***Birthplace:*** Winnipeg, Canada, June 5, 1972

***Citizenship:*** US

***Education:*** PhD, Neuroscience, University of California, San Francisco (2001).

BA, Psychology/Mathematics, Reed College (1995).

***Positions held:***

2012 – present Co-director, Grossman Center for the Statistics of Mind, Columbia University, New York, NY.

2011 – present Assistant Professor, Department of Neuroscience, Kavli Institute for Brain Science, Columbia University Medical Center, New York, NY.

2008 – 2011 Research Associate, Laboratory of Krishna V Shenoy, Stanford University.

2001 – 2008 Postdoctoral Fellow, Laboratory of Krishna V Shenoy, Stanford University.

1995 – 2001 Graduate student, Laboratory of Stephen G Lisberger, University of California San Francisco.

***Research:*** Electrophysiological and behavioral study of the neural events that initiate and generate voluntary movement.

***Postdoctoral research:*** Electrophysiological study of the neural basis of movement planning and execution.

***Doctoral research:*** Electrophysiological study of visual motion processing and ocular smooth pursuit.

***Awards and honors:***

Klingenstein-Simons Fellowship Award (2015)

McKnight Scholar Award (2013)

Sloan Research Fellow (2013)

NIH Director's New Innovator Award Program (2012-2017)

Searle Scholars Program (2012-2015)

Sammy Kuo Award (best neuroscience paper from Stanford, 2010)

Burroughs Wellcome Fund Career Award in the Basic Biomedical Sciences (2006-2012)

Helen Hay Whitney Foundation Research Fellowship (2003-2006)

National Defense Science and Engineering Graduate Fellowship (1995-1998)

National Science Foundation Graduate Research Fellowship (1995)

Phi Beta Kappa (1995)

Barry M Goldwater Excellence in Education Scholarship (1994)

***Professional Service:***

Society for Neuroscience Committee on Animals in Research 2019-2022

Grant review, German Research Foundation, 2019

NIH / NSF CRCNS study section, March 18-19$^{th}$ 2019

Grant review, United States – Israel Binational Science Foundation, 2016

Grant review, German-Israeli Foundation for Scientific Research and Development, 2014

NIH study section, *ad hoc* reviewer July 16th 2013

NSF study section *ad hoc* reviewer 2012

NIH SMI study section, June 13th 2012

*COSYNE* (Computational and Systems Neuroscience) annual meeting program committee 2010, 2011.

Reviewing for*: Science, Nature, Nature Neuroscience, Nature Communications, Neuron, Journal of Neuroscience, eNeuro, Journal of Neurophysiology, eLife, Cerebral Cortex, TINS, Journal of Computational Neuroscience, Vision Research, Behavioral Brain Research, Proceedings of the Royal Society, PNAS*

***Professional Memberships:*** Society for Neuroscience, Society for the Neural Control of movement.

***Teaching:***

Practical analysis of extracellular recordings (G4800), 2017, 2020.

Introduction to MATLAB programming, Neuroscience Bootcamp, 2016.

Instructor, Data Analysis (NBHV G6030), Columbia University, 2016, 2017.

Instructor, Cold Spring Harbor Laboratory Asia Computational and Cognitive Biology Summer School, Beijing China, 2013.

Panelist and discussant, *'Neuroscience and History' working group*, Columbia University, 2013.

Lecturer, Developmental and Systems Neurobiology (BIOL W3005) Columbia University, 2013, 2014, 2018.

Lecturer, Biology of Neurologic and Psychiatric Disorders (G4100) Columbia University, 2014, 2015.

***Workshops organized:***

Quantifying structure in large neural datasets, *Grossman Center for the Statistics of Mind* annual workshop, Sept 26-27, 2019, Aspen Center for Physics, Aspen, CO.

Quantifying structure in large neural datasets, *Grossman Center for the Statistics of Mind* annual workshop, Sept 26-27, 2018, Aspen Center for Physics, Aspen, CO.

Quantifying structure in large neural datasets, *Grossman Center for the Statistics of Mind* annual workshop, April 20-21, 2017, Columbia University, New York, NY.

Quantifying structure in large neural datasets, *Grossman Center for the Statistics of Mind* annual workshop, May 26-27, 2016, Columbia University, New York, NY.

Quantifying structure in large neural datasets, *Grossman Center for the Statistics of Mind* annual workshop, Sept 22-23, 2014, Columbia University, New York, NY.

Quantifying structure in large neural datasets, *Grossman Center for the Statistics of Mind* annual workshop, Oct 16-18, 2013, Columbia University, New York, NY.

Recurrent neural networks and motor control, *COSYNE*, March 1, 2011, Snowbird, Utah

Neural variability and movement variability. *COSYNE*, March 2-3 2009, Snowbird, Utah.

