

# Curriculum Vitae

Randall C. O'Reilly

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## Employment

- Professor, Department of Psychology & Neuroscience, Institute of Cognitive Science, Center for Neuroscience, University of Colorado Boulder, 2008-present.
- Associate Professor, Department of Psychology, Institute of Cognitive Science, Center for Neuroscience, University of Colorado Boulder, 2002-2008.
- Assistant Professor, Department of Psychology, Institute of Cognitive Science, Center for Neuroscience, University of Colorado Boulder, 1997-2002.

## Degrees

- Ph.D., Psychology, Carnegie Mellon University, Aug 13, 1996. Thesis: ``The Leabra Model of Neural Interactions and Learning in the Neocortex.  
*James L. McClelland advisor.*
- M.S., Psychology, Carnegie Mellon University, 1992.
- A.B. Magna with Highest Honors in Psychology, Harvard University, 1989. Interdisciplinary Program in Cognitive Science.

## Additional Education

- McDonnell-Pew Program in Cognitive Neuroscience Postdoctoral Fellow, Department of Brain and Cognitive Sciences, Massachusetts Institute of Technology, 1996-1997.
- Interdisciplinary program in Neural Processes in Cognition, University of Pittsburgh and Carnegie Mellon University, 1990-1996.
- Connectionist Models Summer School, University of Colorado, Boulder, 1993.
- McDonnell Summer Institute in Cognitive Neuroscience, Dartmouth College, 1992.

## Research Interests

- Specialization of function in and interactions between hippocampus, prefrontal cortex, and posterior neocortex in learning, memory, attention, and controlled processing.
- Visual object recognition in biological systems.
- Computational and formal models of the biological bases of cognition (computational cognitive neuroscience).

## Honors and Awards

- College Scholar Award, University of Colorado Boulder, 2009.
- D. G. Marquis Behavioral Neuroscience Award, APA Division 6, 2007.
- Provost Faculty Achievement Award, University of Colorado Boulder, 2007.
- Center for the Neural Basis of Cognition (CMU/Pitt, Pittsburgh, USA) Distinguished Alumnus, 2002.
- Excellence in Teaching award, CU Neuroscience Club, 1999.
- Thomas T. Hoopes Prize for Outstanding Senior Thesis, Harvard College, 1989.
- John Harvard Scholarship, Harvard College, 1987-1989.
- Los Angeles Times National Merit Scholarship, 1985-1987.

## Fellowships

- McDonnell-Pew Program in Cognitive Neuroscience Postdoctoral Fellowship, MIT, 1996-1997.
- Office of Naval Research Graduate Fellowship, 1990-1993.

## Grants

- ICARUS MINDS (Mirroring Intelligence in a Neural Description of Sensemaking), iARPA / HRL, 11/1/10-4/30/14, \$1,508,984 total costs.
- Robotics Collaborative Technology Alliance, ARL, 7/10-6/15, approx \$150,000 total costs per year.
- Embodied Common Sense in Vision and Language, iARPA/ARL W911NF-10-C-0064, 5/1/10 - 4/30/11, \$350,000 total costs (eCortex Inc is prime contractor).
- Embodied Biologically-Based Active Vision, ONR N00014-10-1-0177, 1/15/10-12/31/12, \$600,000 total costs.
- Determinants of Executive Function and Dysfunction, NIH IBSC center 1-P50-MH079485, 4/1/2008-3/31/2013, Marie Banich, PI, \$7,237,015 total costs, PI of Project 2 and Computational Core.
- Integrated Cognitive Architectures for Robust Decision Making, 7/1/2008-5/31/2010, \$412,000 total costs, Co-PI with John R. Anderson and Christian Lebiere.
- An Adaptive, Biologically-Based Cognitive Architecture for Simulated Robots: Active Vision, ONR N00014-07-1-0651, 2/22/07-9/30/09, \$415,981 total costs.
- Biologically-Inspired Cognitive Architecture, DARPA/ONR N00014-05-1-0880, 9/1/05-3/1/07, \$294,532 direct costs.
- Toward a Unified Model of Cognitive Control, NIH R01 MH069597-01, 1/1/2004-12/31/2008, \$787,500 direct costs.
- Developing an Adaptive, Biologically-Based Cognitive Architecture, ONR N00014-03-1-0428, 3/1/2003-2/28/2006, \$433,800 direct costs.
- Toward a Neurobiologically Constrained Framework for Modeling Human Cognition, NIH IBSC center 1 P50 MH 64445, James L. McClelland PI, 9/30/2002-6/30/2007, \$9,340,596 total award, approx \$1,000,000 for components associated with.
- Conjunctive Representations: In Cortex and Hippocampus. NIH R01 MH61316-01, 2000-2004. Co-PI with Jerry W. Rudy. \$600,000 direct costs.
- Towards a Biological Basis of Systematic Controlled Processing: Activation- and Weight-Based Mechanisms. ONR N00014-00-1-0246, 2000-2003, \$360,000 direct costs.
- Discrete Representations in Working Memory: Developmental, Neuropsychological, and Computational Investigations. NSF KDI/LIS IBN-9873492. Awarded to M.C. Mozer, Y. Munakata, R.C. O'Reilly, and A. Miyake, 1998-2001, \$800,000 direct costs.
- Toward a Model of Normal and Disordered Cognition, NIH Program Project MH47566, James L. McClelland PI, 1997-2002, \$3,050,828 direct costs (\$600,000 for components associated with).
- How the hippocampus operates in memory. Human Frontier Science Program Grant, Edmund Rolls PI, 1991-1994.

