RE & Rapoport JL (1997). A developmental functional MRI study of prefrontal activation during performance of a Go-No-Go task. *Journal of Cognitive Neuroscience, 9*, 835-847.
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36. Goddard N, Hood G, Cohen JD, Eddy WF, Genovese CR & Noll DC (1997). Parallel online analysis of functional MRI datasets. *Journal of Supercomputing, 11*, 295-318.
37. MacWhinney B, Cohen J & Provost J (1997). The PsyScope experiment-building system. *Spatial Vision, 11*, 99-101.
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54. Condray R, Steinhauer SR, Cohen JD, van Kammen DP & Kasparek A (1999). Modulation of language processing in schizophrenia: Effects of context and haloperidol on the event-related potential. *Biological Psychiatry, 45*(10), 1336-55.

55. Usher M, Cohen JD, Rajkowski J, Kubiak P & Aston-Jones G (1999). The role of locus coeruleus in the regulation of cognitive performance. *Science, 283*, 549-554.

56. Braver TS & Cohen JD (2000). On the control of control: The role of dopamine in regulating prefrontal function and working memory. In Monsell S & Driver J (Eds.), *Attention and Performance XVIII; Control of Cognitive Processes,* pp. 713-737.

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61. Botvinick, MM, Braver TS, Carter CS, Barch DM & Cohen JD (2001). Conflict monitoring and cognitive control. *Psychological Review, 108*(3) 624-652.

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64. Greene JD, Sommerville RB, Nystrom LE, Darley JM & Cohen JD (2001). An fMRI investigation of emotional engagement in moral judgment. *Science, 293*, 2105-2108.

65. Perlstein WM, Carter CS, Noll DC & Cohen JD (2001). fMRI evidence of prefrontal cortex dysfunction in schizophrenia during parametric manipulation of working memory load. *American Journal of Psychiatry, 158*, 1105-1113.

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68. Usher M, Haarmann H, Cohen JD & Horn D (2001). Neural mechanism for the magical number 4: competitive interactions and non-linear oscillations. *Behavioral and Brain Sciences, 24*, p. 151.

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73. Gilzenrat MS, Holmes BD, Holmes PJ, Rajkowski J, Aston-Jones G & Cohen JD (2002). A modified Fitzhugh-Nagumo system simulates locus coeruleus-mediated regulation of cognitive performance. *Neural Networks, 15*, 647-663.

74. Graziano M, Cohen JD & Botvinick MM (2002). How the brain represents the body. In Prinz W and Hommel B (Eds.), *Attention and Performance XIX: Common Mechanisms in Perception and Action*. Oxford, UK: Oxford University Press, pp. 136-157.

75. Jones AD, Cho R, Nystrom LE, Cohen JD & Braver TS (2002). A computational model of anterior cingulate function in speeded response tasks: Effects of frequency, sequence and conflict. *Cognitive, Affective and Behavioral Neuroscience, 2*(4), 300-317.

76. Miller EK & Cohen JD (2001). An integrative theory of prefrontal cortex function. *Annual Review of Neuroscience, 24,* 167-202.

77. Montague PR, Berns GS, Cohen JD, McClure SM, Pagnoni G, Dhamala M, Wiest MC, Karpov I, King RD, Apple N & Fisher RE (2002) Hyperscanning: Simultaneous fMRI during linked social interactions. *NeuroImage, 16*(4), 1159-64.

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79. Barch, DM, Carter CS, MacDonald A, Braver TS & Cohen JD (2003). Context processing deficits in schizophrenia: Diagnostic specificity, longitudinal course, and relationships to clinical symptoms. *Journal of Abnormal Psychology, 112*, 132-143.

80. Condray R, Siegle GJ, Cohen JD, van Kammen DP & Steinhauer SR (2003). Automatic activation of the semantic network in schizophrenia: N400 elicited by a brief inter-stimulus interval. *Biological Psychiatry, 54*(11): 1134-48.

81. Holroyd CB, Nieuwenhuis S, Yeung N & Cohen JD (2003). Errors in reward prediction are reflected in the event-related brain potential. *NeuroReport, 14*(18), 2481-2484.

82. Perlstein WM, Dixit NK, Carter CS, Noll DC & Cohen JD (2003). Prefrontal cortex dysfunction mediates deficits in working memory and prepotent responding in schizophrenia. *Biological Psychiatry, 53*(1), 25-38.

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87. Green MF, Nuechterlein KH, Gold JM, Barch DM, Cohen JD, Essock S, Fenton WS, Frese F, Goldberg TE, Heaton RK, Keefe RSE, Kern RS, Kraemer H, Stover E, Weinberger DR, Zalcman S, Marder SR (2004). Approaching a consensus cognitive battery for clinical trials in schizophrenia: The NIMH-MATRICS conference to select cognitive domains and test criteria. *Biological Psychiatry, 56*(5), 301-7.

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Ebitz RB, Cohen JD & Buschman (2017). Mechanisms for generating flexibility in a changing world. Society for Neuroscience Abstracts.

Iordan MC,Ritvo VJH, Norman KA, Turk-Browne NB & Cohen JD (2017). Inducing neural plasticity and perceptual similarity via real-time fMRI neurofeedback. Society for Neuroscience Abstracts.

Musslick S, Jang SG, Panichello M, Bustamante L, Shenhav A & Cohen JD (2017). Constraints associated with cognitive control and the stability-flexibility dilemma. Society for Neuroscience Abstracts.

Novick AS, Bornstein AM, Norman KA & Cohen JD (2017). Drift diffusion modeling of interactions between episodic and working memory. Society for Neuroscience Abstracts.

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Bustamante LA, Burton AR, Baker AL, Shenhav AL, Daw ND & Cohen JD (2018). The cost of cognitive control and the balance of random versus directed exploration. Society for Neuroscience Abstracts.

Bustamante LA, Lieder F, Musslick S, Shenhav A & Cohen JD (2018). Learning to overexert cognitive control in the Stroop task. CCN 2018: Proceedings of the Annual Conference on Cognitive Computational Neuroscience.

Iordan MC, Ritvo VJH, Norman KA, Turk-Browne NB & Cohen JD (2018). Using closed loop real-time fMRI neurofeedback to induce neural plasticity and influence perceptual similarity. Society for Neuroscience Abstracts.

Kane G, James M, Shenhav A, Wilson RC, Daw N, Aston-Jones G & Cohen JD (2018). Does the anterior cingulate contribute to foraging decisions? Computational and Systems Neuroscience (CoSyNe).

Musslick S, Cohen JD & Shenhav A (2018). Estimating the costs of cognitive control: Theoretical validation and potential pitfalls. Society for Neuroscience Abstracts.

Novick A, Musslick S, Iordan M & Cohen JD (2018). Why we struggle to multitask: Converging evidence from computational modeling, human behavior, and neuroimaging. Society for Neuroscience Abstracts.

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Dulberg Z and Cohen JD (2020). Learning canonical transformations. BabyMind 2020, NeurIPS Workshop.

Kumar S, Dasgupta I, Cohen JD, Daw N & Griffiths T (2020). Meta-Learning of compositional task distributions in humans and machines. MetaLearn 2020, NeurIPS Workshop.

5. Manuscripts Under Review / In Preparation

Beukers AO, Hamin M, Norman KA & Cohen JD (under review). When working memory is just working, not memory. PsyArXiv: https://psyarxiv.com/jtw5p.

Bornstein AM, Aly M, Feng SF, Turk-Browne NB, Norman KA & Cohen JD (under review). Associative memory retrieval resolves anticipated uncertainty of upcoming perceptual decisions.

