

## PERSONAL

### P. Read Montague

Citizenship: USA

<http://research.vtc.vt.edu/employees/read-montague/>

## EDUCATION

**1983** B.S. Mathematics, Auburn University  
**1985** Neurobiology Course, MBL, Woods Hole, MA  
**1988** Ph.D. Biophysics, University of Alabama at Birmingham School of Medicine  
**1989-1991** Institute Fellow in Theoretical Neurobiology, The Neurosciences Institute, Rockefeller University (sponsor: Gerald Edelman, MD PhD)  
**1991-1993** Fellow and Staff Scientist, Computational Neurobiology Lab The Salk Institute for Biological Studies (sponsor: Terrence Sejnowski, PhD)

## ACADEMIC APPOINTMENTS

**2011-present** **Wellcome Trust Principal Research Fellow**, The Wellcome Trust Centre for Neuroimaging, University College, London  
**2010-present** **Director**, Human Neuroimaging Lab, Virginia Tech Carilion Research Institute  
**2010-present** **Professor**, Department of Physics, Virginia Tech  
**2016-present** **(Inaugural) Virginia Tech Carilion Vernon Mountcastle Research Professor**  
**2010-2013** **Adjunct Professor**, Department of Neuroscience, Baylor College of Medicine  
**2006-present** **Adjunct Professor**, Gatsby Computational Neuroscience Unit, UCL  
**2005-2006** **Member**, Institute for Advanced Study (Princeton, NJ)  
**2003-2010** **Brown Foundation Professor of Neuroscience** Baylor College of Medicine  
**2003-2010** **Professor**, Menninger Department of Psychiatry and Behavioral Sciences Baylor College of Medicine  
**2001-2010** **Director**, Human Neuroimaging Laboratory, Baylor College of Medicine  
**2001-2010** **Professor**, Department of Neuroscience Baylor College of Medicine  
**1998-2001** **Associate Professor**, Division of Neuroscience Baylor College of Medicine  
**1993-1998** **Assistant Professor**, Division of Neuroscience Baylor College of Medicine  
**1992-1993** **Staff Scientist**, Computational Neurobiology Lab The Salk Institute for Biological Studies

## HONORS AND AWARDS

**Michael E. DeBaake Excellence in Research Award** 1997, 2005  
**Member, Institute for Advanced Study, Princeton, NJ** 2005-2006  
**Kavli Fellow**, 2010 National Academy of Science U.S.- China Frontiers of Science  
**Wellcome Trust Principal Research Fellowship** 2011-2018  
**Walter Gilbert Award**, Auburn University 2011  
**Network Member**, 2011, 2012, 2013, 2014, 2015, 2016 The MacArthur Foundation Research Network on Law and Neuroscience  
**William R. and Irene D. Miller Lectureship Recipient**, Cold Spring Harbor Laboratory, 2011-2012

## NATIONAL SCIENTIFIC PARTICIPATION

**Review Panels:**  
**NIMH Cognitive Function Study Section** 1997, 1998  
**NASA Neuroscience (ground) Panel**, 1999  
**NIH Study Section IFCN 8:**  
Integrative Functional Cognitive Neuroscience 8 1998-2002  
**Ad hoc Reviewer** - National Science Foundation  
The Wellcome Trust  
**NIH Director's Pioneer Award (NDPA) Review Panel** 2004  
**NIH Center for Scientific Review:**  
Cognitive Neuroscience (COG) Study Section 2011  
  
**NIMH Research Domain Criteria Project (RDoC) Panel** 2013  
Ad hoc Reviewer: (RFA-MH-14-050)  
*Dimensional Approaches to Research Classification in Psychiatric Disorders*

**Stanford University, Center for Mind, Brain and Computation**, Member of Advisory Board

**Reviewer for:** *Cerebral Cortex, Journal of Neurochemistry, Journal of Neuroscience, Journal of Theoretical Biology, Journal of Computational Neuroscience, Journal of Neurophysiology, Nature, Nature Neuroscience, Neural Computation, Network: Computation in Neural Systems, Psychological Review, Science, The Lancet, Journal of Cognitive Neuroscience, Neuron, NeuroImage*

**Organizer for:**

2004 Neuroeconomics 2004, Kiawah Island, South Carolina Sept.16-19  
2011 Organizing Committee, US-China Frontiers of Science Symposium, National Academy of Science  
2013 Computational Psychiatry 2013, Miami, Florida, October 22-23  
2017 Computational Psychiatry: a didactic introduction, Washington, D.C., November 10-11

**PRESENTATIONS**

**ACCEPTED INVITATIONS – 2018**

January 16 Center for Complex Systems and Brain Sciences, Florida Atlantic University, Boca Raton, Florida  
April 14 Symposium for Young Neuroscientists and Professors of the Southeast (SYNAPSE), High Point University, High Point North Carolina, Keynote Speaker  
May 30 - June 3 Brains and Behavior: Order and Disorder in the Nervous System; Cold Spring Harbor Laboratory Symposium, Cold Spring Harbor, New York  
July 7-11 FENS Forum of Neuroscience, Symposium co-chair, Berlin, Germany