## Publications

### Journal Papers

- Pauli, W. M., Hazy, T. E., & O'Reilly, R. C. (in press). Expectancy, ambiguity and behavioral flexibility: Separable and complementary roles of the orbital frontal cortex and amygdala in processing reward expectancies. *Journal of Cognitive Neuroscience*.
- Munakata, Y., Herd, S. A., Chatham, C. H., Depue, B. E., Banich, M. T., & O'Reilly, R. C. (2011). A unified framework for inhibitory control. *Trends in Cognitive Sciences*, 15, 453-459.
- Snyder H.R., Hutchison N., Nyhus E., Curran T., Banich M.T., O'Reilly R.C., & Munakata Y. (2010). Neural inhibition enables selection during language processing. *Proceedings of the National Academy of Sciences, USA*, 107, 16483-16488,
- O'Reilly, R.C. (2010). The What and How of prefrontal cortical organization. *Trends in Neurosciences*, 33, 355-361.
- O'Reilly, R.C., Herd, S.A., & Pauli, W.M. (2010). Computational Models of Cognitive Control. *Current Opinion in Neurobiology*, 20, 257-261.
- Hazy, T.E., Frank, M.J., & O'Reilly, R.C. (2010). Neural mechanisms of acquired phasic dopamine responses in learning. *Neuroscience and Biobehavioral Reviews*, 34, 701-720.
- Reynolds, J.R. & O'Reilly, R.C. (2009). Developing PFC representations using reinforcement learning. *Cognition*, 113, 281-292.
- Huber, D.E., Tian, X., Curran, T. O'Reilly, R.C., & Woroch, B. (2008). The dynamics of integration and separation: ERP, MEG, and neural network studies of immediate repetition effects. *Journal of Experimental Psychology: Human Perception and Performance*, 34, 1389-1416.
- Jilk, D.J., Lebiere, C., O'Reilly, R.C., & Anderson, J.R. (2008). SAL: An explicitly pluralistic cognitive architecture. *Journal of Experimental and Theoretical Artificial Intelligence*, 20, 197-218.
- Aisa, B., Mingus, B., & O'Reilly, R.C. (2008). The emergent neural modeling system. *Neural Networks*, 21, 1045-1212.
- Bayley, P.J., O'Reilly, R.C., Curran, T. & Squire, L.R. (2008). New Semantic Learning in Patients with Large Medial Temporal Lobe Lesions. *Hippocampus*, 18, 575-583.
- Atallah, H.E., Rudy, J.W., & O'Reilly, R.C. (2008). The Competitive Roles of the Dorsal Striatum and Dorsal Hippocampus in Odor Discrimination Tasks. *Learning and Memory*, 15, 294-298.
- Pauli, W.M. & O'Reilly R.C. (2008). Attentional control of associative learning -- A possible role of the central cholinergic system. *Brain Research*, 1202, 43-53.
- Frank, M.J., Santamaria, A., O'Reilly, R.C., & Willcutt, E. 2007). Testing Computational Models of Dopamine and Noradrenaline Dysfunction in Attention Deficit/Hyperactivity Disorder. *Neuropsychopharmacology*, 32, 1583-99.
- Hazy, T.E., Frank, M.J., and O'Reilly, R.C. (2007). Toward an executive without a homunculus: Computational models of the prefrontal cortex/basal ganglia system. *Philosophical Transactions of the Royal Society, Series B*, 362, 1601-1613.
- O'Reilly, R.C., Frank, M.J., Hazy, T.E., and Watz, B. (2007). PVLV: The Primary Value and Learned Value Pavlovian Learning Algorithm, *Behavioral Neuroscience*, 121, 31-49.
- Atallah, H.E., Lopez-Paniagua, D., Rudy, J.W., & O'Reilly, R.C. 2007). Separate Neural Substrates for Skill Learning and Performance in the Ventral and Dorsal Striatum: Evidence for an Actor-Director System. *Nature Neuroscience*, 10, 126-131.

- O'Reilly, R.C. (2006). Biologically-Based Computational Models of High-Level Cognition. *Science*, 314, 91-94.
- Frank, M.J. & O'Reilly, R.C. (2006). A Mechanistic Account of Striatal Dopamine Function in Human Cognition: Psychopharmacological Studies with Cabergoline and Haloperidol. *Behavioral Neuroscience*, 120, 497-517.
- Frank, M.J., O'Reilly, R.C., & Curran, T. (2006). When memory fails, intuition reigns: Midazolam enhances implicit inference in humans. *Psychological Science*, 17, 700-707.
- Hazy, T.E., Frank, M.J. & O'Reilly, R.C. (2006). Banishing the homunculus: making working memory work. *Neuroscience*, 139, 105-118.
- Herd, S.A., Banich, M.T., & O'Reilly, R.C. (2006). Neural Mechanisms of Cognitive Control: An Integrative Model of Stroop Task Performance and fMRI data. *Journal of Cognitive Neuroscience*, 18, 22-32.
- O'Reilly, R.C. & Frank, M.J. (2006). Making Working Memory Work: A Computational Model of Learning in the Prefrontal Cortex and Basal Ganglia. *Neural Computation*, 18, 283-328.
- Frank, M.J., Rudy, J.W., Levy, W.B. & O'Reilly, R.C. (2005). When logic fails: Implicit transitive inference in humans. *Memory & Cognition*, 33, 742-750.
- Herd, S.A. & O'Reilly, R.C. (2005). Serial visual search from a parallel model. *Vision Research*, 45, 2987-2992.
- Rudy, J.W., Biedenkapp, J.C. & O'Reilly, R.C. (2005). Prefrontal Cortex and the Organization of Recent and Remote Memories: An Alternative View. *Learning and Memory*, 12, 445-446.
- Rougier, N.P., Noelle, D., Braver, T.S., Cohen, J.D., O'Reilly, R.C. (2005). Prefrontal Cortex and the Flexibility of Cognitive Control: Rules Without Symbols. *Proceedings of the National Academy of Sciences*, 102, 7338-7343.
- Frank, M.J., Seeberger, L.C., & O'Reilly, R.C. (2004). By carrot or by stick: Cognitive reinforcement learning in Parkinsonism. *Science*, 306, 1940-1943.
- Attalah, H., Frank, M.J. & O'Reilly, R.C. (2004). Hippocampus, cortex and basal ganglia: Insights from computational models of complementary learning systems. *Neurobiology of Learning and Memory*, 82, 253-267.
- Norman, K.A. & O'Reilly, R.C. (2003). Modeling Hippocampal and Neocortical Contributions to Recognition Memory: A Complementary Learning Systems Approach. *Psychological Review*, 110, 611-646.
- Huber, D.E. and O'Reilly, R.C. (2003). Persistence and accommodation in short-term priming and other perceptual paradigms: Temporal segregation through synaptic depression. *Cognitive Science*, 27, 403-430.
- Munakata, Y. & O'Reilly, R.C. (2003). Developmental and Computational Neuroscience Approaches to Cognition: The Case of Generalization. *Cognitive Studies*, 10, 76-92.
- Van Elzaker, M., O'Reilly, R.C., & Rudy, J.W. (2003). Transitivity, flexibility, conjunctive representations and the hippocampus: I: An empirical analysis. *Hippocampus*, 13, 292-298.
- Frank, M.J., Rudy, J.W., & O'Reilly, R.C. (2003). Transitivity, flexibility, conjunctive representations and the hippocampus: II: A computational analysis. *Hippocampus*, 13, 299-312.
- O'Reilly, R.C. & Norman, K.A. (2002). Hippocampal and Neocortical Contributions to Memory: Advances in the Complementary Learning Systems Framework. *Trends in Cognitive Sciences*, 6, 505-510.
- Barrientos, R. M., O'Reilly, R. C., & Rudy, J. W. (2002). Memory for context is impaired by injecting anisomycin into dorsal hippocampus following context exploration. *Behavioural Brain Research*, 134, 299-306.