Dulberg Z, Dubey, R, Berwian IM & Cohen JD (under review). Having "multiple selves" helps learning agents explore and adapt in complex changing worlds. bioRxiv: https://doi.org/10.1101/2022.12.16.520795.

Iordan MC, Ritvo VJH, Norman KA, Turk-Browne NB & Cohen JDC (under review). Sculpting New Visual Concepts into the Human Brain. bioRxiv: https://www.biorxiv.org/content/10.1101/2020.10.14.339853v1.

Kumar S, Dasgupta I, Marjieh R, Daw ND, Cohen JD & Griffiths TL. (under review). Disentangling abstractions from statistics in human and machine learning with task metamers. https://arxiv.org/abs/2204.01437.

Mondal S, Frankland S, Webb T & Cohen JD (under review). Determinantal Point Process Attention Over Grid Codes Supports Extrapolation.

Mondal S, Webb T & Cohen JD (under review). Combining object-centric and relational inductive biases to achieve systematic visual reasoning.

Pyle R, Musslick S, Cohen JD & Patel AB (under review). An analytic approach to predicting representational learning and performance in neural networks based on initial conditions and training curriculum.

Ravi S, Musslick S, Hamin M, Willke TL & Cohen JD (under review). Navigating the trade-off between multi-task learning and learning to multitask in deep neural networks. https://arxiv.org/abs/2007.10527.

Rier L, Michelmann S, Ritz R, Shah V, Hill RM, Osborne J, Doyle C, Holmes N, Bowtell R, Brookes MJ, Norman KA, Hasson U, Cohen JD & Boto E (under review). Test-Retest reliability of the human connectome: An OPM- MEG study.

Shenhav A, Musslick S, Botvinick MM & Cohen JD (under review) Misdirected vigor: Differentiating the control of value from the value of control.

Wilson RC, Wang S, Sadhegiyeh H & Cohen JD (under review). Deep exploration as a unifying account of explore-exploit behavior. PsyArXiv: https://psyarxiv.com/uj85c.

Bustamante LA, Oshinowo T, Lee J, Tong E, Burton AR, Shenhav AS, Daw N & Cohen JD (in preparation). Effort foraging task reveals positive correlation between individual differences in the cost of cognitive and physical effort in humans and relationship to real-world amotivation. bioRxiv: https://doi.org/10.1101/2022.11.21.517394.

Frankland SM, Webb TW & Cohen JD (in preparation). No coincidence, George: Capacity limits as the curse of compositionality. PsyArXiv: https://doi.org/10.31234/osf.io/cjuxb.

Henselman-Petrusek G, Giallanza T, Musslick S & Cohen JD (in preparation). Multitasking networks use multiaffine representations to direct flow of feature data.

Ho M, Cohen JD & Griffiths TL (in preparation). Rational but rigid representations in human planning.

Jonkes BJ, Todd MT, Lloyd K, Dayan P & Cohen JD (in preparation). When it pays to be quick: dissociating control over task preparation and speed-accuracy trade-off in task switching. https://psyarxiv.com/quhns.

Momennejad I, Tomov M, Norman KA, Cohen JD (in preparation). The strategic allocation of working memory and episodic memory in cognitive control: A neural network model of prospective memory.

Musslick S, Saxe A, Hoskin, AN, Reichman D & Cohen, JD (in preparation). On the rational boundedness of cognitive control: Shared versus separated representations. https://psyarxiv.com/jkhdf

Petri G, Musslick S, Dey B, Kayhan H & Cohen JD (in preparation). An information-theoretic approach to reward rate optimization in the tradeoff between controlled and automatic processing in neural network architectures.

Rosendahl L & Cohen JD (in preparation). A quantum framework for modeling cognitive control and arousal.

Shvartsman M, Sundaram N, Srivasta V, & Cohen JD (in preparation). A normative theory of decision making from multiple stimuli.

PROFESSIONAL ACTIVITIES

TEACHING:

1. Courses

1989-96 Introduction to Cognitive Psychology (undergraduate survey course)
Department of Psychology, Carnegie Mellon University

1989-96 Cognitive Neuroscience section of Cognitive Core (graduate survey course). Department of Psychology, Carnegie Mellon University

1990-93 Co-coordinator, Fellowship Training Program in Schizophrenia Research. Western Psychiatric Institute and Clinic, University of Pittsburgh

1992-93 Research Methods in Cognitive Neuroscience (advanced undergraduate seminar). Department of Psychology, Carnegie Mellon University

1992-93 Functional Neural Circuits (graduate and advanced undergraduate seminar). Department of Psychology, Carnegie Mellon University

1994-95 Neural and Psychological Mechanisms of Working Memory (graduate and advanced undergraduate seminar). Department of Psychology, Carnegie Mellon University

1996-97 Advanced Topics in Cognitive Neuroscience (graduate and advanced undergraduate seminar). Department of Psychology, Carnegie Mellon University.

1996-97 Biological and Psychological Mechanisms of Attention (graduate and advanced undergraduate seminar). Department of Psychology, Carnegie Mellon University; co-taught with Gary Aston-Jones.

1999-00 Neural Bases of Cognitive Control (undergraduate course). Department of Psychology, Princeton University.

1999-01 Topics in Molecular and Cognitive Neuroscience (graduate seminar). Departments of Psychology and Molecular Biology, Princeton University.

1999-01 Introduction to Neural Networks (undergraduate course). Department of Psychology, Princeton University.

2001-02 Advanced Topics in Neural Network Models of Psychological Function (advanced undergraduate / graduate seminar). Department of Psychology, Princeton University.

2002-03 Statistical Methods in Psychological Research (advanced undergraduate / graduate course). Department of Psychology, Princeton University.

2004-07 Graduate Proseminar in Cognitive Psychology. Department of Psychology, Princeton University.

2009-16 Core Course for Ph.D. Program in Neuroscience, Princeton Neuroscience Institute, Princeton University.

2017 Introduction to Cognitive Psychology (undergraduate survey course, with laboratory component). Department of Psychology, Princeton University

2018-19 Computational Models of Psychological Function (undergraduate course, with laboratory component). Princeton Neuroscience Institute and Department of Psychology, Princeton University

2. Tutorials and Workshops

May, 1990-93 — Cohen JD, Servan-Schreiber D. Course co-directors, A primer on neural modeling in psychiatry. 144-7th Annual Meetings of the American Psychiatric Society, New York.

July, 1991 — Invited faculty member. James S. McDonnell Summer Institute in Cognitive Neuroscience, Dartmouth College, Hanover.

October, 1993 — Applications of Functional MRI to Studies of Human Memory. Invited tutorial, Memory Disorders Research Society, Boston.

November, 1993 — Functional neuroimaging. Invited tutorial, Neural Information Processing Society, Boulder.

August, 1996 — Neuroimaging and Behavior. Invited workshop, XXVI International Congress of Psychology, Montreal.

January, 1997 — The Role of Neuromodulation in Cognition: Physiological and Computational Approaches. Panel organizer, 30th Winter Conference on Brain Research, Breckenridge, Colorado.

July, 1997 — Invited faculty member. James S. McDonnell Summer Institute in Cognitive Neuroscience, Dartmouth College, Hanover.

September, 2000 — International Workshop on Neural Bases of Executive Functions and Performance Monitoring, Jena, Germany.

July, 2001 — Invited faculty member. James S. McDonnell Summer Institute in Cognitive Neuroscience, Dartmouth College, Hanover.