**ACCEPTED INVITATIONS – 2017**

Sept. 10-12 Current Challenges in Computing Conference, Napa, California  
October 6 Harvard Medical School, Department of Systems Biology, Harvard University, Boston, Massachusetts  
October 7 Society for Neuroeconomics Symposium, Toronto, Canada  
October 20 Institut des Sciences Cognitives, Bron, France  
November 8 Biocomplexity Institute of Virginia Tech, Research Symposium Keynote Speaker, Blacksburg, Virginia  
Nov. 10-11 Computational Psychiatry: a didactic introduction, Washington, D.C.  
December 5 New York University, The Institute for the Study of Decision Making, Colloquium in Neuroeconomics, Brooklyn, New York

2017 ICM Brain and Spine Institute, Cognition and Psychiatric Diseases Symposium, Paris, France, February 2  
2017 Adrian Seminar, Cambridge, United Kingdom, February 20  
2017 The University of Texas at Dallas, Center for Brain Health, The Brain: An Owner's Guide 2017 Lecture Series, February 28  
2017 Brown University, Pleasure, Reward and Value Conference, Providence, Rhode Island, March 17-19  
2017 First Friday, Invited Speaker, Inn at Virginia Tech, Blacksburg, Virginia, April 7  
2017 Arizona State University, Neuroscience Research Seminar Series, Tempe Arizona, April 13  
2017 NSP Spring Seminar Series, University of Illinois at Urbana-Champaign, Beckman Institute, Urbana, Illinois, April 25  
2017 Aivison Biomedical Symposium, Yonsei University College of Medicine, Seoul, South Korea, May 18  
2017 Yonsei University, Department of Psychiatry and Laboratory of Molecular Neuroimaging, Seoul, South Korea May 19  
2017 University College London, Joint Specialist Registrar Teaching Programme, London, UK, June 7  
2017 The Neuroscience School of Advanced Studies, The Neural Framework for Moral Cognition, Sestri Levante, Italy, June 16  
2017 NIMH Computational Psychiatry: Opportunities and Challenges for the Future, Bethesda, Maryland, June 26-27  
2017 Computational Psychiatry Course, University College London, UK, July 24-25

2016 Rutgers Brain Health Institute, Rutgers University, New Brunswick, New Jersey, January 14  
2016 Kavli Royal Society International Centre, Interpreting BOLD: a dialogue between cognitive and cellular neuroscience, Chicheley Hall, Buckinghamshire, UK, January 28-30  
2016 Beyond Boundaries Forum, Arlington, Virginia, March 31  
2016 Vassar College, Poughkeepsie, New York, April 1  
2016 Cognitive Neuroscience Society, Computational Psychiatry Symposium, NYC, NY, April 3  
2016 Duke University, Science and Society Symposium, 'The Brain and Political Ideology, Durham, NC, April 8  
2016 The Center for BrainHealth, University of Texas at Dallas, April 14  
2016 Keynote Speaker, 2016 California Cognitive Science Conference, University of California, Berkeley, April 30  
2016 Virginia Bio, Richmond, Virginia, May 12  
2016 Sixth Annual Aspen Brain Forum: The Addicted Brain and New Treatment Frontiers, NYC, NY, May 20  
2016 UCLA Center for Neurobehavioral Genetics, Depression Grand Challenge Seminar, Los Angeles, CA, June 16  
2016 The University of Texas at Dallas, Center for Brain Health, Dallas Texas, June 17  
2016 MD Anderson Cancer Center, Houston, Texas, August 16  
2016 Lead Virginia, Conversations with Leaders, The Next Frontier for Virginia's Life Science Sector, Richmond, Virginia, Sept. 20  
2016 North Cross School, Roanoke, Virginia September 22  
2016 Gatsby Computational Neuroscience Unit, Dopamine Workshop, University College London, UK, September 28-30  
2016 The National Academies of Sciences, Engineering, and Medicine; Social and Behavioral Sciences for National Security Summit, Washington, DC, October 4  
2016 Virginia Norway Precision Neuroscience Conference, Virginia Tech Carilion Research Institute, Roanoke, Virginia, October 5

2016 University of Melbourne Neuroscience Institute, Decision Neuroscience Symposium, Melbourne, Australia, Oct. 11  
 2016 Society for Neuroscience, Melbourne Chapter, Melbourne Brain Centre, Melbourne, Australia, October 12  
 2016 Public Lecture, Department of Finance, Business and Economics, The University of Melbourne, October 12  
 2016 Melbourne Brain Centre Symposium, Melbourne, Australia, October 13  
 2016 Invited Speaker, Honors Residential Commons, Principal's Tea, Virginia Tech, Blacksburg, Virginia Oct. 28  
 2016 Society for Neuroscience, San Diego, CA Nov. 14