- Rougier, N.P. & O'Reilly, R.C. (2002). Learning Representations in a Gated Prefrontal Cortex Model of Dynamic Task Switching. *Cognitive Science*, 26, 503-520.
- Rudy, J.W., Barrientos, R.M. and O'Reilly, R.C. (2002). The hippocampal formation supports conditioning to memory of a context. *Behavioral Neuroscience*, 116, 530-538.
- Holdstock, J. S., Mayes, A. R., Roberts, N., Cezayirli, E., Isaac, C. L., O'Reilly, R. C., Norman, K. A. (2002). Under What Conditions is Recognition Spared Relative to Recall After Selective Hippocampal Damage in Humans?, *Hippocampus*, 12, 341-351.
- O'Reilly, R.C., Noelle, D.C., Braver, T.S. and Cohen, J.D. 2002). Prefrontal cortex in dynamic categorization tasks: Representational organization and neuromodulatory control. *Cerebral Cortex*, 12, 246-257.
- Frank, M., Loughry, B. and O'Reilly, R.C. (2001). Interactions between the frontal cortex and basal ganglia in working memory: A computational model. *Cognitive, Affective, and Behavioral Neuroscience*, 1, 137-160.
- Rudy, J.W. and O'Reilly, R.C. (2001). Conjunctive Representations, the Hippocampus and Contextual Fear Conditioning. *Cognitive, Affective, and Behavioral Neuroscience*, 1, 66-82.
- O'Reilly, R.C. (2001). Generalization in interactive networks: The benefits of inhibitory competition and Hebbian learning. *Neural Computation*, 13, 1199-1242.
- O'Reilly, R.C. & Rudy, J.W. (2001). Conjunctive representations in learning and memory: Principles of hippocampal and cortical function. *Psychological Review*, 108, 311-345.
- Munakata, Y., Santos, L.R., Spelke, E.S., Hauser, M.D., and O'Reilly, R.C. (2001). Object representation in the wild: How rhesus monkeys parse objects based on featural information. *Journal of Cognitive Neuroscience*, 13, 44-58.
- O'Reilly, R.C. & Rudy, J.W. (2000). Computational principles of learning in the neocortex and hippocampus. *Hippocampus*, 10, 389-397.
- Vecera, S.V. & O'Reilly, R.C. (2000). Graded effects in hierarchical figure-ground organization: Reply to Peterson. *Journal of Experimental Psychology: Human Perception and Performance*, 26, 1221-1230.
- Rudy, J. W. & O'Reilly, R.C. (1999). Contextual fear conditioning, conjunctive representations, pattern completion, and the hippocampus. *Behavioral Neuroscience*, 113, 867-880.
- O'Reilly, R.C. & Farah, M.J. (1999). Simulation and explanation in neuropsychology and beyond. *Cognitive Neuropsychology*, 16, 49-72. O'Reilly, R.C. (1998). Six principles for biologically-based computational models of cortical cognition. *Trends in Cognitive Sciences*, 2, 455-462.
- Vecera, S.V. & O'Reilly, R.C. (1998). Figure-ground organization and object recognition processes: An interactive account. *Journal of Experimental Psychology: Human Perception and Performance*, 24, 441-462.
- Cohen, J. D., Braver, T. S., & O'Reilly, R. C. (1996). A computational approach to prefrontal cortex, cognitive control, and schizophrenia: Recent developments and current challenges. *Philosophical Transactions of the Royal Society, Series B*, 351, 1515-1527. Reprinted in: *The Prefrontal Cortex: Executive and Cognitive Functions*, A.C. Roberts, T.W. Robbins, and L. Weiskrantz, Eds. (1998), Oxford University Press, pp 195-220.
- O'Reilly, R.C. (1996). Biologically plausible error-driven learning using local activation differences: The generalized recirculation algorithm. *Neural Computation*, 8, 895-938.
- McClelland, J.L., McNaughton, B.L., & O'Reilly, R.C. 1995). Why there are complementary learning systems in the hippocampus and neocortex: Insights from the successes and failures of connectionist models of learning and memory. *Psychological Review*, 102, 419-457.

- O'Reilly, R.C. & McClelland, J.L. (1994). Hippocampal conjunctive encoding, storage, and recall: Avoiding a tradeoff. *Hippocampus*, 6, 661-682.
- O'Reilly, R.C. & Johnson, M.H. (1994). Object recognition and sensitive periods: A computational analysis of visual imprinting. *Neural Computation*, 6, 357-389.
- Farah, M.J., O'Reilly, R.C., & Vecera, S.J. (1993). Dissociated overt and covert recognition as an emergent property of a lesioned neural network. *Psychological Review*, 100, 571-588.
- O'Reilly, R.C., Kosslyn, S.M., Marsolek, C.J., & Chabris, C.F. (1990). Receptive field characteristics that allow parietal lobe neurons to encode spatial properties of visual input: a computational analysis. *Journal of Cognitive Neuroscience*, 2, 141-155.

