

Curriculum Vitae

Earl K. Miller

Picower Professor of Neuroscience
The Picower Institute for Learning and Memory and
Department of Brain and Cognitive Sciences at the
Massachusetts Institute of Technology

Contact information

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Date of Birth

30 November 1962, Columbus, OH USA

Education

1990 Ph.D. in Psychology and Neuroscience, Princeton University
1987 M.A. in Psychology and Neuroscience, Princeton University
1985 B.A. with honors in Psychology, Kent State University

Current Positions

2003 Picower Professor of Neuroscience, The Picower Institute for Learning and Memory and
Department of Brain and Cognitive Sciences, Massachusetts Institute of Technology
2008 Director of Graduate Studies in Brain and Cognitive Sciences, Massachusetts Institute of
Technology
2010 Adjunct Professor, Department of Cognitive and Neural Systems, Boston University
2010 Visiting Scholar, Department of Molecular and Cell Biology, Harvard University
2011 Adjunct Professor, Center for Computational Neuroscience and Neural Technology,
Boston University
2014 Chief Scientist, SplitSage

Past Positions

2009-2011 Co-Director, Center of Excellence for Learning in Education, Science, and Technology,
National Science Foundation Science of Learning Center
2001-2009 Associate Director, The Picower Institute for Learning and Memory, Massachusetts
Institute of Technology
2002-2009 Director (Thrust 5), Center of Excellence for Learning in Education, Science, and
Technology, National Science Foundation Science of Learning Center
1999-2008 Investigator, RIKEN-MIT Neuroscience Research Center
2002-2003 Professor of Neuroscience, The Picower Center for Learning and Memory and
Department of Brain and Cognitive Sciences, Massachusetts Institute of Technology
1999-2002 Associate Professor of Neuroscience, Department of Brain and Cognitive Sciences,
Massachusetts Institute of Technology
2000-2006 Director of Graduate Studies in Brain and Cognitive Sciences, Massachusetts Institute of
Technology
1996-1999 Associate Member, Center for Learning and Memory, Massachusetts Institute of
Technology
1995-1999 Assistant Professor of Neuroscience, Department of Brain and Cognitive Sciences,
Massachusetts Institute of Technology

1990-1995 Intramural Research Fellow, Laboratory of Neuropsychology, National Institute of Mental Health
 1989-1990 Lecturer, Princeton University
 1985-1990 Research Assistant, Princeton University
 1985-1989 Assistant in Instruction, Princeton University
 1983-1985 Research Assistant, Kent State University

Awards and Honors

2018 Excellence in Graduate Teaching, Department of Brain and Cognitive Sciences, MIT
 2017 Elected to the American Academy of Arts and Sciences
 2017 Miller and Cohen (2001) identified as the 5th most-cited paper in Neuroscience (Yeung et al., 2017 *Front. Hum. Neurosci.*, 21 July 2017)
 2017 Paul and Lilah Newton Brain Science Award
 2016 Goldman-Rakic Prize for Outstanding Achievement in Cognitive Neuroscience
 2016 Commencement Address, Kent State University
 2016 Elected to the Memory Disorders Research Society
 2015 Professional Achievement Award, Kent State University Alumni Association
 2014 Amar G. Bose Research Fellow
 2014 Antzoulatos and Miller (2014) selected as one of Neuron's best papers of 2014-2015
 2013 Distinguished Member, National Society of Collegiate Scholars
 2011 Biomed Distinguished Lecturer, University of Leuven
 2010 MERIT Award, National Institute of Mental Health
 2009 A.J. Carlson Memorial Lecture, University of Chicago
 2008 "An Integrative Theory of Prefrontal Cortex Function" (Miller and Cohen, 2001) designated a *Current Classic* by Thomson Scientific as among the most cited papers in the field of Neuroscience and Behavior
 2007 Mathilde Solowey Award in the Neurosciences
 2007 Jeffrey Lecture in Cognitive Neuroscience, UCLA
 2006 Elected to the International Neuropsychological Symposium
 2006 Grass Lecture, University of Illinois
 2005 Fellow, American Association for the Advancement of Science
 2004 Fred Attneave Memorial Lecture, University of Oregon
 2003 Picower Professorship (endowed chair)
 2002 Elected to the International Society for Behavioral Neuroscience
 2000 Society for Neuroscience Young Investigator Award
 2000 National Academy of Sciences Troland Research Award
 1999 Tenured at MIT two years ahead of schedule
 1999 Class of 1956 Career Development Professorship (endowed chair)
 1998 John Merck Scholar Award
 1996 Pew Scholar Award
 1996 McKnight Scholar Award
 1996 Whitehall Foundation Fellowship
 1996 Alfred P. Sloan Research Fellow
 1987 National Research Service Award Predoctoral Fellowship
 1986 National Institutes of Health Predoctoral Training Fellowship
 1985 Graduate *summa cum laude* with honors, Kent State University
 1985 Phi Beta Kappa

Editorships and Editorial Boards

2017 Editorial Board, *Current Opinion in Behavioral Sciences*
 2016 Senior Editor, *Oxford Research Encyclopedia of Neuroscience*
 2016 Editorial Board, *Annual Review of Psychology*
 2011 Advisory Editorial Board, *Trends in Cognitive Science*
 2010 Co-Editor, *Cognitive Neuroscience 2010*, *Current Opinion in Neurobiology*
 2010 Editorial Board, *Neural Systems & Circuits*

2010 Editorial Board, *Neuroscience Research*
 2009 Co-Editor, *Experimental Brain Research*
 2008 Reviewing Editor, *Frontiers in Systems Neuroscience*
 2006 Senior Editor, *Journal of Neuroscience*
 2005 Reviewing Editor, *Journal of Neuroscience*
 2004 Associate Editor, *New Encyclopedia of Neuroscience*
 2003 Action Editor, *Journal of Cognitive Neuroscience*
 2002 Editorial Board, Cognitive Sciences, MIT Press
 2002 Editorial Board, *Journal of Neurophysiology*
 2001 Consulting Editor, *Behavioral Neuroscience*
 2000 Editorial Board, *Neuron*
 2000 Editorial Board, *Cognitive, Affective, and Behavioral Neuroscience*

Committees, Advisory Boards, Consultant Work, Etc.