2015 Humboldt University, Berlin School of Mind and Brain, Reciprocity and Social Cognition, Berlin, Germany, March 24  
 2015 University College London, Implications of Research on the Neuroscience of Affect, Attachment and Social Cognition, April 26  
 2015 Keynote Speaker, Royal Australian and New Zealand College of Psychiatrists 2015 Congress, Brisbane, Australia, May 4  
 2015 Queensland Institute of Medical Research (QIMR) Berghofer, Brisbane, Australia, May 5  
 2015 University of Queensland, Queensland Brain Institute, St. Lucia, Australia, May 6  
 2015 Medical University of South Carolina, Charleston, South Carolina, May 26  
 2015 Ernst Strüngmann Forum, Computational Psychiatry: What Can Theoretical Neuroscience and Psychiatry Teach Each Other? Frankfurt, Germany, June 28 – July 3  
 2015 Champalimaud Neuroscience Symposium: Perspectives on Social Behavior, Champalimaud Centre for the Unknown, Lisbon, Portugal, September 18  
 2015 Columbia University Medical Center, Grand Rounds, Oct. 14  
 2015 Society for Neuroscience Satellite Symposium, 'Brain Stimulation Based Neural Circuits Modeling: Linking levels of Analysis', Chicago, IL, Oct. 16  
 2015 International Symposium on Prediction and Decision Making, University of Tokyo, Japan, Oct. 31-Nov. 1

2014 Georgia State University, Center for Advanced Brain Imaging, Parker H. Petit Institute for Bioengineering and Bioscience, Atlanta GA, January 13  
 2014 Georgia Institute of Technology, Atlanta, GA, January 14  
 2014 University of Pennsylvania, Philadelphia, PA, February 3-4  
 2014 Virginia Tech – Wake Forest University School of Biomedical Engineering and Sciences, Blacksburg, VA, March 27  
 2014 Neuromarketing World Forum, New York, NY, March 6  
 2014 Duke University, Duke Institute for Brain Sciences, Cognitive Neuroscience Colloquium, Durham, NC, April 11  
 2014 Duke University, Fifth Annual Triangle Law and Economics Conference, Rethinking Regulation and Reform: Behavioral Economics and the Regulatory State, Durham, NC, April 11  
 2014 Vanderbilt University, Nashville, TN, April 14  
 2014 University of Virginia, Department of Psychiatry Grand Rounds, Charlottesville, VA, April 29  
 2014 University College London, Max Planck Summer School, Crowd Cognition, London, UK, July 9-11  
 2014 George Washington University, Children's National Medical Center, Keynote Speaker, Washington, D.C., October 14  
 2014 Smart Approaches to Marijuana (SAM) Conference, Virginia Tech Carilion Research Institute, Roanoke, VA, November 3

2013 Institute of Medicine of the National Academies, Accelerating Therapeutic Development for Nervous System Disorders Toward First in Human Trials, Washington, D.C., April 8  
 2013 Randolph Macon College, Mike McKay Annual Lecture on the Mind, Ashland, VA, April 11  
 2013 Society for Experimental Biology and Medicine, New experimental approaches to human brain function in health and disease Symposium, Boston, MA, April 21  
 2013 Temple University, Annual Interdisciplinary Symposium on Decision Neuroscience, Philadelphia, PA, May 5  
 2013 University College London, Implications of Research on the Neuroscience of Affect, Attachment, and Social Cognition Conference, May 18-19  
 2013 Annual Meeting of the Research Society on Alcoholism, Grand Cypress, FL, June 23  
 2013 Workshop on the Mechanism of Brain and Mind, Nagoya Congress Center, Aichi, Japan, August 30  
 2013 Salem Veterans Affairs Medical Center, Salem, VA, September 3  
 2013 Translational Neuromodeling Unit Symposium, Redefining Disease Concepts in Psychiatry: A "Hilbert List" for Translational Research, Zurich, Switzerland, September 18-20  
 2013 University of Pennsylvania, Perelman School of Medicine, Philadelphia PA, October 31

2012 University of Cambridge, Medical Research Council Cognition and Brain Sciences Unit, Cambridge, UK, Jan 19  
 2012 St. Andrew's School, Middletown, DE, Feb 10  
 2012 Stanford University, Stanford Center for Mind, Brain and Computation, Stanford CA, Feb 29  
 2012 DSRC/DARPA, George Mason University, Fairfax, VA, What is information in the Brain, March 15  
 2012 University of Nottingham, School of Psychology, Nottingham, UK, March 21  
 2012 Virginia Psychological Association, Roanoke, VA, April 6  
 2012 Yale University, School of Medicine, New Haven, CT, April 11  
 2012 TEDGlobal 2012, Radical Openness Conference, Edinburgh, Scotland June 27  
 2012 Korea Brain Research Institute, Daegu, South Korea, September 24  
 2012 Society for Neuroeconomics, Key Biscayne, FL, September 28  
 2012 Dynamical Neuroscience XX, Collective Cognition: The Neurophysiology of Social Neuroscience, New Orleans, LA, Oct 11  
 2012 William R. and Irene D. Miller Lectureship, Cold Spring Harbor Laboratory, Laurel Hollow, NY, October 23