### Peer Reviewed Conference Proceedings

- O'Reilly, R.C. & Busby, R.S. (2002). Generalizable Relational Binding from Coarse-coded Distributed Representations. *Advances in Neural Information processing Systems (NIPS) 14*, T. G. Dietterich, S. Becker, and Z. Ghahramani, Eds, Cambridge, MA: MIT Press.
- O'Reilly, R.C. & Soto, R. (2002). A Model of the Phonological Loop: Generalization and Binding. *Advances in Neural Information processing Systems (NIPS) 14*, T. G. Dietterich, S. Becker, and Z. Ghahramani, Eds, Cambridge, MA: MIT Press.
- O'Reilly, R.C., Mozer, M., Munakata, Y. & Miyake, A. (1999). Discrete Representations in Working Memory: A Hypothesis and Computational Investigations. *Proceedings of the Second International Conference on Cognitive Science Tokyo, Japan*, 183-188.
- O'Reilly, R.C., Norman, K., & McClelland, J.L. (1998). A hippocampal model of recognition memory. In M.I. Jordan, M.J. Kearns, and S.A. Solla (Eds) *Advances in Neural Information Processing Systems*, 10, 73-79. Cambridge, MA: MIT Press.

### Books

- O'Reilly, R.C. & Munakata, Y. (2000). *Computational Explorations in Cognitive Neuroscience: Understanding the Mind by Simulating the Brain*. Cambridge, MA: MIT Press.

### Book Chapters

- Pauli, W. M. and Atallah, H. E. and O'Reilly, R. C. (2010). Integrating what & how/where with instrumental and Pavlovian learning: A biologically based computational model, Frensch, P. A. and Schwarzer, R. (Eds) *Cognition and Neuropsychology - International Perspectives on Psychological Science*. East Sussex, UK: Psychology Press.
- Munakata, Y., O'Reilly, R. C., & Morton, J. B. (2007). Developmental and computational approaches to variation in working memory. In A. Conway, C. Jarrold, M. Kane, A. Miyake, & J. Towse (Eds.) *Variation in Working Memory*, Oxford University Press.
- O'Reilly, R.C. (2006). Modeling Integration and Dissociation in Brain and Cognitive Development. Y. Munakata & M.H. Johnson (Eds) *Processes of Change in Brain and Cognitive Development: Attention and Performance XXI*. Oxford University Press.
- Cer, D.M. & O'Reilly, R.C. (2006). Neural mechanisms of binding in the hippocampus and neocortex: Insights from computational models. In H.D. Zimmer & A. Mecklinger & U. Lindenberger (Eds) *Binding in Memory*, Oxford: Oxford University Press.

- O'Reilly, R.C. (2005). The Division of Labor Between the Neocortex and Hippocampus. In G. Houghton, (Ed) *Connectionist Models in Cognitive Science*, New York: Psychology Press.
- O'Reilly, R.C. & Munakata, Y. (2003). Computational Neuroscience and Cognitive Modeling. In L. Nadel (Ed) *Encyclopedia of Cognitive Sciences*, London: Macmillan.
- O'Reilly, R.C., Busby, R. S. and Soto, R. (2003). Three Forms of Binding and their Neural Substrates: Alternatives to Temporal Synchrony. In A. Cleeremans (Ed) *The Unity of Consciousness: Binding, Integration, and Dissociation*, 168-192, Oxford: Oxford University Press.
- O'Reilly, R.C. & Munakata, Y. (2002). Psychological Function in Computational Models of Neural Networks. In M. Gallagher & R. Nelson (Eds) *Handbook of Psychology, Vol. 3, Biological Psychology*. New York: Wiley.
- O'Reilly, R.C. (2001). Cognitive Neuroscience of Learning and Memory. In W.E. Craighead & C.B. Nemeroff (Eds) *The Corsini Encyclopedia of Psychology and Behavioral Science, Third Edition*, New York: John Wiley & Sons.
- O'Reilly, R.C., Braver, T.S., & Cohen, J.D. (1999). A biologically-based computational model of working memory. In A. Miyake & P. Shah (Eds) *Models of Working Memory: Mechanisms of Active Maintenance and Executive Control*, 375-411. New York: Cambridge University Press.
- Farah, M.J., O'Reilly, R.C., & Vecera, S.J. (1997). The neural correlates of perceptual awareness: Evidence from covert recognition in prosopagnosia. In J.D. Cohen & J.W. Schooler (Eds) *Scientific Approaches to the Question of Consciousness*. Mahwah, New Jersey: Lawrence Erlbaum Associates.
- Cohen, J.D. & O'Reilly, R.C. (1996). A preliminary theory of the interactions between prefrontal cortex and hippocampus that contribute to planning and prospective memory. in M. Brandimonte, G. Epstein & M. McDaniel (Eds) *Prospective Memory: Theory and Applications*. Mahwah, New Jersey: Lawrence Erlbaum Associates.
- O'Reilly, R.C. (1994). Temporally local unsupervised learning: The MaxIn algorithm for maximizing input information. In M.C. Mozer, P. Smolensky, & A.S. Weigend (Eds) *Proceedings of the 1993 Connectionist Summer School*, Hove, England: Lawrence Erlbaum Associates.

## Technical Reports

- O'Reilly, R.C. & McClelland, J.L. (1992). The self-organization of spatially invariant representations. Technical Report PDP.CNS.92.5, Carnegie Mellon University, Department of Psychology.

## Software

- The emergent neural modeling system. <http://grey.colorado.edu/emergent>
- O'Reilly, R.C., Dawson, C.K., & McClelland, J.L. (1995--2007). The PDP++ Neural Network Simulation System. Carnegie Mellon University and the Center for the Neural Basis of Cognition.