3. Trainees

Graduate advisees:

Therese Huston, Ph.D. (1990-1995)
CMU Department of Psychology
Behavioral and computational modeling studies of selective attention
Director, Center for Excellence in Teaching & Learning, University of Seattle

Todd Braver, Ph.D. (1992- 97)
CMU Department of Psychology
Computational and neuroimaging studies of prefrontal cortex and cognitive control
Professor of Psychology, Washington University, St. Louis

Matthew Botvinick, M.D., Ph.D. (1995-2001)
CMU Department of Psychology
Computational modeling and fMRI studies of the role of anterior cingulate cortex in conflict monitoring and control
Professor of Psychology and Neuroscience, Princeton University

Mark Gilzenrat, Ph.D. (1996-2006)
CMU Department of Psychology (1996-1998)
Princeton Department of Psychology (1998-2006)
Computational models and pupillometric studies of neuromodulatory influences on selective attention
Software architect, Navaraga Corporation

Raymond Cho, M.D. (1999-2003)
Department of Psychology, Princeton University
Assistant Professor of Psychiatry, University of Pittsburgh

Eric Shea-Brown, Ph.D. (1999-2004)
Program in Applied and Computational Mathematics, Princeton University
Co-advisor with Philip Holmes
Neural oscillators and integrators in the dynamics of decision tasks
Associate Professor of Applied Mathematics, University of Washington, Seattle

Sean Polyn (2000-2005)
Department of Psychology, Princeton University
Computational modeling of context updating, reinforcement learning and dopamine function
Associate Professor of Psychology and Psychiatry, Vanderbilt University

Aaron Schurger (2001-2008)

Department of Psychology, Princeton University
Electrophysiological and fMRI studies of perceptual awareness
Associate Professor, Inserm-CEA

Agatha Lenartowicz (2002-2008)
Department of Psychology, Princeton University
Behavioral, electrophysiological and fMRI studies of task switching
Postdoctoral Fellow, UCLA

Kimberly D'Ardenne McClure (2005-2008)
Department of Chemistry, Princeton University
fMRI studies of brainstem neuromodulatory nuclei
Postdoctoral Fellow, Montague Lab, Virginia Tech

Susan Robison (2005-2009; co-advised with Ken Norman)
Department of Chemistry, Princeton University
Behavioral and fMRI studies of cognitive control and episodic memory

Emily Chakwin (2006-2008)
Department of Psychology, Princeton University
Behavioral and fMRI studies of moral reasoning

Michael Todd (2006-2012)
Department of Psychology, Princeton University
Computational modeling studies of cognitive control
Data Scientist, Netflix

Adam Moore (2006-2011; co-advised with Andy Conway)
Department of Psychology, Princeton University
Behavioral and fMRI studies of moral reasoning

John White (2008-2013)
Department of Psychology, Princeton University
Behavioral and fMRI studies of economic decision making
Data Scientist, Netflix

Sarah Getz (2008-2013; co-advised with Andy Conway)
Department of Psychology, Princeton University
Behavioral and fMRI studies of economic decision making

Andra Geana (2010-2016)
Department of Psychology, Princeton University
Behavioral and fMRI studies of exploration and exploitation in decision making
Postdoctoral Fellow, Brown University

Jane Keung (2011-2016)

Princeton Neuroscience Institute, Princeton University
Behavioral and fMRI studies of prefrontal cortex and cognitive control
Postdoctoral Fellow, University of Arizona

Yida Wang (2011-2016)
Department of Computer Science, Princeton University
Co-advisor with Kai Li and Nick Turk-Browne
Full-correlation matrix analysis of fMRI data
Applied Scientist, Amazon

Olga Lositsky (2012-2017)
Princeton Neuroscience Institute, Princeton University
Behavioral and fMRI studies of decision making
Postdoctoral Fellow, Brown University

Gary Kane (2012-2018)
Department of Psychology, Princeton University
Behavioral and neurophysiological studies of foraging behavior and LC function in rodents
Postdoctoral Fellow, Harvard University

Sachin Ravi (2014-2019)
Department of Computer Science, Princeton University
Co-advisor with Kai Li
Meta-learning and controlled vs. automatic processing

Laura Bustamante (2014-2022)
Princeton Neuroscience Institute, Princeton University
Behavioral and fMRI studies of the cost of cognitive control
Postdoctoral Fellow, Washington University

Sebastian Musslick (2014-2022)
Princeton Neuroscience Institute, Princeton University
Behavioral and fMRI studies of cognitive control
Schmidt Science Fellow, Assistant Professor, Brown University

Abigail Novick (2014-2022)
Department of Psychology, Princeton University
Behavioral and fMRI studies of representational sharing and multitasking

Lena Rosendahl (2016-2022)
Department of Mechanical and Aerospace Engineering
Co-advisor with Naomi Leonard
Quantum probabilistic models of cognitive control
Data Analyst, Mathematica

Mayank Agrawal (2017-present)
Department of Psychology, Princeton University
Computational and Behavioral studies of learning and cognitive control

Zach Dulberg (2019-present)
Princeton Neuroscience Institute, Princeton University
Learning mechanisms for acquiring representations that support generalization

Sreejan Kumar (2019-present)
Princeton Neuroscience Institute, Princeton University
Neural mechanisms underlying learning, representation and reasoning

Simon Segert (2019-present)
Princeton Neuroscience Institute, Princeton University
Neurally-plausible mechanisms of relational reasoning

Tyler Giallanza (2020-present)
Department of Psychology, Princeton University
Neural mechanisms underlying learning, representation and processing of semantics

Samyak Gupta (2020-present)
Department of Computer Science, Princeton University
Co-advisor with Kai Li
Compilation and efficient computational of heterogeneous cognitive models

Shanka Mondal (2020-present)
Electrical and Computer Engineering, Princeton University
Neural mechanisms underlying learning, representation and generalization

Declan Campbell (2022-present)
Princeton Neuroscience Institute, Princeton University
Computational models of human intelligence

Ph.D. Thesis Co-Advisor:

Cliona Golden (2004, Ingrid Daubechies), PACM, Princeton University

Adi Livnat (2005, Simon Levin), Ecology and Evolutionary Biology, Princeton University

Ilya Fischoff (2006, Daniel Rubenstein), Ecology and Evolutionary Biology, Princeton University

Juan Gao (2007, Phil Holmes), Program in Applied and Computational Mathematics, Princeton University

Yuan (Sophie) Liu (2007, Phil Holmes), Physics, Princeton University

Caitlin Newberry (2007, Wolf Richter), Chemistry, Princeton University

Phil Eckoff (2008, Phil Holmes), Program in Applied and Computational Mathematics, Princeton University

Andrea Nedic (2011, Phil Holmes), Electrical Engineering, Princeton University

Samuel Feng (Phil Holmes), Program in Applied and Computational Mathematic, Princeton University

Stephanie Goldfarb (2013, Naomi Leonard), Program in Applied and Computational Mathematic, Princeton University

Eran Eldar (2014, Yale Niv), Princeton Neuroscience Institute, Princeton University

Paul Reverdy (2014, Naomi Leonard), Mechanical and Aerospace Engineering, Princeton University

Postdoctoral trainees:

Steve Forman, M.D., Ph.D. (1992-1994)
University of Pittsburgh Department of Psychiatry
fMRI studies of prefrontal function
Associate Professor of Psychiatry, University of Pittsburgh
Medical Director of the Center for Treatment of Addictive Disorders, Pittsburgh VA

Marius Usher, Ph.D. (1993-1995)
CMU Department of Psychology
Computational models of catecholaminergic neuromodulation and selective attention
Professor of Psychology and Neuroscience, Tel Aviv University

Deanna Barch, Ph.D. (1993-1995)
University of Pittsburgh Department of Psychiatry
Professor of Psychology and Radiology, Washington University, St. Louis