2011 Yonsei University, College of Medicine, Motivation and Reward Studies in Social Neuroscience, Seoul, Korea, Feb 25  
 2011 Raymond and Beverly Sackler USA-UK Scientific Forum: Neuroscience and the Law, Irvine, CA, March 2-3  
 2011 EmSense Corporation, NeuroMetric Market Behavior Prediction using Movie Trailers, New York, NY, March 21

2011 University of Texas Southwestern Medical Center, Ethics Grand Rounds, Dallas TX, April 11-12  
 2011 Harvard University, Safra Symposium on the Scientific Basis of Conflict of Interest: The Role of Implicit Cognition, Cambridge, MA, April 12-14  
 2011 Duke University, Transcending the Boundaries Symposium, Free Will and Responsibility, Durham, NC, April 14-16  
 2011 NIH Seminar Series, Neuroeconomic Approaches to Mental Disorders, Bethesda, MD, May 2  
 2011 Association for Behavior Analysis International, B. F. Skinner Lecture, Denver, CO, May 30  
 2011 University College London, Gatsby Computational Neuroscience Unit, June 13  
 2011 Temple University, Annual Interdisciplinary Symposium on Decision Neuroscience, Philadelphia, PA, Sept 16-18  
 2011 Society for Neuroeconomics, Evanston, IL, Sept 30-Oct 2  
 2011 University of Zurich, Foundations of Human Social Behavior, Zurich, Switzerland, Dec 8  
  
 2010 NIDA Exploring Interconnections Workshop, Bethesda, MD, Jan 13  
 2010 Grand Rounds, UT Southwestern Medical Center, Dallas, TX, Jan 20  
 2010 Yonsei University, College of Medicine, Seoul, Korea, Feb 26 - 27  
 2010 The Interventional Centre, Rikshospitalet, Oslo, Norway, March 25  
 2010 UC Davis Neuroscience Seminar Series, Davis, CA, April 8  
 2010 7th Annual Skoll World Forum, University of Oxford, UK, April 14-16  
 2010 Biological Sciences Advising Center, University of Texas at Austin, TX, April 28  
 2010 NCCAM Advisory Council Strategic Planning Meeting, Bethesda, MD, Jun 3  
 2010 Mount Sinai Brain Institute Translational Neuroscience Seminar Series, New York, NY, Jun 17  
 2010 Computational Neuroscience Meeting, San Antonio, TX, Jul 27-28  
 2010 Chinese-American Kavli Frontiers of Science Symposium, Irvine, CA, Sept 23-24  
 2010 Dean's Distinguished Lecture, University of Arkansas for Medical Sciences, Little Rock, AR, Oct 12  
 2010 Adolescent Psychiatry Meeting, New York, NY, Oct 28-29  
 2010 Southern Economic Association, Atlanta, GA, Nov 20-22  
 2010 The Neurobiology of Political Violence: New tools, New Insights Conference, Silver Springs, MD Dec 1-2  
  
 2009 American Neuropsychiatric Association, San Antonio, TX, Feb 19-22  
 2009 Computational and Systems Neuroscience meeting (Cosyne09), Salt Lake City, UT, Feb 26-March 1  
 2009 Plenary Grand Rounds, Neuroscience, Medical University of South Carolina, Charleston, SC, March 4-5  
 2009 Central Virginia Chapter of the Society for Neuroscience Symposium, Richmond, VA, March 12-13  
 2009 Psychogenic Movement Disorders and Related Conversion Disorders Conference, Washington, DC, April 3  
 2009 Neuroeconomics Summit (invited by Al Gore), New York, NY, May 1  
 2009 Center for Lifespan Psychology, Max Planck Institute for Human Development Colloquium Series, Berlin, Germany, May 3-7  
 2009 NIH Roadmap Meeting on the Science of Behavior Change, Bethesda, MD, Jun 15-16  
 2009 Wellcome Trust, Centre for Neuroimaging Brain Meeting Series, London, Jul 24  
 2009 International Society for the Study of Personality Disorders, New York, NY, Aug 21  
 2009 Oregon Health and Science University, Portland, Oregon Aug 25  
 2009 Tools for Recognizing Unconscious Signals of Trustworthiness Workshop, Arlington, VA, Sept 29  
 2009 Mind Science Foundation, San Antonio, TX, Oct 26  
 2009 American College of Neuropsychopharmacology, Hollywood, FL, Dec 8  
 2009 Neuroscience Research Seminar, John Hopkins University, Baltimore, MD, Dec 10  
  