## Presentations

### Conference Presentations: Invited

- O'Reilly, R.C. (2011): Biologically Based Models of Executive Function. Invited Tutorial, Summer Institute of Cognitive Neuroscience, Santa Barbara, CA.
- O'Reilly, R.C. (2011): Embodied Object Recognition and Metacognition. Keynote Talk, Human Robot Interaction Conference, Lausanne, Switzerland.

- O'Reilly, R.C. (2009): From Spikes to Object Recognition and Beyond: Building an Embodied Brain. Plenary Talk, Cognitive Science Conference, Amsterdam.
- O'Reilly, R.C. (2007): Abstract Representations and Embodied Agents: Prefrontal Cortex and Basal Ganglia Contributions. Invited talk at CoSy Meeting of the Minds Workshop, Paris, France.
- O'Reilly, R.C. (2005): Interactions between the prefrontal cortex and basal ganglia in the dopamine-based learning of cognitive control. Invited talk at Betty Behrens Symposium, Cambridge, UK.
- O'Reilly, R.C. (2005): Toward an Executive without a Homunculus: Computational Models of the Prefrontal Cortex/Basal Ganglia System. Invited talk at Modelling Natural Action Selection Workshop, Edinburgh, Scotland.
- O'Reilly, R.C. (2005): Primary Value and Learned Value: A computational model of dopamine-based learning in the amygdala and basal ganglia. Invited talk at Motivational Neuroscience Conference, New York, NY.
- O'Reilly, R.C. (2005): Biologically-Based Cognitive Architecture: Posterior Cortex, Hippocampus, and Prefrontal Cortex/Basal Ganglia. Invited talk at Cortical Memory Storage Symposium, UCLA, Los Angeles, CA.
- O'Reilly, R.C. (2004). Modeling Integration and Dissociation in Brain and Cognitive Development. Invited talk for Processes of Change in Brain and Cognitive Development: Attention and Performance XXI, Winter Park, CO.
- O'Reilly, R.C. (2003): Reinforcement Learning of Dynamic Gating Signals in the Prefrontal Cortex/Basal Ganglia Working Memory System. Invited talk at A Multidisciplinary Approach to the Study of the Frontal Cortex, Nancy, France.
- O'Reilly, R.C. (2003): Prefrontal-Hippocampal Interactions: A Computational Perspective. Invited talk at Memory Disorders Research Society Conference, Chicago, IL.
- O'Reilly, R.C. (2002): Learning and Memory in the Hippocampus and Neocortex: Principles and Models. Invited talk at Sixth International Conference on Cognitive and Neural Systems, Boston University, Boston, MA.
- O'Reilly, R.C. (2001): Models of Hippocampal and Neocortical Contributions to Memory, and Neural Network Modeling Tutorial. Invited talks at EPOS Workshop: Computational Models of Memory, Amsterdam, Netherlands.
- O'Reilly, R.C. (2001): Interactions Between Frontal Cortex and Basal Ganglia in Working Memory: A Computational Model. Invited talk at International Society for Behavioural Neuroscience Conference, Marrakech, Morocco.
- O'Reilly, R.C. (2001): Recent developments of the rapid-incident-conjunctive model of hippocampal function. Invited talk at 25th Annual Neurobiology of Learning and Memory Conference, Park City, Utah.
- O'Reilly, R.C. (2000): How the Hippocampus and Prefrontal Cortex can Contribute to the Unity of Consciousness: A Computational Perspective. Plenary talk presented at the Association for the Scientific Study of Consciousness Conference: The Unity of Consciousness: Binding, Integration, and Dissociation, Brussels, Belgium.
- O'Reilly, R.C. (2000). Computational Principles of Learning in the Neocortex and Hippocampus. Invited talk presented at: The Nature of Hippocampal-Cortical Interaction: Theoretical and Experimental Perspectives, *Dublin, Ireland*.
- O'Reilly, R.C. (1999). Conjunctive Representations in Learning and Memory: Principles of Cortical and Hippocampal Function. Invited talk at the American Psychological Society Annual Meeting, Denver, CO.

## Conference Presentations: Contributed

- Wyatte, D.R. & O'Reilly, R.C. (2010). The role of feedback projections in a biologically realistic, high performance model of object recognition. Poster presented at the 2010 annual meeting of the Vision Sciences Society.
- Wyatte, D.R. & O'Reilly, R.C. (2010). Activation dynamics in the visual hierarchy during object learning and recognition. Poster presented at the 2010 Temporal Dynamics of Learning Center NSF Site Visit.
- Pauli, W.M., Hazy, T.E. & O'Reilly, R.C. (2010). Division of labor among multiple parallel cortico - basal ganglia - thalamic loops in Pavlovian and instrumental tasks: A biologically-based computational model. Poster at Determinants of Executive Function and Dysfunction Conference, Boulder, CO.
- Pauli, W.M., Clark, A.D., O'Reilly, R.C., & Rudy, J.W. (2010). Distinct striatal areas support goal-directed and stimulus-driven behavior. 7th Forum of European Neuroscience, Amsterdam.
- Herd, S.A., Mingus, B. & O'Reilly, R.C. (2010). Dopamine and self-directed learning. Talk at Biologically Inspired Cognitive Architectures conference, Washington, DC.
- Herd, S.A., Mingus, B. & O'Reilly, R.C. (2010). Artificial Boredom: toward human-like self-directed learning. Poster at Biologically Inspired Cognitive Architectures conference, Washington, DC.
- Pauli, W.M., Hazy, T.E., & O'Reilly, R.C. (2009). Division of labor among multiple parallel cortico -- basal ganglia -- thalamic loops in Pavlovian and instrumental tasks: A biologically-based computational model. Poster at the Computational Cognitive Neuroscience Conference, Boston, MA.
- Reynolds, J. R., O'Reilly, R. C., & Braver, T. S. (2008). Computational, behavioral, and neuroimaging approaches to understanding the hierarchical organization of prefrontal cortex and goal-oriented behavior. Talk given at the annual meeting of the Memory Disorders Research Society, St. Louis, MO.
- O'Reilly, R.C., Atallah, H.E., Pauli, W.M., Hazy, T.E. & O'Reilly, R.C. (2007). An integrated model of instrumental conditioning. Poster at the Annual Neuroscience Society Meeting, San Diego, CA.
- Aisa, B., and Mingus, B., and O'Reilly, R. C. (2007). The Emergent Neural Network Modeling System. Poster presented at the Annual Society for Neuroscience meeting, San Diego, CA
- Reynolds, J. R., O'Reilly, R. C., & Braver, T. S. (2007). Computational, behavioral and neuro-imaging methods investigating the hierarchical organization of prefrontal cortex and goal-oriented behavior. Talk given at the Neural Information Processing Systems Workshop on the Hierarchical Organization of Behavior.
- Pauli, W.M. & O'Reilly, R.C. (2006). Attentional Control of Associative Learning. Poster at the Computational Cognitive Neuroscience Conference 2006, Houston, TX.
- Reynolds, J. R., & O'Reilly (2006). Computational constraints in the development of hierarchical goal representations. Paper presented at the annual meeting of the Society for Neuroscience, Atlanta, GA.
- Hazy, T.H., Frank, M.J., Watz, B. & O'Reilly, R.C. (2005). The PVLV model: A new biological theory of Pavlovian conditioning. Poster presented at the Annual Neuroscience Society Meeting, Washington, DC.
- Atallah, H.E. & O'Reilly, R.C. (2005). Effects of basal ganglia lesions on instrumental and Pavlovian learning in rats. Poster presented at the Annual Neuroscience Society Meeting, Washington, DC.
- Branning, P., Watz, B., Aisa, B. & O'Reilly, R. C. (2005). Simulated arm coupled with posterior parietal cortex model performs visually guided reach. Poster presented at Computational Cognitive Neuroscience I.
- Santamaria, A. & O'Reilly, R.C. (2005). A Computational Model of Interval Timing in the Cerebellum and