William Perlstein, Ph.D. (1993-1996)
University of Pittsburgh Department of Psychiatry
Electrophysiological and fMRI studies of working memory in schizophrenia
Associate Professor of Clinical and Health Psychology and Psychiatry, University of Florida, Gainsville

Gregory Berns, M.D., Ph.D. (1995-1998)
University of Pittsburgh Department of Psychiatry
Functional neuroimaging studies of novelty detection
Professor of Economics, Emory University

Randy Gobbel, Ph.D. (1997-1998)
Carnegie Mellon University Department of Psychology

Computational modeling studies of basal ganglia function in control of sequential action
Computer Scientist, Artificial Intelligence Center, SRI International

James Kroger (1998-2001)
Princeton University Department of Psychology
FMRI studies of prefrontal cortex organization
Professor of Psychology, New Mexico State University

Nicholas Yeung, Ph.D. (1999-2004)
Princeton University Department of Psychology
Modeling, ERP and fMRI studies of conflict monitoring and cognitive control
University Lecturer in Experimental Psychology, University of Oxford

Gesine Dreisbach, Ph.D. (2000-2001)
Princeton University Department of Psychology
fMRI studies of tasking switching
Professor of Psychology, University of Regensburg

Clay Holroyd, Ph.D. (2001-2004)
Princeton University Department of Psychology
Neural network modeling, ERP, and fMRI studies of performance monitoring and reinforcement learning
Professor of Psychology, University of Victoria

James Rilling, Ph.D. (2001-2003)
Center for the Study of Brain, Mind & Behavior, Princeton University
Neural mechanisms of economic decision making; neural mechanisms in placebo responding.
Associate Professor of Anthropology and Psychiatry and Behavioral Sciences, Emory University

Alan Sanfey, Ph.D. (2001-2003)
Center for the Study of Brain, Mind & Behavior, Princeton University
Neural mechanisms of economic decision making; neural mechanisms in placebo responding.
Associate Professor of Psychology, University of Arizona
Principal Investigator, Donders Institute for Brain, Cognition and Behavior, Radboud University

Rafal Bogacz, Ph.D. (2002-2004)
Princeton University Department of Psychology
Neural network modeling and ERP studies of task switching and performance monitoring.
Associate Professor of Clinical Neuroscience, University of Oxford

Sander Nieuwenhuis, Ph.D. (2002-2003)
Princeton University Department of Psychology
ERP studies and neural network modeling of performance monitoring, task switching and the attentional blink.
Assistant Professor, Cognitive Psychology Unit, Leiden University

Joshua Greene, Ph.D. (2001-2006)
Princeton University Department of Psychology
Neural bases of moral reasoning
Professor of Psychology, Harvard University

Samuel McClure, Ph.D. (2003-2007)
Princeton University Department of Psychology
Neural network modeling and neuroimaging studies of reinforcement learning and decision making
Assistant Professor of Psychology, Stanford University

Jean-Baptiste Pochon, Ph.D. (2003-2005)
Princeton University Department of Psychology
Neuroimaging studies of decision making, conflict monitoring and cognitive control
Postdoctoral Fellow, L'Hôpital de la Salpêtrière in Paris

Patrick Simen, PhD. (2003-present)
Princeton University Program in Applied & Computational Mathematics
Computational modeling, mathematical analysis, behavioral and neuroimaging studies of decision making and cognitive control
Assistant Professor, Oberlin College

Jason Chein, Ph.D. (2004-2005)
Princeton University Department of Psychology
Neuroimaging studies of prefrontal cortex organization and function
Assistant Professor of Psychology, Temple University

Brent Field, Ph.D. (2004-2015)
Center for Study of Brain, Mind and Behavior, and Center for Health and Well-Being, Woodrow Wilson School of Public Policy
Behavioral and neuroimaging studies of attention and emotional regulation among meditation practitioners

Angela Yu, Ph.D. (2004-2008)
Princeton University Department of Psychology
Computational modeling and mathematical analysis studies of decision making and cognitive control
Associate Professor of Cognitive Science, University of California, San Diego

Damon Tomlin, Ph.D. (2006-2013)
Princeton University Department of Psychology and Princeton Neuroscience Institute
Neuroimaging studies of economic and social decision making and cognitive control

KongFatt Wong-Lin, Ph.D. (2006-2009)
Princeton University Department of Mechanical and Aerospace Engineering
Computational modeling and mathematical analysis studies of decision making and cognitive control
Lecturer, Ulster University

Yael Niv, Ph.D. (2007-2008)
Princeton University Department of Psychology
Neuroimaging and computational modeling studies of decision making and cognitive control
Associate Professor of Psychology and Neuroscience, Princeton University

Benjamin Eppinger, Ph.D. (2007-2010)
Princeton University Department of Psychology and Center for Health and Well Being of the Woodrow Wilson School for Public Policy
Neuroimaging studies of age-related differences in economic decision making and cognitive control
Researcher, MPI for Human Development, Berlin

Marieke van Vugt, Ph.D. (2008-2010)
Princeton University Department of Psychology
Neuroimaging and computational modeling studies of decision making and cognitive control
Assistant Professor, University of Groningen

Fuat Balci, Ph.D. (2008-2010)
Princeton University Department of Psychology
Theoretical and behavioral studies of interval timing and decision making
Assistant Professor, Department of Psychology, Koc University, Istanbul

Robert Wilson, Ph.D. (2009-2014)
Princeton University Department of Psychology and Princeton Neuroscience Institute
Theoretical, behavioral and neuroimaging studies of cognitive control & locus coeruleus function
Assistant Professor, University of Arizona

Michael Schwemmer, Ph.D. (2010-2012)
Princeton Neuroscience Institute
Theoretical analyses of capacity constraints on cognitive control
Postdoctoral Fellow, Mathematical Biosciences Institute, Ohio State University

Jarrod Lewis-Peacock, Ph.D. in Psychology, University of Wisconsin-Madison
Princeton Neuroscience Institute (2011-2013; co-advised with Ken Norman)
Neuroimaging studies of cognitive control and prospective memory
Assistant Professor, University of Texas, Austin

Elliot Ludvig, Ph.D., Psychological and Brain Sciences, Duke University
Princeton Neuroscience Institute (2011-2013)
Theoretical model and behavioral studies of learning, memory and cognitive control
Professor, University of Warwick

Amitai Shenhav, Ph.D. in Psychology, Harvard University
CV Starr Fellow, PNI (2012-2016; co-advised with Matthew Botvinick)
Theoretical and neuroimaging studies of the costs of cognitive control
Associate Professor, Brown University

Aaron Bornstein, Ph.D. in Neuroscience, NYU
Princeton Neuroscience Institute (2013-2019; co-advised with Ken Norman)
Neuroimaging studies of episodic memory and decision making
Assistant Professor, University of California, Irvine

Ida Momennajad, Ph.D.
Princeton Neuroscience Institute (2013-2018; co-advised with Ken Norman & Nathaniel Daw)
Neuroimaging and theoretical modeling studies of prospective memory

Michael Shvartsman, Ph.D. in Cognitive Science, University of Michigan
Princeton Neuroscience Institute (2014-2018)
Theoretical analysis of decision making; Bayesian hierarchical analysis of neuroimaging data
Occulus Research

Hasan Kayhan Ozcimder, Ph.D. in Mechanical Engineering, Boston University
Princeton Neuroscience Institute (2015-2017; co-advised with Naomi Leonard)
Mathematical modeling of capacity constraints in controlled (interactive parallel) processing
Mathworks

Michael Lesnick, Ph.D in Applied Mathematics, Stanford University
Princeton Neuroscience Institute (2016-2018)
Tools for topological data analysis (TDA) and their application to neuroscientific data analysis
Department of Mathematics, SUNY Albany

Biswadip Dey, Ph.D. in Mechanical Engineering, University of Maryland, College Park
Princeton Neuroscience Institute (2015-present; co-advised with Naomi Leonard)
Mathematical modeling of capacity constraints in controlled (interactive parallel) processing.