2015 Scientific Advisory Board, Motimatic
 2012 Scientific Advisory Board, Thync
 2011 Society for Neuroscience Committee on Animals in Research
 2011 Advisory Council, International Association for the Study of Attention and Performance
 2010 Consultant, BBN Technologies
 2010 Advisory Panel, Research Domain Criteria Project, National Institute of Mental Health
 2010 College of CSR Reviewers, National Institutes of Health
 2010 Consultant, Shire Pharmaceuticals
 2010 Selection Committee, Eppendorf and Science Prize for Neurobiology
 2009 Advisory Board, National Institutes of Health Program Project, Yale University
 2008 National Institute of Neurological Disorders and Stroke Advisory Panel for Basic Research
 2006 Scientific Advisory Board, Nielsen Neuroscience.
 2006 Scientific Advisory Board, Polimetrix, Inc
 2005 National Institutes of Health Cognitive Neuroscience study section
 2005 National Institute of Mental Health Workshop on Social Neuroscience
 2004 College of Reviewers for Canada Research Chairs
 2003 Working Group on Interspecific Chimeric Brains, Phoebe R. Berman Bioethics Institute, Johns Hopkins University
 2003 Advisory Council, Department of Psychology, Princeton University
 2002 Advisory Board, International Centre for Research on the Biology of Memory, Norwegian Research Council
 1999 Advisory Council of the International Association for the Study of Attention and Performance
 1997 Steering Committee, Boston Area Neuroscience Group

Patents

Method and Apparatus Accounting for Independent Cognitive Capacities in the Right vs Left Half of Vision (pending) United States Patent Application 61/492,877 (June 3, 2011)
 Inventors: Earl K. Miller and Timothy J. Buschman

Systems and Methods for Selective Memory Enhancement and/or Disruption (pending)
 United States Patent Application 62/118,190 (February 19, 2015)
 Inventors: Earl K. Miller and Scott L. Brincat

Dynamic Display System and Method for Customizing a Controller in a Display System (pending)
 United States Patent Application 15/679,126 (August 16, 2017)
 Inventors: Earl K. Miller, Timothy Joseph Buschman, Simon John Kornblith

Techniques for Closed-Loop Neurostimulation and Related Systems and Methods (pending)
 United States Patent Application 62/582,466 (November 7, 2017)

Inventors: Alik Widge, Earl K. Miller, Andrew Mullen and Daniel Freedman

Publications

1. Pinotsis, D.A., Buschman, T.J. and Miller, E.K. "Working Memory Load Modulates Neuronal Coupling" *Cerebral Cortex*, in press.
2. Tiganj, Z., Cromer, J.A., Roy, J.E., Miller, E.K., and Howard, M.W. "Compressed timeline of recent experience in monkey IPFC". *Journal of Cognitive Neuroscience*, in press.
3. Lundqvist, M., Herman, P. Warden, M.R., Brincat, S.L., and Miller, E.K. "Gamma and beta bursts during working memory read-out suggest roles in its volitional control" *Nature Communications* 9: 394, 2018
4. Wutz, A., Loonis, R., Roy, J.E., Donoghue, J.A., and Miller, E.K. "Different levels of category abstraction by different dynamics in different prefrontal areas" *Neuron*, 97:,1-11, 2018.
5. Bastos, A.M., Loonis, R., Kornblith, S., Lundqvist, M., and Miller, E.K. "Laminar recordings in frontal cortex suggest distinct layers for maintenance and control of working memory" *Proceedings of the National Academy of Sciences*, 2018.
6. Loonis, R.F, Brincat, S.L., Antzoulatos, E.G., and Miller, E.K. "A meta-analysis suggests different neural correlates for implicit and explicit learning.", *Neuron*, 96:521-534, 2017.
7. Lindsay, G.W., Rigotti, M., Warden, M.R., Miller, E.K., and Fusi, S. "Hebbian Learning in a Random Network Captures Selectivity Properties of Prefrontal Cortex." *Journal of Neuroscience*, in press.
8. Pinotsis, D. Brincat, S.L., and Miller, E.K. "On memories, neural ensembles and mental flexibility" *NeuroImage*, 2017.
9. Jia, N., Brincat, S.L., Salazar-Gomez, A., Panko, M., Guenther, F. and Miller, E.K. "Decoding of intended saccade direction in an oculomotor brain-computer interface." *Journal of Neural Engineering*, 2017. <https://doi.org/10.1088/1741-2552/aa5a3e>
10. Antzoulatos, E.G. and Miller, E.K. "Synchronous beta rhythms of frontoparietal networks support only behaviorally relevant representations." *eLife*, 2016;10.7554/eLife.17822
11. Stanley, D.A., Roy, J.E., Aoi, M.C., Kopell, N.J., and Miller, E.K. "Low-beta oscillations turn up the gain during category judgments." *Cerebral Cortex*, 2016. doi: 10.1093/cercor/bhw356
12. Stokes, M., Buschman, T.J., and Miller, E.K. "Dynamic coding for flexible cognitive control." *The Wiley Handbook of Cognitive Control*, The Wiley Handbook of Cognitive Control, Edited by Tobias Egner, John Wiley & Sons, 2017(Chichester, West Sussex, UK).
13. Brincat, S.L. and Miller, E.K "Prefrontal networks shift from external to internal modes during learning" *Journal of Neuroscience*. 36(37): 9739-9754, 2016 doi: 10.1523/JNEUROSCI.0274-16.2016.
14. Pinotsis, DA. Loonis, R. Bastos, A. Miller, EK. and Friston,KJ "Bayesian modelling of induced responses and neuronal rhythms" *Brain Topography*, in press.
15. Lundqvist, M., Rose, J., Herman, P, Brincat, S.L, Buschman, T.J., and Miller, E.K. "Gamma and beta bursts underlie working memory" *Neuron*, published online March 17, 2016.
16. Fusi, S., Miller, E.K., and Rigotti, M. "Why Neurons Mix: High Dimensionality for Higher Cognition" *Current Opinion in Neurobiology*, 37:66-74, 2016.
17. Widge, A.S., Zorowitz, S., Link, K., Miller, E.K., Deckersbach, T., Eskandar, E.N., and Dougherty, D.D. "Ventral Capsule/Ventral Striatum Deep Brain Stimulation Does Not Consistently Diminish