Prefrontal Cortex. Poster presented at the Annual Cognitive Neuroscience Society Meeting, New York, NY.

- Herd, S.A. & O'Reilly, R.C. (2004). A Neural Feature Integration Theory of Visual Search. Poster presented at the Annual Neuroscience Society Meeting, San Diego, CA.
- Atallah, H.A., Rudy, J.W. & O'Reilly, R.C. (2004). Rats with a hippocampal lesion are not impaired on the transitive inference task, but are they using logic? Poster presented at the Annual Neuroscience Society Meeting, San Diego, CA.
- Frank, M.J. & O'Reilly, R.C. (2004). Dynamic dopamine modulation in the basal ganglia: A neurocomputational account of cognitive deficits in medicated and non-medicated Parkinsonism. Poster presented at the Annual Cognitive Neuroscience Society Meeting, San Francisco, CA.
- Santamaria, A. & O'Reilly, R.C. (2004). Conditioned Interval Timing: A Computational Model and Experimental Tests. Poster presented at the Annual Cognitive Neuroscience Society Meeting, San Francisco, CA.
- O'Reilly, R.C. (2004). Prefrontal-Hippocampal Interactions: A Computational Perspective. Talk presented at the Winter Conference on Brain Research, Copper, CO.
- Jilk, D.J., Cer, D. & O'Reilly, R.C. (2003). Effectiveness of Neural Network Learning Rules Generated by a Biophysical Model of Synaptic Plasticity. Poster presented at the Computational Neuroscience Conference, Alicante, Spain.
- Herd, S.A. & O'Reilly, R.C. (2003). Parallel Neural Network Models of Visual Search. Poster presented at the Computational Neuroscience Conference, Alicante, Spain.
- Huber, D.E., Curran, T., O'Reilly, R.C., & Woroch, B. 2003). Immediate Repetition Priming: Measuring Synaptic Depression with ERPs. Poster presented at the Computational Neuroscience Conference, Alicante, Spain.
- Santamaria, A. & O'Reilly, R.C. (2002). Interval Timing: A Cerebellar Model and Investigation of Temporal Production. Poster presented at the Annual meeting of the Psychonomic Society, Kansas City, MO.
- Huber, D.E., Curran, T. & O'Reilly, R.C. (2002). Temporally segregating written words through synaptic depression: The electrophysiological correlates of neural persistence and neural accommodation. Poster presented at the Summer Annual Interdisciplinary Conference, Squamish, BC, Canada.
- Huber, D.E., Curran, T. & O'Reilly, R.C. (2002). Discounting repeated words through synaptic depression: Using ERPs to measure the correlates of lingering and depressing neural activation. Poster presented at the Annual Cognitive Neuroscience Society Meeting, San Francisco, CA.
- Herd, S.A., & O'Reilly, R.C. (2002). Attentional Control as Excitatory Bias -- Accounting for fMRI Data. Poster presented at the Annual Cognitive Neuroscience Society Meeting, San Francisco, CA.
- Huber, D.E., & O'Reilly, R.C. (2002). How is the brain able to identify items with minimal interference from prior presentations? Talk presented at the Annual Interdisciplinary Conference, Jackson Hole, WY.
- O'Reilly, R.C. (2002). Computational Principles of Learning in the Neocortex and Hippocampus. Talk at the Winter Conference on Neural Plasticity, Moorea, French Polynesia.
- O'Reilly, R.C. (2002). Neural Mechanisms of Learning in Frontal Cortex and Basal Ganglia. Talk at the Winter Conference on Brain Research, Snowmass, Colorado.
- Rudy, J.W. & O'Reilly, R.C. (2001). Conditioning to A Memory: Episodic Recall Depends on the Hippocampus. Poster presented at the Annual Society for Neuroscience Meeting, San Diego, CA.