Marius Cătălin Iordan, Ph.D. in Computer Science, Stanford University
Princeton Neuroscience Institute (2016-present; co-advised with Daniel Osherson)
Theoretical and neuroimaging studies of semantic representations and cognitive control

Simon Cullen, PhD. in Philosophy, Princeton University
Princeton Neuroscience Institute (2017-2018)
Theoretical and experimental studies of moral reasoning
Assistant Professor, Carnegie Mellon University

Greg Henselman, Ph.D. in Applied Mathematics, University of Pennsylvania
Princeton Neuroscience Institute (2017-present)
Tools for topological data analysis (TDA) and their application to neuroscientific data analysis

Steven Frankland, Ph.D. in Psychology, Harvard University
Princeton Neuroscience Institute (2017-present)
Neural network modeling of analogical reasoning

Taylor Webb, Ph.D. in Psychology, Princeton University
Princeton Neuroscience Institute (2018-2019)
Neural network modeling of analogical reasoning.

Bryant Jonkes. Ph.D. in Cognitive Psychology, Leiden University, the Netherlands
Princeton Neuroscience Institute (2019-2020)
Theoretical modeling and behavioral studies of the dynamics of cognitive control
Assistant Professor in Cognitive Psychology Unit, Leiden University, the Netherlands.

Javier Masis, Ph.D. in Psychology, Harvard University
Princeton Neuroscience Institute (2020-present)
Neural network modeling of learning and control

Harrison Ritz, Ph.D. in Psychology, Brown University
CV Starr Fellow, PNI (2022-present)
Theoretical and neuroimaging studies of the dynamics of cognitive control

RESEARCH and PROFESSIONAL ACTIVITIES:

1. Grants

NIMH Physician Scientist Award	Context Disturbance in Schizophrenia: Models and Measures	PI	1987-92	MH00673
NIMH P50	Cortical Circuitry and Cognition in Schizophrenia (Edward Stricker, PI) Project 4 (1990-96), Project 7 (1997-02): The Role of Prefrontal Cortex in the Cognitive Dysfunctions of Schizophrenia; Project ?? (2003-07): Neuroendophenotypes and the expression of illness liability in schizophrenia	PI, Project 4,7	1990-07	MH45156
NIMH FIRST Award; RO1	Mechanisms of Context Processing in Schizophrenia	PI	1991-2012	MH47073
NIMH Program Project	Toward Models of Normal and Disordered Cognition (James L. McClelland, PI) Project 2 (1991-96): Neuromodulation and the Processing of Context in Schizophrenia; Project 4 (1997-02): Mechanisms of Cognitive Control	PI, Project 2,4	1991-2002	MH47566
NIMH P50	Center for Functional Brain Imaging (Robert Moore & Mark Mintun, Co-PIs) Cognitive Studies Core	Co-Direct., Cognitive Core	1992-97	MH49815
McDonnell Foundation	Neural Bases of Rehearsal and Maintenance in Working Memory	PI	1994-96	JSMF 94-32

NSF CRI	Computational and Statistical Methods for the Analysis of Neuroimaging Datasets	PI	1995-96	IBN9418982
NIMH RO1	fMRI Studies of Prefrontal Cortex	PI	1996-2009	MH52864
NIMH Program Project	Toward Models of Normal and Disordered Cognition (James L. McClelland, PI)	PI, Project 4	1997-02	MH47566
NIDA/HBP RO1	Advanced Methods for Neuroimaging Data Analysis	PI	1997-99	DA11469
NSF ESI	Tracking the Human Brain: An Interactive Planetarium Exposition (Bryan Rogers, PI)	Co-Invest.	1997-99	ESI9705491
NARSAD Independent Investigator Award	An fMRI Study of the Role of Anterior Cingulate in Working Memory Dysfunction in Schizophrenia	PI	1997-99	
NIMH RO1	Neurophysiological and Modeling Studies of Locus Coeruleus (Gary Aston-Jones, Co-PI)	Co-PI	1998-2001	MH33194
NSF MRI	Acquisition of Core Equipment for Princeton Cognitive and Behavioral Neuroscience Initiative (Marcia Johnson and Charles Gross, Co-PIs)	Co-PI	1998-2001	MRI/ OSTI9871186
NJCST	New Jersey Brain Imaging Consortium: Acquisition of high field MRI scanner	PI	1999	
NIMH/HBP RO1	Usability and Interoperability of Neuroimaging Software	PI	2000-03	MH62006
NIMH RO1	Pathophysiology of Cognitive Disability in Schizophrenia (Cameron Carter, PI)	Co-Invest.	2000-04	MH59883
NIMH P50	Conte Center for Neuroscience Research: Cognitive and Neural Mechanisms of Conflict and Control	PI	2000-10	MH62196
Seaver Institute	Neural Economics: Understanding the brain mechanisms underlying cognitive-emotional interactions in decision making	PI	2001-02	
NIDA R21	Hyperscan: Simultaneous fMRI Across the Internet (Emory University; Greg Berns, PI)	Co-Invest.	2001-03	DA014883
MacArthur Foundation	Neural Bases of Placebo Effect and the Expectation of Pain	PI	2001-03	
NIMH P50	IBSC: Toward a Neurobiologically Constrained Framework for Modeling Human Cognition (James L. McClelland, PI). Project 4: Mechanisms of Cognitive Control	PI Project 4	2002-07	MH64445
NIMH RO1	New Wavelet-Based and Source Separation Methods for fMRI (Ingrid Daubechies, PI)	Co-Invest.	2002-07	MH067204
NIMH T32	Training Program in Quantitative Neuroscience	PI	2002-present	MH65214
NJCST	Center for Molecular and Biomolecular Imaging (Warren Warren, PI)	Co-Invest.	2002-09	

DURIP	Computing Environment for Computational Modeling of Brain Functions	PI	2003	ONR
NSF BCS	Social Cognitive Neuroscience of Category-based Responses (Susan Fiske, PI)	Co-Invest.	2004-05	
NIDA RO1	Neural Mechanisms and Social Influence in Delay Discounting and Impulsive Behavior	PI	2006-11	DA022564
NIDA T90	Training Program in Quantitative and Computational Neuroscience (David Tank, Co-PI)	Co-PI	2006-11	DA022770
MURI	Dynamic Decision Making in Complex Task Environments: Principles and Neural Mechanisms (James L. McClelland, PI)	Co-Invest.	2006-11	AFOSR
MURI	Behavioral Dynamics in the Cooperative Control of Mixed Human/Robotic Teams (John Baillieul, PI)	Co-Invest.	2006-11	AFOSR
DURIP	A Second Generation Flexible Computing Environment for Computational Modeling of Brain Function and Neuroimaging Data Analysis	PI	2008	AFOSR
NCRR	Expansion of a Computing Facility for fMRI and Neuroimaging Analysis	PI	2008	RR023532
NSF MRI	Acquisition of High Performance Compute Cluster for Multivariate Realtime.	PI	2012	BCS1229597
John Templeton Foundation	Toward a Scientific Understanding of the Human Capacity for Cognitive Control	PI	2012-2022	
Intel Corporation	Advanced Methods for Realtime Analysis of Human Brain Imaging Data	PI	2014-2019	
Templeton World Charity	System-Level Modeling of Intelligent Behavior	PI	2018-2020	Beyond Turing
NIH CTSA	New Jersey Alliance for Clinical and Translational Science	Co-Invest.	2019-2024	UL1 TR003017
NIH R21	PsyNeuLink: A Block Modeling Environment for Cognitive Neuroscience	PI	2019-2021	MH117548
NSF Convergence Accellerator — Track D	A Standardized Model Description Format for Accelerating Convergence in Neuroscience, Cognitive Science, Machine Learning and Beyond	PI	2020-2021	Approved
DURIP	A Balanced, shared Computational Resource for Multidisciplinary Neuroscience Research	PI	2020	AWD1006863
Vannevar Bush Faculty Fellowship	Toward a Brain-Inspired Model of the Flexibility and Autonomy of Human Behavior	PI	2021-2026	N00014-22-1-2002