18. Kornblith, S., Buschman, T.J., and Miller, E.K. “Stimulus load and oscillatory activity in higher cortex.” *Cerebral Cortex*, 2015. Published online August 18, 2015 doi: 10.1093/cercor/bhv182
19. Siegel, M., Buschman, T.J., and Miller, E.K. “Cortical information flow during flexible sensorimotor decisions.” *Science*, 19 June 2015: 1352-1355.
20. Brincat, S.L. and Miller, E.K. “Frequency-specific hippocampal-prefrontal interactions during associative learning.” *Nature Neuroscience*, 2015. Published online 23 Feb 2015 doi:10.1038/nn.3954
21. Miller, E.K. and Buschman, T.J. “Working memory capacity: Limits on the bandwidth of cognition”. *Daedalus*, Vol. 144, No. 1, Pages 112-122, 2015.
22. McKee, J., Riesenhuber, M., Miller, E.K., and Freedman, D.J. "Task dependence of visual and category representations in prefrontal and inferior temporal cortices". *Journal of Neuroscience*, 34(48): 16065-16075, 2014; doi: 10.1523/JNEUROSCI.1660-14.2014
23. Buschman TJ, Miller EK. "Goal-direction and top-down control". *Philos Trans R Soc Lond B Biol Sci*. Nov 5;369(1655), 2014
24. Roy, J.E., Buschman, T.J., Miller, E.K. "PFC neurons reflect categorical decisions about ambiguous stimuli" *Journal of Cognitive Neuroscience*, 26:6, 1283-1291, 2014.
25. Antzoulatos, E.G. and Miller, E.K. Increases in functional connectivity between the prefrontal cortex and striatum during category learning.” *Neuron*, 83:216-225, 2014.
26. Puig, M.V. and Miller, E.K. “Neural substrates of dopamine D2 receptor modulated executive functions in the monkey prefrontal cortex.” *Cerebral Cortex*, published online May 9, 2014
27. Miller, E.K. and Buschman, T.J. “Neural mechanisms for the executive control of attention” In: *The Oxford Handbook of Attention*. Nobre, K. and Kastner, S. Oxford University Press, 2014 ISBN: 9780199675111
28. Puig, M. V., Antzoulatos, E. G., & Miller, E. K. Prefrontal dopamine in associative learning and memory. *Neuroscience*, 282, 217-229, 2014.
29. Lindsay, G., Rigotti, M., Warden, M. R., Miller, E. K., & Fusi, S. Hebbian-inspired rewiring of a random network replicates pattern of selectivity seen in PFC. *BMC Neuroscience*, 15(1), 1, 2014.
30. Miller, E.K. “The ‘working’ of working memory” *Dialogues in Clinical Neuroscience*, 15:411-418, 2013.
31. Miller, E.K. and Buschman, T.J. "Brain Rhythms for Cognition and Consciousness". *Neurosciences and the Human Person: New Perspectives on Human Activities* A. Battro, S. Dehaene and W. Singer (eds), Pontifical Academy of Sciences, *Scripta Varia* 121, Vatican City, 2013.
32. Rigotti, M., Barak, O., Warden, M.R., Wang, X., Daw, N.D., Miller, E.K., & Fusi, S. “The importance of mixed selectivity in complex cognitive tasks.” *Nature*, 497, 585-590, 2013 doi:10.1038/nature12160..
33. Miller, E.K. and Fusi, S. “Limber neurons for a nimble mind.” (Preview) *Neuron*, 78:211-213, 2013.
34. Miller, E.K. and Buschman, T.J. “Cortical circuits for the control of attention” *Current Opinion in Neurobiology*, 23:216–222, 2013.

35. Buschman, T.J., Denovellis, E.L., Diogo, C., Bullock, D. and Miller, E.K. "Synchronous oscillatory neural ensembles for rules in the prefrontal cortex." *Neuron*, 76: 838-846, 2012.
36. Puig, M.V. and Miller, E.K. "The role of prefrontal dopamine D1 receptors in the neural mechanisms of associative learning." *Neuron*, 74: 874-868, 2012.
37. Miller, E.K. and Wallis, J.D. "The prefrontal cortex and executive brain functions". *Fundamental Neuroscience*, 4th edition, 2013.
38. Duncan, J. and Miller, E.K. "Adaptive neural coding in frontal and parietal cortex." In: Stuss, D.T. and Knight, R.T. (Eds). *Principles of Frontal Lobe Function: Second Edition*, 2012.
39. Silver, M.R., Grossberg, S., Bullock, D., Histed, M. and Miller, E.K. "A neural model of sequential movement planning and control of eye movements: Item-order-rank working memory and saccade selection by the supplementary eye fields." *Neural Networks* 26:29-58, 2012.
40. Miller, E.K. and Buschman, T.J. "Top-Down Control of Attention by Rhythmic Neural Computations" In: Posner, M.I. (ed) *Cognitive Neuroscience of Attention*. New York: Guilford Press, 2012.
41. Buschman, T.J., Siegel, M., Roy, J.E. and Miller, E.K. "Neural substrates of cognitive capacity limitations." *Proceedings of the National Academy of Sciences*, 108(27):11252-5, 2011.
42. Antzoulatos, E.G. and Miller, E.K. "Differences between neural activity in prefrontal cortex and striatum during learning of novel, abstract categories." *Neuron*, 71(2): 243-249, 2011.
43. Cromer, J.A., Roy, J.E., Buschman, T.J., and Miller, E.K. "Comparison of primate prefrontal and premotor cortex neuronal activity during visual categorization." *Journal of Cognitive Neuroscience*, 23: 3355-3365, 2011.
44. Cromer, J.A., Machon, M. and Miller, E.K. "Rapid association learning in the primate prefrontal cortex in the absence of behavioral reversals." *Journal of Cognitive Neuroscience*, 23: 1823-1828, 2011.
45. Warden, M.R. and Miller, E.K. "Task-dependent changes in short-term memory in the prefrontal cortex." *Journal of Neuroscience*, 30(47):15801-15810, 2010.
46. Buschman, T.J. and Miller, E.K. "Shifting the Spotlight of Attention: Evidence for Discrete Computations in Cognition." *Frontiers in Human Neuroscience*, 4(194):1-9, 2010.
47. Cromer, J.A., Roy, J.E., and Miller, E.K. "Representation of multiple, independent categories in the primate prefrontal cortex." *Neuron*, 66: 796-807, 2010
48. Miller, E.K. and Phelps, E.A. (eds.) "Preface: Current Opinion in Neurobiology—Cognitive Neuroscience 2010." *Current Opinion in Neurobiology*, 20:1-2, 2010.
49. Roy, J.E., Riesenhuber, M., Poggio, T., and Miller, E.K. "Prefrontal cortex activity during flexible categorization." *Journal of Neuroscience*, 30:8519-8528, 2010.
50. Seger, C.A. and Miller, E.K. "Category Learning in the Brain" *Annual Review of Neuroscience*, Vol. 33, 203-219, 2010.
51. Engel, A.K., Friston, K., Kelso, J.A.S., Konig, P., Kovacs, I., MacDonald, A., Miller, E.K., Phillips, W.A., Silverstein, S.M., Tallon-Baudry, C., Triesch, J., Uhlhaas, P. "Coordination in Behavior and Cognition." In: *Dynamic Coordination in the Brain*, MIT Press, Cambridge, pp 267-299, 2010.