- Huber, D.E., & O'Reilly, R. C. (2001). Unbiased benefits and deficits in short-term repetition priming. Poster presented at the 42nd Annual meeting of the Psychonomic Society, Orlando, Florida.
- O'Reilly, R.C. (2001). Toward a biological basis of systematic controlled processing: Activation- and weight-based approaches. Talk presented at the ONR Cortex Workshop, Raleigh-Durham, NC.
- O'Reilly, R.C. (2001): Interactions Between Prefrontal Cortex and Basal Ganglia in Working Memory. Talk at 34th Annual Winter Conference on Brain Research, Steamboat Springs, CO.
- Stedron, J.M., Munakata, Y., & O'Reilly, R.C. (2000). Spatial reorientation in young children: A case of modularity? Poster presented at the 2000 meeting of the International Conference on Infant Studies, Brighton, England.
- Norman, K. A., O'Reilly, R.C., & Huber, D. E. (2000). Modeling Neocortical Contributions to Recognition Memory. Poster presented at the Seventh Annual Cognitive Neuroscience Society, San Francisco, CA.
- O'Reilly, R.C. (2000). Towards a biological basis of systematic controlled processing: Activation- and weight-based approaches. Talk presented at the ONR Cortex Workshop, Elkridge, MD.
- O'Reilly, R.C. (1999). Interactions between working memory and long-term memory: Computational insights. Talk presented at the Memory Disorders Meeting, Tucson, AZ.
- O'Reilly, R.C. & Munakata, Y. (1999). Cognitive modeling using the PDP++ neural network simulation system. Tutorial presented at the Twenty First Annual Conference of the Cognitive Science Society.
- O'Reilly, R.C. & Farah, M. J. (1999). Covert Face Recognition: Further Tests of a Computational Model. Poster presented at the Sixth Annual Cognitive Neuroscience Society, Washington, DC.
- Wager, T.D. & O'Reilly, R.C. (1999). Reconciling Biology and Function in the Thalamus: A Computational Simulation of the Role of the Thalamic Reticular Nucleus in Attention. Poster presented at the Sixth Annual Cognitive Neuroscience Society, Washington, DC.
- O'Reilly, R.C. (1998). The combination of supervised and unsupervised learning facilitates rerepresentation in deep networks. Talk presented at the Neural Information Processing Systems workshops, Breckenridge, CO.
- O'Reilly, R.C. (1998). Principles for learning and processing in the cortex: Reconciling interactivity and generalization using competition and Hebbian learning. Talk presented at the Fifth Annual Cognitive Neuroscience Society, San Francisco, CA.
- O'Reilly, R.C. & Norman, (1997). A hippocampal model of recognition memory. Talk presented at the Neural Information Processing Systems workshops, Breckenridge, CO.
- O'Reilly, R.C. (1995). Combined error-driven and associative learning as a model of neocortical learning. Poster presented at the Second Annual Cognitive Neuroscience Society Meeting, San Francisco, CA.
- Goddard, N.H., McClelland, J.L., & O'Reilly, R.C. (1995). Correlation-based invertible encoding in a model of hippocampal memory. Society for Neuroscience Abstracts. & Poster presented at the 1995 Society for Neuroscience Conference, San Diego, CA.
- McClelland, J.L, McNaughton, B.L, & O'Reilly, R.C. (1993). Why there are complementary learning systems in the hippocampus and neocortex: Insights from the successes and failures of connectionist models of learning and memory. Talk presented at the Annual Meeting of the Psychonomics Society, Washington, D.C.
- O'Reilly, R.C. (1992). Object recognition and sensitive periods: A computational analysis of visual imprinting. Paper presented at the Third Annual Midwest Connectfest, Pittsburgh, PA.

- McClelland, J.L., McNaughton, B.L., O'Reilly, R.C., & Nadel, L. (1992). Complementary roles of hippocampus and neocortex in learning and memory. Society for Neuroscience Abstracts. & Poster Presented at 1992 Society for Neuroscience Conference, Anaheim, CA.
- Farah, M.J., O'Reilly, R.C., & Vecera, S.J. (1991). Dissociated overt and covert recognition as an emergent property of lesioned attractor networks. Poster presented at the Annual Meeting of the Psychonomics Society, San Francisco, CA.
- O'Reilly, R.C. (1991). The self-organization of spatially invariant representations. Paper presented at the 9th Annual Pitt-CMU Conference on Cognition, Pittsburgh, PA.

## Colloquia and Other Invited Talks

- Neuroscience Research Group, University of Denver, November, 2011
- Department of Psychology, Carnegie Mellon University, February, 2011
- CogFest 2010, The Ohio State University, May, 2010.
- ICSI, UC Berkeley, December, 2009.
- ICBS, UC Berkeley, November, 2009.
- Cognitive Science Department, UCSD, November, 2009.
- CPD Group, UC Berkeley, October, 2009.
- Department of Psychology, Stanford University, October, 2009.
- Neuroscience Research Group, University of Denver, May 2007.
- Cognitive Neuroscience Section, NINDS, NIH, November 2005.
- Department of Psychology, University of Iowa, April 2005.
- Picower Center for Learning and Memory, MIT, March 2005.
- Center for Memory and Brain, Boston University, March 2005.
- Neuroscience Center, University of Colorado Boulder, February, 2004.
- Neuroscience Research Group, University of Denver, February, 2004.
- Cognitive Science Center, University of Arizona, Tuscon, AZ, January 2004.
- Developmental Brain Research Center Inaugural Symposium, Hokkaido University, December, 2003.
- Department of Psychology, Rutgers University Newark, November 2003.
- Brain Institute Student Invited Speaker, Vanderbilt University, May 2003.
- Center for the Neural Basis of Cognition Distinguished Alumni lecture, CMU, November 2002.
- RIKEN Brain Science Institute, Saitama, Japan, August 2002.
- Department of Systems Science, Tokyo University, Tokyo, Japan, August 2002.
- Department of Psychology, Otago University, Dunedin, New Zealand, July 2002.
- Department of Brain and Cognitive Sciences, MIT, May 2002.
- Department of Psychology, University of Colorado, Denver, March 2002.
- Computation and Neural Systems Seminar, California Institute of Technology, February 2002.
- Cognitive Science Program, Georgia Institute of Technology, October 2001.
- Centre for Brain and Cognitive Development, Birkbeck College, London, May 2001.
- Department of Psychology, University of Wisconsin Madison, April 2001.
- Department of Psychology, UCLA, March, 2001.
- Cognitive Science, Indiana University, March 2001.
- Gatsby Computational Neuroscience Unit at the University College, London, July 2000.
- Institute for Neuroscience at the University of Pennsylvania, April, 2000.
- University of Arizona, Tuscon, AZ, April, 1999.
- Departments of Computer Science, Psychology, and Center for the Neural Basis of Cognition Science of Learning Research Seminar, Carnegie Mellon University, Pittsburgh, PA, November, 1998.
- Colorado School of Mines, Department of Mathematics and Computer Science, Golden, Colorado, April, 1998.
- University of Denver, Department of Psychology Neuroscience Research Group, Denver, CO, October 1997.
- Umea University, Psychology Department, Umea, Sweden, January 1997.
- Harvard University Cognition, Brain, and Behavior, Cambridge, MA, November 1996.
- University of the Sorbonne, Paris, France, July 1995.