2. Invited Lectureships

American Association for the Advancement of Science (2002)

American Association of Directors of Psychiatry Residency Training (AADPRT), Annual Meeting, Schein Lecture (2012)
American College of Neuropsychopharmacology, Panels (1994, 1995, 1997, 1998, 1999, 2005)
American Economic Association, Symposia (2003, 2005, 2006)
American Psychological Association, Distinguished Scientific Contribution Award Lecture (2010)
American Psychological Society (1994, 1998)
ARVO (2000)
Association for Research in Nervous and Mental Disease, Annual Conference Special Lecture (2006)
Association for Psychological Science, William James Award Public Address (2018)
Attention and Performance XV, XVIII (1992, 1998)
Baylor College of Medicine, Neuroscience Colloquium (1999); Keynote speaker, Annual Neuroscience Retreat and Rush and Helen Record Forum (2008)
Beckman Institute for Advanced Science and Technology, University of Illinois, Smith, Hinchman & Grills Distinguished Lecture (2003)
Behavioral Neurology Society, Keynote Address (1998)
Biological Psychiatry Society, Presidential Symposium (2002, 2008)
Boston University, Department of Cognitive and Neural Systems Colloquium (2001)
Brandeis University, Department of Biology, Colloquium (1997, 2003)
Brown University, Shlossberg Colloquium (2017)
California Institute of Technology 2nd Annual Chen Center Distinguished Lecture (2018)
Cambridge University and the Royal Society, Symposium on Executive and Cognitive Functions of Prefrontal Cortex (1996)
Cardiff University, Cardiff Cognitive Neuroscience Seminar Series (2005)
Carmel Conference XV (1997)
Carnegie Mellon University, Psychology Department Colloquium (1994, 2009)
Cognitive Neuroscience Society (1995, 1996, 2000, 2002, 2006)
Cognitive Neuroscience Treatment Research to Improve Cognition in Schizophrenia Meeting, Invited Talk (2007)
Cold Spring Harbor Laboratory, Computational and Systems Neuroscience Workshop (2004)
College de France, Colloque de Rentrée, Invited Talk (2007)
Columbia Presbyterian Hospital, Joseph Zubin Memorial Fund Award Lecture (1994)
Columbia University, College of Physicians and Surgeons, Department of Psychiatry, Grand Rounds (1990)
Columbia University, College of Physicians and Surgeons, Department of Economics, Cognition and Decision Seminar Series (2016)
Computational Psychiatry 2017 Keynote Address (2017)
Computational Psychiatry 2018 Keynote Address (2018)
Cornell Medical School, Sackler Institute Colloquium (2002)
CUNY, Department of Psychology Colloquium (2000)
DARPA ISAT Toward Optimal Learning Workshop, Invited Address (2014)
Dynamical Systems in Neuroscience, Annual Meeting (1999)
Eden Institute Foundation, Lecture Series Fellow (2001)
Emory School of Medicine, Department of Psychiatry, Grand Rounds (1999)

Ellison Medical Foundation, Workshop of the Biological Assessment of Mental Processes (2006)
Eunice Kennedy Shriver Center for Developmental Cognitive Neuroscience, Colloquium (2000)
FENS and The Brain Prize, Brain Conference on New Insights into Psychiatric Disorders through Computational, Biological and Developmental Approaches, Keynote Address (2016)
Florida State University, Department of Psychology, Colloquium (1998)
Frankfurt Institute for Advanced Studies, Ernst Strüngmann Forum (2007)
Future Science Prize Ceremony and Future Forum Science Symposium Keynote Address (2018)
Harvard University, Department of Psychology, Colloquium (1996, 2002)
Harvard University, Department of Economics, Labor Economics Seminar (2003)
Human Brain Project, Annual Conference (1998, 1999)
Indiana University, William Lowe Bryan Memorial Lecture on Cognitive Science (1992)
Institute for Advanced Studies, Department of Mathematics, Symposium (2003)
Institute of Psychiatry, King's College, London, Paul Janssen Lecture (2010)
Intel Corporation Annual Developers' Conference, Keynote Address (2016)
Intel Corporation, 2018 Consumer Electronics Show Spotlight Presentation (2018)
Intel Corporation Technology Strategy and Leadership Meeting: Outsider Perspective (2018)
Intel Labs Open Innovation Leadership Forum, Invited Address (2105)
Intel Labs, Mini-Symposium: The Mind's Eye Project (2106)
Interface 95 - The 27th Symposium on the Interface: Computing Science and Statistics (1995)
International Conference on Cognitive and Neural Systems, 10th Annual Meeting (2006), Invited Address
International Conference on Cognitive Neuroscience, Keynote Address (1996)
International Congress on Schizophrenia Research (1997), Invited Address
International Meeting on Fully Three-Dimensional Image Reconstruction in Radiology and Nuclear Medicine (1997)
International Neuropsychological Society (1992), Invited Address
James S. McDonnell Summer Institute in Cognitive Neuroscience (1995, 1997, 2001)
Japanese Neuropsychological Association, Keynote Address (1997)
Jena International Workshop on Executive Functions and the Brain (2000)
Kern Medina Seminar on Humanities and Science for State and Federal Judges (2014)
Lehigh University, Annual Neuroscience Retreat, Keynote Address (2015)
Library of Congress / NIMH Annual Decade of the Brain Public Program (1999)
Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Distinguished Guest Lecture Series (2011)
McGill University, Department of Psychiatry, Grand Rounds (1991)
Memory Disorders Research Society (1994, 1997, 1999)
Mind-Life Institute / M.I.T. (2003)
National Foundation for Functional Brain Imaging 1st Annual Meeting (1999)
New York Academy of Medicine, Annual Salmon Lecture (2006)
New York Academy of Sciences, Imaging Discussion Group Meeting (2005)
NIDA, Invited Seminar (2011)
NINDS, Cognitive Neuroscience Section, Grand Rounds (1993)
NIMH, St. Elizabeth's Hospital, Grand Rounds (1997)