52. Siegel, M., Warden, M.R., and Miller, E.K. "Phase-dependent neuronal coding of objects in short-term memory." *Proceedings of the National Academy of Sciences*, 106: 21341-21346, 2009.
53. Histed, M.H., Pasupathy, A., and Miller, E.K. "Learning substrates in the primate prefrontal cortex and striatum: sustained activity related to successful actions." *Neuron*, 63: 244-253, 2009.
54. Buschman, T.J. and Miller, E.K. "Serial, covert, shifts of attention during visual search are reflected by the frontal eye fields and correlated with population oscillations." *Neuron*, 63: 386-396, 2009.
55. Miller, E.K. and Wallis, J.D. "Executive function and higher-order cognition: Definitions and neural substrates." In: *The Encyclopedia of Neuroscience*, Volume 4, Squire LR (Ed.), pp 99-104. Oxford: Academic Press, 2009.
56. Miller, E.K. and Wilson, M.A. "All my circuits: Using multiple-electrodes to understand functioning neural networks." *Neuron*, 60: 483-488, 2008.
57. Meyers, E.M., Freedman, D.J., Kreiman, G., Miller, E.K., and Poggio, T. "Dynamic population coding of category information in the inferior temporal cortex and prefrontal cortex" *Journal of Neurophysiology*, 100: 1407-1419, 2008.
58. Loh, M., Pasupathy, A., Miller, E.K., and Deco, G. "Neurodynamics of the prefrontal cortex during conditional visuomotor associations." *Journal of Cognitive Neuroscience*, 20: 421-431, 2008.
59. Freedman, D.J. And Miller, E.K. "Neural mechanisms of visual categorization: Insights from neurophysiology" *Neuroscience and Biobehavioral Reviews*, 32(2):311-29, 2008.
60. Buschman, T.J. and Miller, E.K. "Top-down versus bottom-up control of attention in the prefrontal and posterior parietal cortices." *Science*, 315: 1860-1862, 2007.
61. Miller, E.K. and Wallis, J.D. "The prefrontal cortex and executive brain functions". *Fundamental Neuroscience*, 3rd edition, 2008.
62. Warden, M.R. and Miller, E.K. "The representation of multiple objects in prefrontal neuronal delay activity." *Cerebral Cortex*, 17: i41-i50, 2007.
63. Fusi, S., Asaad, W.F., Miller, E.K., and Wang, X.J. "A neural circuit model of flexible sensori-motor mapping: Learning and forgetting on multiple timescales." *Neuron*, 54: 319-333, 2007.
64. Miller, E.K. and Buschman, T.J. "Rules through recursion: How interactions between the frontal cortex and basal ganglia may build abstract, complex, rules from concrete, simple, ones" S. Bunge & J. Wallis (Eds.), *The Neuroscience of Rule-Guided Behavior*, Oxford University Press, 2007.
65. Miller, E.K. "The prefrontal cortex: categories, concepts, and cognitive control" In: *Memories: Molecules and Circuits, Research and Perspectives in Neurosciences*, Bontempi B., Silva A.J., Christen Y. (eds), Heidelberg: Springer, 2007.
66. Miller, E.K. and Buschman, T.J. "Bootstrapping your brain: How interactions between the frontal cortex and basal ganglia may produce organized actions and lofty thoughts" In: *Neurobiology of Learning and Memory* (2nd Edition), Kesner, R.P. and Martinez, J.L. (Eds), Elsevier, 2007.
67. Cacioppo, J.T., Amaral, D.G., Blanchard, J.J., Cameron, J.L., Sue C.C., Crews, D., Fiske, S., Heatherton, T., Johnson, M.K., Kozak, M.J., Levenson, R.W., Lord, C., Miller, E.K., Ochsner, K., Raichle, M.E., Tracie S.M., Taylor, S.E., Young, L.J., and Quinn, K.J. "Social Neuroscience: Progress and Implications for Mental Health" *Perspectives on Psychological Science* 2: 99-123, 2007.