# Teaching and Supervision

## Awards

- Excellence in Teaching award, CU Neuroscience Club, 1999.

## Courses Taught

- Computational Cognitive Neuroscience (graduate and undergraduate).
- Cognitive Neuroscience Proseminar (graduate).
- Introduction to Cognition and Perception (undergraduate).
- Introduction to Statistics and Research Methods (undergraduate).
- Behavioral, Biological, and Computational Principles of Learning and Memory in the Hippocampus and Neocortex (graduate).
- Analytical Methods in Psychological Modeling (graduate and undergraduate).

## Supervision: Current

### Postdocs

- Thomas Hazy, MD (10/2001 -- present)
- Seth Herd, PhD (2005 -- present)
- Tren Huang, PhD (6/2011 -- present)
- Trent Kriete, PhD (9/2010 -- present)
- Kai Krueger, PhD (3/2011 -- present)
- Wolfgang M. Pauli, PhD (9/2011 -- present)
- Sergio Verduzco-Flores, PhD (2/2011 -- present)

### Graduate students

- Dean Wyatte (9/2008 -- present)
- Brian Mingus (9/2010 -- present)
- Nick Ketz (9/2010 -- present)
- Jessica Mollick (9/2011 -- present)

## Supervision: Completed

### Grads, Primary Advisor

- Dr. Seth A. Herd, PhD 1999 - 2005 (now Postdoc in Lab)
- Dr. Hisham Atallah, PhD 2000 - 2006 (now Postdoc with Ann Graybiel at MIT)
- Dr. Amy Santamaria, PhD 2000 - 2006 (now Staff Research Scientist, Micro Analysis and Design)
- Dr. Michael Frank, PhD 2001 - 2006 (now Associate Professor at Brown University <http://ski.cog.brown.edu/>)
- Philip Branning, 2005 - 2006 (now Software Developer at ?)
- Brad Aisa, 2007 - 2009 (Software Developer in Lab 2004 - 2009; now Software Developer at ?)

### Grads, Secondary Advisor

- Richard Busby, Applied Math Masters Student
- Daniel Cer, CS PhD Student
- Brian Loughry, CS Masters Student
- Rodolfo Soto, Psych PhD Student

## Postdocs

- Dr. David Huber, 1999 - 2003 (now Associate Professor at UC San Diego <http://psy2.ucsd.edu/~dhuber/>)
- Dr. Kenneth Norman, 1999 - 2002 (now Associate Professor at Princeton University <http://compmem.princeton.edu/>)
- Dr. Nicolas Rougier, 2000 - 2003 (now Research Scientist at LORIA, Nancy, France <http://www.loria.fr/~rougier/>)
- Dr. Jeremy Reynolds, 2005 - 2008 (now Assistant Professor at University of Denver <http://www.du.edu/psychology/people/reynolds.htm>)
- Dr. Alex Petrov, 2005 - 2006 (now Assistant Professor at Ohio State University <http://alexpetrov.com/>)

## Professional Activities

### Editorial boards

- Associate Editor, *Psychological Review*, 2003-2006
- Reviewing Editor, *Hippocampus*, 2003-2006.
- Associate Editor, *Cognitive Science*, 2001-2004.
- Faculty of 1000 Contributor, ([www.facultyof1000.com](http://www.facultyof1000.com)), Theoretical Neuroscience, 2001-2005

### Professional memberships

- American Psychological Association
- American Psychological Society
- Society for Neuroscience
- Cognitive Neuroscience Society
- Cognitive Science Society
- International Society for Behavioral Neuroscience
- Memory Disorders Research Society

### Program Committees

- Computational Cognitive Neuroscience Conference, 2005-
- Cognitive Science Society Conference, 2002.

### Reviewing

- NSF grant proposal reviewing (CRCN panel, May 2002; ad hoc).
- National Institutes of Health grant peer review panels, ad hoc member several times.
- Journals, Conferences, Books: *Biological Cybernetics*, *Cognitive Science*, *Cognitive Science Society*, *Experimental Brain Research*, *Hippocampus*, *IEEE Transactions on Neural Networks*, *Journal of Experimental Psychology: General*, *Journal of Neuroscience*, *Memory*, *Memory and Cognition*, *MIT Press*, *Network: Computation in Neural Systems*, *Neural Computation*, *Neural Information Processing Systems (NIPS)*, *Neural Networks*, *Neuron*, *Oxford University Press*, *PLOS Computational Biology*, *Psychological Bulletin*, *Psychological Review*, *Science*, *Trends in Cognitive Sciences*.

### Professional Service

- Chair of inaugural organizing committee for Computational Cognitive Neuroscience Conference, Washington, DC, 2005.
- Cognitive Program Chair, Department of Psychology, University of Colorado Boulder, 2002-3.
- Member of organizing committee for fourth International Conference on Cognitive Modeling, George Mason University, 2001.

- Co-organized workshop on ``The hippocampus and episodic memory *at the Neural Information Processing Systems conference in Breckenridge, CO, 1997.*
- Maintain email list for Emergent software, and provide assistance to researchers using this software (1995-present).

## **Personal information**

- Born: March 1, 1967 in Denver, CO
- Citizenship: USA