 2008 Neuroeconomics Decision Making and the Brain Symposium, New York University, New York, NY Jan 11-13  
 2008 University of Arizona Colloquium Series, Psychology Department, Tucson, AZ, Feb 1  
 2008 Edwin Gildea Lecture, Dept. of Psychiatry, Washington University, St. Louis, MO, Feb 12  
 2008 Imaging Imagining-National Institute of Mental Health and the National Institute on Drug Abuse Workshop, Rockville, Maryland, Feb 20-21  
 2008 Institute of Medicine's Forum on Neuroscience and Nervous System Disorders workshop, "From Molecules to Mind: Challenges for the 21st Century." Washington, DC, Jun 25  
 2008 SRC/NSF/ITRS Forum on 2020 Computing: Virtual Immersion Architectures, Seymour Marine Discover Center, University of California, Santa Cruz, CA, Jul 10-11  
 2008 Wellcome Trust Centre for Neuroimaging, Institute of Neurology, University College London, Jul 21-25th  
 2008 Forum on Conflict of Interest in Academe, Mayo Clinic, Rochester, MN, Sept 14-16  
 2008 Weill Medical College of Cornell University, New York, NY, Sept 25  
 2008 Neuroimaging in Obesity Research, National Institutes of Health, Bethesda, MD, Oct 27  
 2008 AAMC, Group on Institutional Advancement, San Antonio, TX, Nov 2  
 2008 Trilience Conference, California Institute of Technology, Pasadena, CA, Nov 18-19  
 2008 Roadmap to Define Neurobiological Mechanisms of Political Conflict, Arlington, VA, Dec 15-16  
  
 2007 Winter Conference on Brain Research, Snowmass Village, CO, Jan 22-Feb 2  
 2007 Wellcome Trust, Computational Neuroscience Frontiers Meeting, London, Apr 16-17  
 2007 University of Alabama Birmingham, Apr 29-May 1  
 2007 Cognitive Neuroscience Society Annual Meeting, New York, May 5-6  
 2007 Reciprocity and Influence, AAMC, Washington Marriott, Washington, DC, Jun 12  
 2007 International Society for New Institutional Economics conference, Reykjavik, Iceland, Jun 21-23  
 2007 Gordon Research Conference, Salve Regina University, Newport, Rhode Island, Jul 1-6  
 2007 NIDA Science Meeting- Social Neuroscience: Developing More Powerful Behavioral Interventions, Oct 1-2

- 2007 Annual Keck Center Research Conference, Southshore Harbor Conference Center, League City, Oct 11-12  
2007 Keynote Speaker-Computational Cognitive Neuroscience Conference, San Diego, CA, Nov 1  
2007 37<sup>th</sup> Annual Society for Neuroscience Meeting, San Diego, CA, Nov 3-7  
2007 NINDS - A Blue Sky Vision for the Future of Neuroscience: Expert Panel, Washington, D.C., Nov 13-14  
2007 Massachusetts Institute of Technology, Cambridge, MA, Nov 30  
2007 Harvard University, Department of Economics, The Behavior and Experimental Economics Workshop, Dec 11