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69. Freedman, D.J., Riesenhuber, M., Poggio, T., and Miller, E.K. "Experience dependent sharpening of visual shape selectivity in inferior temporal cortex" *Cerebral Cortex*. 16: 1631-1644, 2006.
70. Muhammad, R., Wallis, J.D., and Miller, E.K. "A comparison of abstract rules in the prefrontal cortex, premotor cortex, the inferior temporal cortex and the striatum." *Journal of Cognitive Neuroscience*, 18, 974-989, 2006.
71. Greene, M., Schill, K., Takahasi, S., Bateman-House, A., Beauchamp, T., Bok, H., Cheney, D., Coyle, J., Deacon, T., Dennett, D., Donovan, P., Flanagan, O., Goldman, S., Greely, H., Martin, L., Miller, E., Mueller, D., Siegel, A., Solter, D., Gearhart, J., McKhann, G., and Faden, R. "Moral issues of human-non-human primate neural grafting" *Science*, 309, 385-386, 2005.
72. Pasupathy, A. and Miller, E.K. "Different time courses for learning-related activity in the prefrontal cortex and striatum." *Nature*, 433, 873-876, 2005.
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76. Miller, E.K. and Wallis, J.D. "Volition and the prefrontal cortex" In: *The Visual Neurosciences*, Chalupa, L.M. and Werner, J.S. (eds.), MIT Press, pp 1546-1560, 2004.
77. Freedman, D.J., Riesenhuber, M., Poggio, T., and Miller, E.K. "A comparison of primate prefrontal and inferior temporal cortices during visual categorization." *Journal of Neuroscience*, 23(12):5235-5246, 2003.
78. Nieder, A. and Miller, E.K. "Coding of cognitive magnitude: Compressed scaling of numerical information in the primate prefrontal cortex." *Neuron*, 37, 149-157, 2003.
79. Wallis, J.D. and Miller, E.K. "From rule to response: neuronal processes in the premotor and prefrontal cortex." *Journal of Neurophysiology*, 90, 1790-1806, 2003.
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83. Miller, E.K., Freedman, D.J., and Wallis, J.D. "The prefrontal cortex: categories, concepts, and cognition." In: *The Physiology of Cognitive Processes*, Parker, A., Derrington, A., Blakemore, C. (eds.). Oxford University Press, pp 252-273., 2003.

84. Miller, E.K. and Wallis, J.D. "The prefrontal cortex and executive brain functions" *Fundamental Neuroscience 2nd Edition*, Squire, L.R., Bloom, F.E., Roberts, J.L., Zigmond, M.J., McConnell, S.K., Spitzer, N.C. (eds.), Academic Press, pp. 1353-1376, 2003.
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86. Nieder, A., Freedman, D.J., and Miller, E.K. "Representation of the quantity of visual items in the primate prefrontal cortex." *Science*, 297, 1708-1711, 2002.
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88. Freedman, D.J., Riesenhuber, M., Poggio, T., and Miller, E.K. "Visual categorization and the primate prefrontal cortex: Neurophysiology and behavior." *Journal of Neurophysiology*, 88, 914-928, 2002.
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91. Duncan, J. and Miller, E.K. "Cognitive focusing through adaptive neural coding in the primate prefrontal cortex" *Principles of Frontal Lobe Function*, Stuss, D. and Knight, R.T. (eds.) Oxford University Press, Oxford, pp 278-291, 2002.
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93. Freedman, D.J., Riesenhuber, M., Poggio, T., and Miller, E.K. "Categorical representation of visual stimuli in the primate prefrontal cortex" *Science*, 291, 312-316, 2001.
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95. Wallis, J.D., Anderson, K.C., and Miller, E.K. "Single neurons in the prefrontal cortex encode abstract rules." *Nature*, 411, 953-956, 2001.
96. Miller, E.K. and Cohen, J.D. "An integrative theory of prefrontal cortex function" *Annual Review of Neuroscience*, 24:167-202, 2001. - Designated a *Current Classic* as among the most cited papers in *Neuroscience and Behavior*
97. Rainer G. and Miller, E.K. "Neural ensemble states in prefrontal cortex identified using a hidden markov model with a modified EM algorithm." *Neurocomputing*, 32-33, 961-966, 2000.
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100. Miller, E.K. "The prefrontal cortex and cognitive control", *Nature Reviews Neuroscience*, 1, 59-65, 2000.

101. Miller, E.K. "The prefrontal cortex: no simple matter" (Commentary), *Neuroimage*, 11:447-450, 2000.
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Distinguished Lectures

Plenary Speaker, International Neuropsychological Society Conference, 2018
 Goldman-Rakic Memorial Lecture, Yale University, 2017
 Commencement Address, Kent State University, 2016
 Keynote Address, Annual Alumni College, Kent State University, 2014
 Keynote Address, Eastern Psychological Association Annual Meeting, 2014
 Biomed Distinguished Lecturer, University of Leuven, Belgium, 2011
 Plenary Lecture, International Conference on Cognitive and Neural Systems, Boston University, 2010
 Carlson Lecture, University of Chicago, 2009
 Keynote Speaker, Meeting of the Comparative Cognition Society, 2009
 Engineering Distinguished Lecture, National Science Foundation, Washington, DC, 2009
 Keynote Speaker, Yale University Science Day, 2008

Mathilde Solowey Lecture in the Neurosciences, National Institutes of Health, 2007
Plenary Lecture, Japanese Society for Neuroscience Meeting, Yokohama, Japan, 2007
Grass Lecture, University of Illinois at Urbana-Champaign, 2006
Keynote Address, Human Brain Mapping Meeting, Toronto, Canada, 2005
Keynote Address, Motivational Neuronal Network meeting, Clearwater, Florida, 2005
Fred Attneave Lecture, Department of Psychology, University of Oregon, 2004
Swammerdam Lecture, Vrije Universiteit and University of Amsterdam, The Netherlands, 2002

Invited Lectures

2018

Plenary Speaker, International Neuropsychological Society Conference

2017

Goldman-Rakic Memorial Lecture, Yale University

Big Questions in Neuroscience, Arlington, VA

Seminar, Brown University

Seminar, New York University

Symposium, Memory Disorders Research Society Meeting, Chicago, IL

ONR Computational Neuroscience Program

2016

Symposium, Memory Disorders Research Society Meeting, Princeton, NJ

Seminar, Boston University

28th Annual International Mental Health Research Symposium, Brain and Behavioral Research Foundation, NYC