NIMH Extramural program, Colloquia and Workshops (1999, 2000, 2001)
NIMH Intramural program, Neuroscience Colloquium (1999)
Nordic Center of Excellence and the Stockholm Brain Institute, Invited Talk (2007)
Northern California Psychiatric Society, Award Address (1986)
Northwestern University, Department of Psychology, Colloquium (1998)
NYU, Departments of Psychology and Neuroscience, Colloquia (1999, 2000)
Ohio State University, Mathematical Biosciences Institute Workshop on Systems Level Modeling (2002)
President's Council on Bioethics (2004)
Princeton Conference on Cerebral Vascular Disease (1994)
Princeton Plasma Physics Laboratory, Colloquium (2004)
Princeton University, Department of Psychology, Colloquium (1996)
Princeton University, Council on Science and Technology Public Lecture Series (2000)
Psychonomic Society, Invited Symposium Lectures (1996, 2002)
Queens College, CUNY, Annual Neuropsychology Symposium, Keynote Address (2007)
Reinforcement Learning and Decision Making, First Annual Meeting, Invited Address (2013)
Research Society on Alcoholism, Plenary Address (2002)
Rockefeller University, Neuroscience Colloquium (1999)
Rotman Research Institute, 10th Annual Conference on the Frontal Lobes (2000)
Royal Society, UK, Mental Processes in the Human Brain (2006)
Rutgers University, Department of Psychology & Center for Molecular and Behavioral Neuroscience Colloquium (1999, 2000)
Rutgers University Brain Health Institute, Invited Colloquium Address (2015)
Sierra Ventures 13th Annual CXO Summit Keynote Address (2018)
Simons Foundation SFARI Annual Scientific Meeting Keynote Address (2018)
SISA, Trieste Encounters in Cognition (1992)
Smithsonian Institute Public Lecture Series (1999)
Society for Psychophysiological Research, Invited Address (2006)
Society for Research on Psychopathology (1993)
Stanford University, Neurobiology Department, Frontiers in Neuroscience Lecture Series (2009)
Templeton Foundation, Annual Members Meeting Keynote Address (2016)
Templeton World Charities Fund Diverse Intelligences Grantee Meeting (2018)
TPG Annual Retreat, Featured Speaker (2007)
University of California, Berkeley, Helen Wills Neuroscience Institute Inaugural Lecture (2000)
University of California, Berkeley, Neuroscience Student Seminar Series (2010, 2016)
University of California, Davis, Keynote Address, Opening of Brain Imaging Center (2005)
University of California, Davis, Department of Psychiatry Grand Rounds (2005)
University of California, San Francisco, Department of Psychiatry Grand Rounds (2001)
University College London and Wellcome Functional Imaging Laboratory (1997, 2000)
University of Colorado Boulder, Department of Psychology, Symposium (1997, 2002)
University of Colorado Boulder, Determinants of Executive Function & Dysfunction Conference (2013)
University of Illinois, Program in Neuroscience, Colloquium (1998)

University of Michigan, Departments of Psychology and Psychiatry Colloquia (1994, 2000)
University of Michigan, Marshall Weinberg Cognitive Science Symposium (2013)
University of Maryland, Psychiatric Research Center, 25th Anniversary Symposium (2002)
University of Maryland, Cognitive Science Colloquium (2016)
University of Medicine and Dentistry of New Jersey, Graduate Program in Physiology and Neurobiology, Special Lecture (1999)
University of Medicine and Dentistry of New Jersey, Dept. of Neurology Grand Rounds (2002)
University of North Carolina at Greensboro, Kendon Smith Annual Lecture Series (2004)
University of Oregon, Institute of Cognitive and Decision Sciences, Symposia (1990, 1996)
University of Pennsylvania, Department of Psychology, Cognitive Science Program, and Institute for Neural Sciences Colloquia (1996, 2001)
University of Pennsylvania, Institute of Neurological Sciences, James M. Sprague Annual Lecture (2006)
University of Pennsylvania and Philadelphia Psychoanalytic Center, Evening Program (2006)
University of Rochester, Department of Brain and Cognitive Sciences, Colloquium (2006)
University of Texas Austin, Cognitive Neuroscience & Imaging Research Center Seminar, Invited talk (2016)
University of Texas Southwestern Medical Center, Dept. of Psychiatry, Colloquium (2003)
University of Vermont, Department of Psychiatry, Grand Rounds (1992)
University of Waterloo, Centre for Theoretical Neuroscience, 5th Annual Brain Day (2011)
University of Waterloo, Neuroscience Colloquium Series (2021)
University of Wisconsin, Department of Psychology, Colloquium (1987, 2002)
University of Wisconsin Medical School, 5th Annual Symposium on Emotion (1999)
Vanderbilt University, Annual Neuroscience Retreat Keynote Address (2001)
Vanderbilt University, Stroopfest (2002)
Virginia Tech Carilion Research Institute Maury Strauss Distinguished Public Lecture (2018)
Washington University, Department of Psychiatry, Grand Rounds (2003)
Winter Conference on Brain Research (1993, 1996, 1997, 1998)
Workshop on Neural Modeling of Brain and Cognitive Disorders (1995, 1998)
Yale University School of Medicine, Department of Neurobiology, Colloquium (2002)
Yale University School of Medicine, Department of Psychiatry, Abraham Ribicoff Annual Lecture (2004)

3. Other research-related activities

Advisory Boards and Councils

Allegheny County Neuropsychiatric Survey, Executive Advisory Board (1996-8)
University of Michigan, Department of Psychology, External Advisory Board (1997)
National Alliance for Research on Schizophrenia and Depression (NARSAD), Scientific Council (1998-present)
NIMH Board of Scientific Counselors, Advisory Panel on Intramural Research Program (1999)
Yale-New Haven VAMC Schizophrenia Research Center, Scientific Advisory Board (1999)

International Organization of Human Brain Mapping, Governing Council (1998-2002), Treasurer (2000-2001), Chair of Neuroinformatics Committee (1998-2001), Chair, Nominations Committee (2001)
National Foundation for Functional Brain Imaging, Advisory Board (1999-2004)
Center for Magnetic Resonance Research, University of Minnesota, Advisory Board (2000)
Harvard Initiative in Systems Neuroscience, Advisory Board (2000)
American Psychiatric Association / NIMH DSM-V Workgroup on Neuroscience (2000-2002)
NIMH Workgroup on Strategic Plan for Mood Disorders (2000-2002).
International Association for the Study of Attention and Performance, Advisory Council (2001-present)
University of Pennsylvania NIMH Silvio O. Conte Center for Neuroscience Research, "The Neurobiology of Stimulus Encoding in Schizophrenia," External Advisory Board (2003, 2008)
Harvard University, Department of Psychology, External Review Committee (2003)
NIMH Measurement and Treatment Development Activities on Cognition in Schizophrenia (MATRICS), Neurocognition Committee (2002-2006)
Council of Princeton University, Executive Committee (2004-5)
National Advisory Mental Health Council (NAMHC) (2004-8)
The Society for Neuroeconomics, Board of Directors (2004-2005)
Gatsby Computational Neuroscience Unit, UCL, Quinquennial Review Panel (2005)
National Advisory Mental Health Council Workgroup on MRI Safety (2005-2007)
Brookhaven National Laboratory, Science and Technology Steering Committee (2005-2014)
Institute for Advanced Studies, Princeton, Decadal Visiting Committee for School of Social Sciences (2007)
National Advisory Mental Health Council Workgroup on Neuroscience Training (2007-2008)
University of Colorado, Boulder NIMH Interdisciplinary Behavioral Science Center, "Executive Function and Dysfunction," External Advisory Board (2009)
Johns Hopkins University, Psychological Brain Sciences Department and Mind Brain Institute External Review Committee (2011)
Princeton University, Research Computing Advisory Council, Member (2011-present)
Harvard University, Mind, Brain and Behavior Initiative, External Review Committee (2013)
Ecole Normale Supérieure, Scientific Advisory Committee of the Département d'Etudes Cognitives (2014-present)
National Academy of Medicine, Forum on Neuroscience (2015-present)
Yale University, Wu Tsai Institute, External Advisory Board (2022-present)

Editorial Boards

American Journal of Psychiatry, Consulting Editor (2001-2006)
Biological Psychiatry, Board of Editors (1999-2009)
Brain Research, Senior Editor for Computational Neuroscience (2005-2010)
Cognitive Neuropsychology, Advisory editor (1997-2002)
Journal of Experimental Psychology: General, Consulting Editor (1996-2005)
Journal of Neurophysiology (2003-2004)
Neuroimage, Board of Editors (2002-2003)

Neuroinformatics, Board of Editors (2002-present)
Neuropsychopharmacology, Board of Editors (1999-2008)
Neuroscience, Board of Editors (1999-2003)
NMR in Biomedicine, Board of Editors (2003-2006)
Proceedings of the Royal Society, Biological Sciences, Board of Editors (2003-2008)
Science, Board of Reviewing Editors (1998-2014)
Trends in Cognitive Science, Advisory Editorial Board (2004-present)
Computational Psychiatry, Editorial Board (2014-present)

Grant Review

Integrative Cognitive Functional Neuroscience Study Section, NIH
Clinical Psychopathology Study Section, NIMH
Human Development and Aging Study Section, NIH
Human Frontier Science Program
Medical Research Council (MRC), UK
National Center for Research Resources, NIH
NIMH Intramural Research Program, NIH
NSF Review Panel
Wellcome Trust

Conference Organization

New Directions in Health Care and Education Annual Colloquium. University of Pennsylvania Medical School, May, 1980. Founder and Co-organizer.