**PUBLICATIONS** (for downloadable versions see <http://research.vtc.vt.edu/employees/read-montague/publications/>)

- Montague PR, Friedlander MJ. (1989). Expression of an intrinsic growth strategy by mammalian retinal neurons. **Proceedings of the National Academy of Sciences (USA)** 86:7223-7227.
- Gally JA, Montague PR, Reeke GN, Edelman GM. (1990). The NO hypothesis: possible effects of a short-lived rapidly diffusible signal in the development and function of the nervous system. **Proceedings of the National Academy of Sciences (USA)** 87:3547-3551.
- Montague PR, Gally JA, Edelman GM. (1991). Spatial signaling in the development and function of neural connections. **Cerebral Cortex** 1(3):199-220.
- Montague PR, Friedlander MJ. (1991). Morphogenesis and territorial coverage by isolated mammalian retinal ganglion cells. **Journal of Neuroscience** 11(5):1440-1457.
- Montague PR, Dayan P, Sejnowski TJ. (1993). Volume learning: Signaling covariance through neural tissue, In: J. Bower and F. Eeckman (Eds.) *Computation and Neural Systems* (pp. 377-382). Norwell, MA: Kluwer Academic Publishers.
- Montague PR, Dayan P, Nowlan SJ, Pouget A, Sejnowski TJ. (1993). Using aperiodic reinforcement for directed self-organization. **Advances in Neural Information Processing Systems** 5:969-976. San Mateo CA: Morgan Kaufmann Publishers.
- Montague PR. (1993). Transforming sensory experience into structural change. **Proceedings of the National Academy of Sciences (USA)** 90(14):6379-6380.
- Montague PR (1993). The NO hypothesis. *Encyclopedia of Neuroscience* (supp 3, pp. 100-103). Birkhauser: Cambridge, MA
- Montague PR, Gancayco CD, Winn M, Marchase RB, Friedlander MJ. (1994). Role of NO production in NMDA receptor-mediated neurotransmitter release in cerebral cortex. **Science** 263:973-977.
- Montague PR, Sejnowski TJ. (1994). The predictive brain: temporal coincidence and temporal order in synaptic learning mechanisms. **Learning and Memory** 1(1):1-33.
- Montague PR, Dayan P, Sejnowski TJ. (1994). Foraging in an Uncertain Environment Using Predictive Hebbian Learning. **Advances in Neural Information Processing Systems** 6:598-605. San Mateo CA: Morgan Kaufmann Publishers.
- Sejnowski TJ, Dayan P, Montague PR. (1995). Predictive hebbian learning. **Proceedings of Eighth ACM Conference on Computational Learning Theory**, Santa Cruz, CA, USA. New York, NY, pp. 15-18.
- Montague PR. (1995). Integrating information at single synaptic connections. **Proceedings of the National Academy of Sciences (USA)** 92:2424-2425.
- Montague PR, Dayan P, Person C, Sejnowski TJ. (1995). Bee foraging in uncertain environments using predictive Hebbian learning. **Nature** 377:725-728. [commentary: *Nature. The bee's needs, Douglas RJ (1995)*].
- Person C, Egelman DM, King RD, Montague PR. (1996). Three-dimensional synaptic distributions influence neural processing through the resource consumption principle. **Journal of Physiology (Paris)** 90(5-6):323-325.
- Montague PR. (1996). The Resource Consumption Principle: attention and memory in volumes of neural tissue. **Proceedings of the National Academy of Sciences (USA)** 93(8):3619-3623.
- Montague PR. (1996). General properties of the resource consumption principle of neural function. **Journal of Physiology (Paris)** 90(3-4):239-242.
- Montague PR, Dayan P, Sejnowski TJ. (1996). A Framework for Mesencephalic Dopamine Systems Based on Predictive Hebbian Learning. **Journal of Neuroscience** 16(5):1936-1947.
- Schultz W, Dayan P, Montague PR. (1997). A neural substrate of prediction and reward. **Science** 275:1593-1599. doi: 10.1126/science.275.5306.1593.

- Goodhill GJ, Bates KR, Montague PR. (1997). Influences on the global structure of cortical maps. *Proceedings of the Royal Society London B* 264:1-7.
- Montague PR. (1997). The cerebral code is still encrypted. A review of the The Cerebral Code. *Journal of Chemical Neuroanatomy* 14(1):67-68.
- Montague PR. (1997). Biological substrates of predictive mechanisms in learning and action choice. In J. Donahoe (Ed.), *Neural-Network Approaches to Cognition - Biobehavioral Foundations* (pp. 406-421). Elsevier Science Publishers.
- Montague PR, Dayan P. (1998). Neurobiological modeling: squeezing top down to meet bottom up. In W. Betchel and G. Graham (Eds.), *A Companion to Cognitive Science* (pp. 526-542). Oxford: Blackwell.
- Egelman DM, King RD, Montague PR. (1998). Interaction of nitric oxide and external calcium fluctuations: a possible mechanism for rapid information retrieval. *Progress in Brain Research* 118:199-211.
- Egelman DM, Person C, Montague PR. (1998). A computational role for dopamine delivery in human decision-making. *Journal of Cognitive Neuroscience* 10(5):623-630.
- Egelman DM, Montague PR. (1998). Computational properties of peri-dendritic calcium fluctuations. *Journal of Neuroscience* 18(21):8580-8589.
- Montague PR. (1999). Review of Reinforcement Learning: An Introduction. *Trends in Cognitive Science* 3(9):360-61.
- Montague PR, Quartz SR. (1999). Computational approaches to neural reward and development. *Mental Retardation & Developmental Disabilities Research Reviews* 5:86-99. doi: 10.1002/(SICI)1098-2779(1999)5:1<86::AID-MRDD9>3.0.CO;2-K.
- Egelman DM, Montague PR. (1999). Calcium dynamics in the extracellular space of mammalian neural tissue. *Biophysical Journal* 76(4):1856-1867.
- Dayan P, Kakade S, Montague PR. (2000). Learning and Selective Attention. *Nature Neuroscience* 3(suppl):1218-1223.
- King RD, Wiest M, Eagleman D, Montague PR. (2000). Do extracellular calcium signals carry information through neural tissue? *Trends in Neuroscience* 23(1):12-13.
- Wiest MC, Eagleman DM, King RD, Montague PR. (2000). Dendritic spikes and their influence on extracellular calcium signaling. *Journal of Neurophysiology* 83(3):1329-1337.
- Berns GS, McClure SM, Montague PR. (2001). Predictability modulates human brain response to reward. *Journal of Neuroscience* 21(8):2793-2798.
- Perrett SP, Dudek SM, Eagleman DM, Montague PR, Friedlander, MJ. (2001). LTD induction in adult visual cortex: role of stimulus timing and inhibition. *Journal of Neuroscience* 21(7):2308-2319.
- King RD, Wiest MC, Montague PR. (2001). Extracellular calcium depletion as a mechanism for short-term synaptic depression. *Journal of Neurophysiology* 85(5):1952-1959.
- Montague PR. (2002). Uniting the Confederation. *Trends in Neuroscience* 25(11):595-596. doi: 10.1016/S0166-2236(02)02282-8.
- Montague PR, Eagleman DM, McClure, SM, Berns, GS. (2002). Reinforcement Learning. *Encyclopedia of Cognitive Science* (pp. 908-913). London: Macmillan Publishers Ltd.
- Montague PR, Berns GS. (2002). Neural Economics and the biological substrates of valuation. *Neuron* 36:265-284. doi: 10.1016/S0896-6273(02)00974-1.
- Eagleman DM, Montague PR. (2002). Models of learning and memory. *Encyclopedia of Cognitive Science* (pp. 806-812). New York: MacMillan Publishers Ltd.
- 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):1159-1164. doi: 10.1006/nimg.2002.1150.
- Pagnoni G, Zink CF, Montague PR, Berns GS. (2002). Activity in human ventral striatum locked to errors in reward prediction. *Nature Neuroscience* 5(2):97-98. doi:10.1038/nn802.
- Montague PR. (2003). Uncertainty Rules. *Nature* 424:371-372. doi: 10.1038/424371a.
- McClure SM, Berns GS, Montague PR. (2003). Temporal prediction errors in a passive learning task activate human striatum. *Neuron* 38(2):339-346. doi:10.1016/S0896-6273(03)00154-5. [commentary: *Neuron*. The principles of pleasure prediction, Braver and Brown (2003). doi:10.1016/S0896-6273(03)00230-7].