2015

Brain Stimulation Based Neural Circuit Modeling: Linking Levels of Analysis, Chicago

Workshop on Advances in Electroencephalography, Chicago

Computational Neuroscience Seminar, Brandeis University

Computational Properties of the Prefrontal Cortex, Bethesda

Neurobiology Seminar, Yale University

Pfizer Neuroscience Seminar Series

2014

Workshop on Neural Oscillations, Oxford University

Keynote Address, Annual Alumni College, Kent State University

Keynote Address, Eastern Psychological Association Annual Meeting

Symposium on Categorization, Eastern Psychological Association Annual Meeting

Gordon Conference on Cognitive Neuroscience

Seminar, Dartmouth College

2013

Symposium on Attention, 20th Annual Meeting of the Cognitive Neuroscience Society

Cognitive Rhythms Collaborative Conference: Rhythmic Dynamics and Cognition, Cambridge, MA

Neural Circuits for Adaptive Control of Behavior, Paris, France

Affective Brain Lab Talk, University College London

Seminar, University of New Hampshire

Working Memory Conference, University of Oregon

2012

Working Group of the Pontifical Academy of Sciences on "Human Activities, Neurosciences, and the Person", The Vatican

Reprogramming the Brain, University of Texas at Dallas

Biomedical Engineering Seminar, Tufts University

"Rewards, Habits, and Learning: Towards an Integrative View of Frontostriatal Function", Columbia University

"Measuring and Interpreting Cognitive Changes in Early Huntington's Disease", CHDI Foundation, New York

Workshop on Categorization, Cosyne Meeting, Salt Lake City

Workshop on Working Memory, Cosyne Meeting, Salt Lake City
Center for Mind/Brain Medicine Seminar Series, Brigham and Women's Hospital

2011

International Conference on Cognitive Neuroscience, Mallorca, Spain
Biomed Distinguished Lecturer, University of Leuven, Belgium
International Neuropsychological Symposium, Mondsee, Austria
Meet-the-Expert Event, Society for Neuroscience Annual Meeting, Washington, DC
Helen Wills Neuroscience Institute, University of California at Berkeley
Interdisciplinary Graduate Conference on Consciousness, Boston University
Neuroscience Seminar, Brandeis University
Neuroscience Seminar, Columbia University
Cognitive Rhythms Collaborative, Cambridge, MA
Visual Attention Seminar, Brigham and Women's Hospital, Cambridge, MA

2010

Center for Brain Science Seminar, Harvard University
Cognitive Brain and Behavior Seminar, Department of Psychology, Harvard University
"Lunch and Learn" seminar, Shire Pharmaceuticals, Philadelphia
Workshop on Working Memory, National Institute of Mental Health, Bethesda, MD
Symposium at the annual meeting of the American Psychiatric Association, New Orleans
Plenary Lecture, International Conference on Cognitive and Neural Systems, Boston University
Homewood Brain and Cognition Lecture Series, Johns Hopkins University
The Frontal Lobes 2010, Toronto, Canada
Adler Symposium, Salk Institute for Biological Studies

2009

Carlson Lecture, University of Chicago
Keynote Speaker, Meeting of the Comparative Cognition Society
Engineering Distinguished Lecture, National Science Foundation, Washington, DC
Ernst Strungmann Forum on Dynamic Coordination in the Brain, Frankfurt, Germany
Neuroscience Seminar, University of California at San Diego
Banbury Workshop: "Searching for principles underlying memory in biological systems", Cold Spring Harbor
Invited address, Computational and Systems Neuroscience meeting, Salt Lake City, Utah
University of Minnesota Department of Neuroscience seminar
Charles River Association for Memory seminar, Cambridge, MA

2008

Conference on Memory and Neural Networks, Longyearbyen, Svalbard, Norway
Netherlands Neuroscience Institute Conference on Perceptual Learning, Motor Learning, and Automaticity, Amsterdam, Netherlands
Keynote Speaker, Yale University Science Day
Shire Biopharmaceuticals Advisory Board Meeting – Guanfacine Mechanism of Action in ADHD, New York City
Seminar, Merck & Co., Inc., Philadelphia
Neuroscience Seminar, Brown University
Cognitive Neuroscience Seminar Series, Columbia University
Seminar, Princeton University
"Emotions, Memories, Consciousness, and Attention: Biological Approaches to Cognitive Problems" , Columbia University
Symposium in honor of Brenda Milner, Montreal Neurological Institute
Cognitive, Computational and Systems Neuroscience Seminar, Washington University, St. Louis
BrainMap Seminar, Martinos Center, Massachusetts General Hospital

2007

Mathilde Solowey Lecture in the Neurosciences, National Institutes of Health
Plenary Lecture, Japanese Society for Neuroscience Meeting, Yokohama, Japan
Jeffrey Lecture in Cognitive Neuroscience, UCLA
Cambridge Neuroscience Symposium, Cambridge, UK

Meeting on Executive Functions, Leiden, Netherlands
Neuroscience Seminar, University of California at Irvine
Wisconsin Symposium on Emotion, University of Wisconsin
"Neurons, brains and models: crossing levels of analysis in cognitive brain research", University of Michigan
"The cognitive science of semantics", Tufts University
Neuroscience Seminar, University of Maryland

2006

"Memories: Molecules and Circuits", IPSEN Foundation, Paris, France
Invited Address, Annual Meeting, American Psychological Society, New York City
Symposium on "Prefrontal cortex, Working Memory, Flexible behavior", Yale University
Learning Sciences Institute seminar, Vanderbilt University
Grass Lecture, University of Illinois at Urbana-Champaign
Neuroscience Seminar Series, University of California at Berkeley
Neuroscience Colloquium, Boston University School of Medicine
"New Frontiers in Brain Science: from molecules to mind", Massachusetts Institute of Technology