25th Annual Carnegie Symposium on Cognition: Scientific Approaches to the Question of Consciousness. Carnegie Mellon University, May, 1993. Co-organizer.

Center for Neuroscience and Mental Disorders bi-annual workshop: Cognitive Neuroscience Approaches to Schizophrenia. University of Pittsburgh, May, 1994. Organizer.

International Congress on Schizophrenia Research. Colorado Springs, April, 1997. Program Consultant.

Society for Research in Psychopathology. Palm Springs, October, 1997. Program Committee.

Neural Processes and Economics Workshop, Woodrow Wilson School, Princeton University. Co-organizer, 2000.

Organization for Human Brain Mapping, New York City, 2003, Chair, Local Organizing Committee.

Computational Cognitive Neuroscience Conference, Co-Founder (with Randall O'Reilly); 2005-2008, Program Committee.

Membership in Professional Organizations

American Academy of Arts and Sciences
American Association for the Advancement of Science
American Psychological Society
Cognitive Science Society

Psychonomic Society
Society for Neuroscience

Software Development

PsyScope, Designer and Co-Producer with Brian MacWhinney, Psychology, Carnegie Mellon University — this is a graphical, interactive program for the design and implementation of cognitive experimental tasks on Macintosh computers. It provides the ability to present stimuli in text, graphic, and acoustic form, and can be used to record manual or voice responses with millisecond accuracy. It incorporates a fully general scripting language, as well as a graphic interface, and is extensible through the use of plug-and-play add-on modules. PsyScope was originally designed for Mac OS prior to and through System 9. It was independently ported to MacOS X, and continues to be supported by the community, freely available, and widely used (with over 3,00 downloads) for experimental research and as a teaching instrument in research centers throughout the world. The design of PsyScope also provided one of the foundations for E-Prime, a PC/Windows-based commercially supported package that was developed in collaboration with Psychology Software Tools (PST) Inc. and is also in widespread use.

Brain Image Analysis Kit, Project Co-Director, with Ted Willke, Brain Inspired Computing Lab, Intel Labs; Ken Norman, Neuroscience and Psychology, Princeton; and Nicholas Turk-Browne, Psychology, Yale University — this is a Python-based, open source software package, developed in collaboration with Intel Labs, that supports the application of advanced methods from machine learning and multivariate statistics to the analysis of neuroimaging data. It is tightly integrated with SciKit-Learn, and includes modules for Full Correlation Matrix Analysis (FCMA; Wang et al. 2015), Multi-voxel Pattern Analysis (MVPA), a suite of methods for Shared Response Modeling (SRM) (including hyper alignment and Inter-Subject Functional Correlation [IFSC]), Topographic Factor Analysis (TFA), and Bayesian-derived methods for Representational Similarity Analysis (RSA). Within the first year and half of its development it has attracted over 9,000 downloads.

RT-Cloud, Project Co-Director, with Ken Norman, Princeton Neuroscience Institute. This is an open-source software package, integrated into the BrainIAK environment, that makes it easier to build and deploy real-time fMRI experiments. The framework provides a coordination hub between the experimenter's script, a subject feedback script, the scanner data, and experiment control. It streams scanner data (in real-time) to an experimenter's script and forwards the results for use in subject feedback (optionally using tools like PsychoPy, jsPsych, or PsychToolbox). It provides a web-based user interface that allows for starting and stopping runs, changing settings, and viewing output. It can be configured to run in the cloud, on a cluster, or in the control room. This framework is under active development with funding from NIMH to further extend its capabilities, including support for standards such as BIDS and OpenNeuro.

PsyNeuLink, Designer and Lead Developer, with Abhishek Bhattacharjee, Computer Science, Yale University and Amitai Shenhav, Brain and Cognitive Sciences, Brown University; and support from Templeton World Charitable Foundation and NIMH — this is a "block modeling environment" designed for use by neuroscientists, psychologists, computational psychiatrists and others interested in building system-level models of the computational mechanisms underlying brain function and its

expression in psychological processes and behavior, and in exploring their relationship to developments in research on machine learning and artificial intelligence. It allows components to be constructed that implement various, possibly disparate functions, at potentially different levels of analysis and/or timescale of operation, and integrate these into a coherent modeling environment that can be used to simulate and study their interaction. PsyNeuLink is written in Python, is open source, and meant to be extended. Its goal is to provide an environment for implementing models that are expressed in a concise and easy to read form, and that can be executed, shared, compared, and integrated with one another. PsyNeuLink maintains a publicly accessible library of its components and models, to which users can contribute, providing a common repository for model-sharing in a manner paralleling data-sharing efforts in empirical research.

SweetPea, Co-Designer, with Matthew Flatt and Vivek Srikumar, Computer Science, University of Utah — this is an experimental design environment that simplifies and standardizes the format in which experimental factors are expressed and combined, and used to generate balanced samples of valid trial sequences. As experimental designs in psychology and neuroscience — as well as the theories they are designed to test — become more complex, the ability to insure appropriately balanced sampling of relevant experimental and control conditions becomes increasingly difficult, and designs that do so increasingly difficult to express and/or interpret, which poses challenges to reliability and/or reproducibility of results. Similar problems arise in computational modeling, where uncontrolled or poorly understood differences in the inputs to a simulation can confound interpretations of its behavior, just as it does empirical data. SweetPea addresses this problem by providing a declarative language for expressing a design— in terms of factors (experimental variables), levels (values for those variable to be sampled), crossings among factors, and constraints on trial sequences (e.g., number or types of repeats). The design is then translated into a form (currently, conjunctive normal form) that can be sampled using a SAT solver, to insure that valid trial sequences are sampled in a balanced fashion.

ModECI (Model Exchange and Convergence Initiative, Lead Developer with Abhishek Bhattacharjee, Computer Science, Yale University; Sharon Crook, Arizona State University and NeuroML; Padraig Gleason, Neuroscience, Physiology and Pharmacology, University of College London and NeuroML; Ted Willke, Brain Inspired Computing Lab, Intel Labs; and support from the NSF Convergence Accelerator Program — this project seeks to accelerate the convergence of progress in the brain, cognitive and computer sciences by facilitating the exchange of computational models, through the development of a standardized model description format, that expresses models in the form of a computational graph in which each node is a computational component and edges specify connections between them that determine the flow of computation. The format is implemented in serialized forms (e.g., JSON, YAML) that allows the exchange of models in machine-readable form among a broad range of existing environments — from biologically detailed ones (e.g., NeuroML, Emergent, and Nengo) and system-level level packages (such as PsyNeuLink) to abstract symbol processing environments used in cognitive science (such as ACT-R) and neural network modeling ones served by the ONNX standard used in the machine learning community (e.g., PyTorch and TensorFlow).