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- McClure SM, York MK, Montague PR. (2004). The neural substrates of reward processing in humans: the modern role of functional magnetic resonance imaging. *The Neuroscientist* 10(3):260-268. doi: 10.1177/1073858404263526.
- McClure SM, Li J, Tomlin D, Cypert KS, Montague LM, Montague PR. (2004). Neural correlates of behavioral preference for culturally familiar drinks. *Neuron* 44:379-387. doi: 10.1016/j.neuron.2004.09.019.
- Montague PR, McClure SM, Baldwin PR, Phillips PEM, Budygin EA, Kilpatrick M, Stuber G, Wightman RM. (2004). Dynamic gain control of dopamine delivery in freely moving animals. *Journal of Neuroscience* 24(7):1754-1759. doi: 10.1523/JNEUROSCI.4279-03.2004.
- Montague PR, Hyman SE, Cohen JD. (2004). Computational roles for dopamine in behavioural control. *Nature* 431:760-767. doi: 10.1038/nature03015.
- King-Casas B, Tomlin D, Anen C, Camerer CF, Quartz SR, Montague PR. (2005). Getting to know you: Reputation and Trust in a two-person economic exchange. *Science* 308:78-83. doi: 10.1126/science.1108062. [commentary: *Neuroscience. Economic game shows how the brain builds trust, Miller (2005)*. doi: 10.1126/science.308.5718.36a].
- Li J, McClure SM, King-Casas B, Montague PR. (2006). Policy Adjustment in a Dynamic Economic Game. *PLOS ONE* 1(1):e103. doi: 10.1371/journal.pone.0000103.
- Stetson C, Cui X, Eagleman DM, Montague PR. (2006). Motor-sensory recalibration leads to an illusory reversal of action and sensation. *Neuron* 51:651-659. doi: 10.1016/j.neuron.2006.08.006.
- Montague PR, King-Casas B, Cohen JD. (2006). Imaging valuation models in human choice. *Annual Review of Neuroscience* 29:417-448. doi: 10.1146/annurev.neuro.29.051605.112903.
- Tomlin D, Kayali MA, King-Casas B, Anen C, Camerer CF, Quartz SR, Montague PR. (2006). Agent-specific responses in cingulate cortex during economic exchanges. *Science* 312:1047-1050. doi: 10.1126/science.1125596.
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#### **Books:**

*Why Choose This Book?* by Read Montague, (Dutton Press, Penguin Group) published November 2, 2006.