2005

Keynote Address, Human Brain Mapping Meeting, Toronto, Canada
International Conference on Cognitive Neuroscience, Havana, Cuba
Fudan University Institute of Neurobiology Seminar, Shanghai, China
International Neuropsychology Symposium, Sardinia, Italy
Helmholtz Lecture Series, Helmholtz Research Institute, Universities of Utrecht, Amsterdam, and Rotterdam, The Netherlands
Colloquium, Max Planck Institute, Berlin, Germany
Symposium on Executive Functions and the Frontal Lobe, Tuebingen, Germany
Keynote Address, Motivational Neuronal Network meeting, Clearwater, Florida
Computational Neuroscience Seminar Series, University of Chicago
Neuroscience Seminar, University of California at San Diego
Mind and Brain Colloquium, University of California at Davis
Psychology Seminar, Stanford University
Seminar, California Institute of Technology
Seminar, Harvard Mind, Brain, and Behavior Initiative, Harvard University
Course on the Biology of Memory, Cold Spring Harbor
Workshop on Schizophrenia, Cold Spring Harbor

2004

Munich Encounters in Cognition and Action Symposium, Max Planck Institute, Munich, Germany
International Congress of Psychology, Beijing, China
American College of Neuropsychopharmacology Meeting, Puerto Rico
Neurons and Memory, a satellite meeting of the Society for Neuroscience Annual Meeting, San Diego
Neural Control of Behavior Meeting, University of California, Los Angeles
Center for Visual Science Symposium, University of Rochester
Neuroscience Symposium, University of Western Ontario
Mind, Brain and Behavior Distinguished Lecture, Duke University
Symposium, Cognitive Neuroscience Meeting, San Francisco
Course on Brain Science for Knight Science Journalism Fellows, M.I.T.
Working Group on Interspecific Chimeric Brains, Phoebe R. Berman Bioethics Institute, Johns Hopkins University
Interdisciplinary Program in Neuroscience Seminar, Georgetown University
Seminar, University of Texas Medical School
Seminar, Harvard Medical School
Seminar, Johns Hopkins University
Summer Institute in Cognitive Neuroscience, Dartmouth College
Fred Attneave Lecture, Department of Psychology, University of Oregon

2003

Fyssen Colloquium, St Germain en Laye, France

Department of Psychology Colloquium, Cornell University
Center for Neural Science Seminar, New York University
International Joint Conference on Neural Networks, Portland, Oregon
Symposium at the Cognitive Neuroscience Society Meeting, New York
Department of Neuroscience Seminar, University of Connecticut Health Center
NIDA Workshop on Developing Behavioral Treatments for Cognitively Impaired Drug Abusers, Bethesda
NIH Workshop on Executive Functions, New York City
Roche Pharmaceuticals, Palo Alto
RIKEN Brain Sciences Institute Retreat, Shinrin-Koen, Japan
John Merck Summer Course in Cognitive Neuroscience, Princeton University
Cognitive Science Seminar, University of Quebec in Montreal
Neuroscience Seminar Series, Mount Sinai School of Medicine, New York
Neuroscience Formal Seminar Series, University of California, San Francisco
Neuroscience Retreat, University of Pittsburgh
Department of Psychology Seminar, Stanford University
Seminar, Columbia University

2002

UCLA Neuroscience Seminar Series
F.C. Donners Lecture, University of Nijmegen, The Netherlands
Swammerdam Lecture, Vrije Universiteit and University of Amsterdam, The Netherlands
Symposium at the European Conference on Visual Perception, Glasgow, Scotland
Seminar, Honda Research and Development Co., Wako-shi, Japan
Meeting of the American Association for the Advancement of Science (symposium organizer), Boston
University of Illinois Neuroscience Seminar Series
Emory University Neuroscience Colloquium
Institute for Cognitive Science Colloquium Series, University of Colorado at Boulder
Helmholtz Club, University of California at Irvine
Sloan Seminar, California Institute of Technology
Neurobiology and Behavior Seminar Series, Columbia University
Cognitive Neuroscience Seminar, National Institutes of Health
Department of Psychology Seminar, University of Pennsylvania
Neuroscience Seminar, Wake Forest University School of Medicine

2001

Society for Research in Child Development, Minneapolis
Winter Conference on Neural Plasticity, Antigua, West Indies
Gordon Research Conference on Neural Plasticity, Newport, Rhode Island
International Society for Behavioral Neuroscience, Marrakech, Morocco
Royal Society Meeting, London, UK
Association for the Study of Consciousness Meeting, Duke University
Rotman Research Institute Seminar, Toronto, Canada
University of Rochester Colloquium Series
Cold Spring Harbor Summer Course
Kennedy Shriver Center Colloquium Series, Waltham, MA
Memory Research and Disorders Society Meeting, Boston
Department of Psychology Colloquium, Harvard University

2000

The Frontal Lobes: In the Forefront of the Millennium, Rotman Research Institute, Toronto Canada
Symposium on the Cognitive Neuroscience of Attention and Awareness, London, UK
Neuroscience Seminar, Washington University
RIKEN Brain Institute Summer Program, Japan
Workshop on Executive Functions of Attention, New York University
University of Minnesota Center for Cognitive Sciences Colloquium
Mini-Symposium on Visual Working Memory, ARVO Meeting
Neuroscience Colloquium, Massachusetts General Hospital
Towards Animal Models of Attention and Consciousness, Cold Spring Harbor

Harvard Psychology Seminar
Boston University Psychology Seminar
Baylor University Neuroscience Seminar
Department of Physiology Seminar, University of Montreal
Neuroscience Seminar Series, National Institutes of Health

1999

Department of Psychology Seminar, Princeton University
Neuroscience Seminar Series, Boston University
Attentional Processes in Selective Perception and Working Memory, Satellite Symposium of the Cognitive Neuroscience Society Meeting, Washington, DC
Department of Psychiatry, Harvard Medical School
Neuroscience Seminar, University of California at Berkeley
Summer Institute in Cognitive Neuroscience, Dartmouth College
RIKEN Brain Institute Summer Program, Japan
Brain and Machines Lecture Series, MIT
Stanford Neurosciences Program Annual Retreat, Monterey, CA
Department of Psychology Seminar, University of Iowa
Conference in Cognitive Science, Vancouver, Canada
Brandeis Summer Lecture Series in Neuroscience

1998

Workshop on Visuospatial Working Memory, Executive Control and The Frontal Lobes, Delmenhorst, Germany
International Symposium on Learning and Memory, University of Otago, New Zealand
Attention and Performance 18, The Great Park, Windsor, England
Symposium at the Annual Society for Neuroscience Meeting: Neural Basis of Working Memory
RIKEN Symposium, Tokyo, Japan
Cognitive Neuroscience Society Meeting, San Francisco
McKnight Foundation Meeting, Aspen
Neuroscience Seminar Series, Princeton University
Winter Conference on Brain Research, Snowbird, Utah
Winter Conference on Neural Plasticity, St. Lucia, West Indies
Institute for Research in Cognitive Science Seminar, University of Pennsylvania
Neuroscience Seminar Series, Rockefeller University
Zanvyl Krieger Mind/Brain Institute Seminar Series, Johns Hopkins University
Developmental Neuroscience Seminar, Eunice Kennedy Shriver Center, Waltham
Neuroscience Seminar Series, Center for Neuroscience, Rutgers University
Department of Neuroanatomy Seminar, Boston University
Second International Conference on Cognitive and Neural Systems, Boston University
Center for Neuroscience Seminar, University of California at Davis
Laboratory of Neuropsychology Symposium, National Institute of Mental Health

1997

Novartis Foundation Meeting on Functions of the Prefrontal Cortex, London, UK
Colloquium Series, MRC Applied Psychology Unit, Cambridge, UK
ONR Workshop on Cognitive Neuroscience, Marine Biology Lab, Woods Hole
Department of Psychology Colloquium, Carnegie Mellon University
Neuroscience Colloquium Series, Brown University
Bowman Gray Medical School Neuroscience Colloquium Series
Neurocomputation Seminar, Brandeis University
Pew Scholars Annual Meeting, San Jose, Costa Rica
Department of Neurobiology Seminar, Harvard University
Department of Psychology Seminar, Boston University
Department of Neuroanatomy Seminar, Boston University
Imaging Center Seminar, Massachusetts General Hospital
Brain and Cognitive Sciences Colloquium Series, MIT

1996

Department of Neurobiology Seminar, Weizmann Institute of Science, Israel
Department of Psychology Seminar, University of Connecticut

1995

Winter Conference on the Neurobiology of Learning and Memory, Park City
The Helmholtz Club, University of California, Irvine
Vision Center Laboratory Seminar, The Salk Institute for Biological Studies
Harvard Undergraduate Neuroscience Society

1994

Cooperation Forum for Multi-Disciplinary Researches, Hiroshima, Japan
Department of Neurobiology Seminar, Harvard Medical School
Third Appalachian Conference on Behavioral Neurodynamics, Center for Brain Research and
Informational Sciences, Radford University
Neural Systems, Memory, and Aging Seminar, University of Arizona
Third Workshop on Neural Networks, Elba International Physics Center, Italy
Department of Psychology Seminar, Carnegie Mellon University
Joint Vision Laboratory - Cognitive Brain and Behavior Seminar, Harvard University
Department of Brain and Cognitive Sciences Seminar, Massachusetts Institute of Technology
Department of Neurobiology Seminar, Emory University
Department of Physiology and Biophysics Seminar, University of Washington

1992

Section on Neurobiology Seminar, Yale University
Vision Center Laboratory Seminar, The Salk Institute for Biological Studies
Neural Systems Seminar, National Institute of Neurological Disorders and Stroke

Teaching (MIT):

9.02 Brain and Behavior Laboratory (Laboratory course required for undergraduate majors. Primary Instructor, designed the course and student laboratories.)

9.012 Brain and Cognitive Sciences II (Core course taken by all BCS graduate students. Course organizer and one of several primary lecturers)

9.011 Brain and Cognitive Sciences I (Core course taken by all BCS graduate students. Course organizer)

9.011J Principles of Neuroscience (Several lectures)

9.401 Survey of Cognitive Science (Several lectures)

9.10 Cognitive Neuroscience (Several lectures)

9.30/7.98 Neural Plasticity (Several lectures)

MIT Committees and Service:

Animal Care and Use Committee (1998 -2005): MIT's Animal Care and Use Committee oversees all animal research affiliated with MIT.

Graduate Committee (1998 - present): We oversee all policy decisions regarding the graduate program in Brain and Cognitive Sciences at MIT. I also oversee admissions to our graduate program in Systems Neuroscience program and supervise the qualifying exam taken by second year graduate students in Systems Neuroscience.

Director of the Graduate Studies in Brain and Cognitive Sciences at MIT (1999 - 2006): I was director of our department's graduate program.

Supervisor, Electronics Shop, Department of Brain and Cognitive Sciences (1996 - 2004): I supervised the work of the electronics shop staff.

Organizer, Brain and Cognitive Sciences Faculty Seminar Series (1998 - 2001)

Thesis Committees: I have been on the thesis committees of many students in the Department of Brain and Cognitive Sciences and in Health Sciences and Technology

Education Committee (1999 - 2000): The Education Committee oversees the curricula of the Department of Brain and Cognitive Sciences.

Lecture at launch of MIT's capital campaign, Spring 2000.

Lecture to MIT alumni for "MIT On the Road" program, Palm Beach, Florida, January 2001

Organizer, Plastic Lunch Seminar Series for MIT's Center for Learning and Memory (1999 - 2003)

Committee on an Interdepartmental Program in Neuroscience (2000): We were charged with constructing a new interdepartmental graduate training program in neuroscience at MIT.

Director Advisory Committee for the McGovern Institute for Brain Research, 2000

Lecture at MIT's Technology Day, June, 2001

Associate Director, The Picower Center for Learning and Memory, 2001 –

Lecture at MIT's Alumni Summer Course in Neuroscience, June 2003

Advisory Committee on the Appointment of the Next Director of the McGovern Institute for Brain Research, 2003

Neuroscience Advisory Council, 2006-2008