### **STUDENT AND POSTDOCTORAL TRAINING**

**Ph.D. Students (1996-present):** Sarah Carr; Josepheen Cruz; Xu Cui; David Eagleman; Ann Harvey; Gecia Hermsdorff; Richard King; Misha Koshelev; Jian Li; James Lu; Samuel McClure; Damon Tomlin; Richard Wiest; Ting Xiang

**Postdoctoral Fellows (2000-present):** Woo-Young Ahn, Ph.D.; Phillip Baldwin, Ph.D.; Srinivasa Chakravarthy, Ph.D.; Pearl Chiu, Ph.D.; Kimberlee D'Ardenne, Ph.D.; Jonathan Downar, Ph.D.; Geoffrey Goodhill, Ph.D.; Xiaosi Gu, Ph.D.; Santosh Helekar, Ph.D.; Sebastien Hetu, Ph.D.; Kevin Hill, Ph.D.; Andreas Hula, Ph.D.; Amin Kayali, Ph.D.; Brooks King-Casas, Ph.D.; Ulrich Kirk, Ph.D.; Kenneth Kishida, Ph.D.; Brie Linkenhoker, Ph.D.; Laura Lomax-Bream, Ph.D.; Brandi Mattson, Ph.D.; Ignacio Saez, Ph.D.; Carla Sharp, Ph.D.; Alireza Soltani, Ph.D.; Alec Solway, Ph.D.; Lane Strathearn, Ph.D.; Iris Vilares, Ph.D.; Michael Wesley, Ph.D.; Dongni Yang, Ph.D.; Albo Zimbul, Ph.D.

### **SOFTWARE DEVELOPMENT BY THE MONTAGUE GROUP**

**1982** (undergraduate) Developed computational methods for rapid *ab initio* calculations to estimate molecular orbital cross sections in ethane. Programs written in FORTRAN 77 and run on IBM 370.

**1984-85** (medical student) Developed optimization programs for fitting multidimensional models to datasets derived from recordings of neuronal units from mammalian visual cortex. Program ran online under RT-11, DEC's real time operating system. Developed optimization programs for re-alignment and three dimensional reconstruction of stacked electron micrographic sections.

**1986-1988** (graduate student) Developed computer programs to perform automatic calculation of Hausdorff dimension (one kind of fractal dimension) of neuronal structures – programs written in C, C++, and assembly code. Outcome of this work was communicated to Proceedings of National Academy of Sciences by Torsten Wiesel.

**1989** (postdoctoral fellow) Developed neural network simulation and simulation environment. Received patent 5,485,546 for the methods by which the simulations learn from experience. In the neuroscience community, the learning rule is now known as 'volume learning'. Also developed algorithms for mapping spatial problems onto massively parallel supercomputers. In particular, a fast method for mapping problems onto hypercube topologies (e.g. N-Cube computer) was developed. Program also allowed the growth and development of volumes of neural tissue. This work was carried out in collaboration with Gerald M. Edelman (Rockefeller University, New York, NY).

**1991** Developed reinforcement learning algorithm to explain foraging behavior in bees. Developed learning algorithms to explain self-organized development of the visual cortex. Implemented in C on Sun, Silicon Graphics workstations. Also ported to parallel Intel Paragon computer (512 processors).

**1993** Developed virtual environment simulation in which a simulated bee moved about and foraged on a simulated field of flowers. The entire world was dynamic with the bee gathering sensory information while moving and learning to improve its foraging behavior. The simulated field also grew and changed. This work was profiled in Nature magazine, Time magazine, New York Times, London Daily Telegraph, and other major journalistic outlets. Code written in C and implemented on Silicon Graphics workstations.

**1996** Developed new simulation environment for estimating calcium dynamics in the extracellular space of mammalian neural tissue. This simulation used a combination of Monte Carlo and finite difference techniques and was written in C. It is now being ported to a Java implementation for use over the web.

**1998** Developed model of human economic decision-making using Java program that samples human's decision-making performance and predicts future performance. Also, developed Java simulation of fluctuations of dopamine delivery to brain tissue. Dopamine systems are those hijacked by drugs of abuse. This work was profiled on a PBS special, New York Times Science Section, Japanese News Magazine (Fuji Television Network), and other news outlets.

**2000** Designed and implemented a method for linking ongoing fMRI scanning experiments over the web (**hyperscanning**). This software is written in Java. Pilot 'linked scanner' experiments have now been carried out at Emory University and Princeton University.

**2002-2003** Led development of full web-based Hyperscan software that allows for simultaneous brain scanning of behaviorally interacting subjects. This software has made possible the simultaneous study of socially interacting brains. This project is organized through the Human Neuroimaging Laboratory at Baylor College of Medicine. It is an open source project with release scheduled for fall 2003. The software modules for remotely executing, monitoring, and analyzing functional MRI experiments will be included in the release.

**2005** March 15, 2005. Open source release of hyperscan software (called NEMO) for remote synchronization, control, and viewing of fMRI experiments (see <http://labs.vtc.vt.edu/hnl/nemo> ). May 31, 2005 – First inter-continental hyperscan experiment using two-person trust exchange, Baylor College of Medicine and Hong Kong University of Science and Technology. July 5, 2005 – Second intercontinental hyperscan experiment, Baylor College of Medicine and Universitat Ulm.

**2006** Graphical user interface development and generalization of NEMO into a multi-user, multi-site tool for interactive social exchange experiments.