***Public (general audience) lectures & appearances***

The neural dynamics underlying voluntary movement. *Celebration of the work of Patrick Suppes*. May 2nd, 2013. Faculty House, Columbia University.

Motion from rhythm. *New York Times R&D Seminar Series*. October 24th, 2012, New York, NY.

Motion from rhythm. *Frontiers of the Mind Seminar Series*. May 8th 2012, New York, NY.

The science studio, *Science network video series*, 2010.

***Keynote Talks:***

Opening talk, III Neurobiology Meeting of the Mexican Society for Biochemistry. *Guanajuato, México*, September 22-25, 2019

The neural dynamics of movement generation, Temporal Dynamics of Learning Meeting, *UC San Diego,* La Jolla, CA, February 7-9, 2013.

***Invited Seminars and Presentations:***

(Upcoming) *Neurobiology of Cognition Gordon Research Conference (GRC)*. July 26-31, 2020, Sunday River Resort, Newry, ME.

(Upcoming) Student-invited speaker, *Departmental Seminar, Department of Neuroscience, Washington University School of Medicine*. May 6, 2020.

(Upcoming) *Stanford Neuroscience Institute Seminar Series, Stanford University*, Winter 2020.

(Upcoming) *Departmental Seminar, Solomon H. Snyder Department of Neuroscience, Johns Hopkins University*. December 12, 2019.

Leveraging theory to understand and predict cortical activity during movement. *FENS Brain Conferences: Dynamics of the brain: temporal aspects of computation*. June 9-12, Rungstedgaard, Denmark.

Leveraging theory to understand motor cortex activity. *Tokyo Hand Meeting*. April 21st, 2019. Faculty of Education, Hongo Campus, University of Tokyo, Tokyo, Japan.

Leveraging theory to understand the motor cortex population response. *Swartz Seminar Series for Computational Neuroscience, Center for Neural Science*. September 21st, 2018. New York University, New York NY.

Motor cortex embeds muscle-like commands in an untangled population response. *Mechanisms of Dexterous Behavior.* May 13-16, Janelia Research Campus, VA.

Why motor cortex responses don't obey expectations. *Carnegie Mellon University, Department of Electrical & Computer Engineering Seminar Series*. March 22, 2018, Pittsburgh PA.

Motor cortex embeds muscle-like commands in an untangled population response. *University of Montreal Dept. of Neuroscience Seminar Series,* October 13, 2017, Montreal, Canada.

Motor cortex embeds muscle-like commands in an untangled population response. *Neural Coding, Computation and Dynamics (NCCD)* September 17-20, 2017, Capbreton, France.

Motor cortex is a disentangled code for muscle activity. *Progress in Motor Control XI,* July 19-20, 2017, Miami Marriott Biscayne Bay Hotel, Miami, Florida.

How does motor cortex activity relate to movement? The enduring challenge of reversing causality. *Kavli Salon*, January 20th 2017, Hotel Nacional, Havana, Cuba

You should look before you leap… but must you prepare before you move? *CNEURO Symposium*, January 19th 2017, Cuban Neuroscience Center, Havana, Cuba

The neural events preceding voluntary movement. *University of California at Santa Barbara SAGE lecture*. February 17th 2016, Santa Barbara CA

The neural events preceding voluntary movement. *Caltech Computation and Neural Systems Program Seminar Series*. Dec. 7th, 2015. Pasadena CA

The neural events preceding voluntary movement. *Stanford Neurosciences Graduate Program Retreat*. October 23-25, 2015, Hopkins Marine Station, Pacific Grove, CA

How your brain generates voluntary movement. *Simons Foundation Conference on Theory & Biology*, April 17th 2015, New York NY

Initiating and generating patterns of activity for movement. *Department of Neuroscience Seminar Series*, University of Geneva, January 30th, 2015.

A Neural Signature of Movement Initiation. *Neurobiology of Cognition. Gordon Research Conference. Circuits, Dynamics, Action and Perception*. July 20-25, 2014 Sunday River Resort Newry, ME

Many movements, one trigger? *AREADNE 2014*, Santorini, Greece, 25-29 June 2014.

The neural basis of voluntary movement initiation. *LXXIX Cold Spring Harbor Symposium on Quantitative Biology: Cognition.* May 28–June 2, 2014

The neural dynamics of movement generation. *Neurosciences Seminar Series*, UCSD, San Diego CA, May 13, 2014.

A neural signature of movement initiation, *Center for Brain Science Seminar Series*, Harvard University. April 22nd, 2014.

The neural dynamics of movement generation, *Neuroscience Institute Seminar Series*, Princeton University. April 10th, 2014.

The neural dynamics of movement generation, *Neurobiology Seminar Series*, Duke University. March 19th, 2014.

The neural dynamics of movement generation, *Neurobiology Seminar Series*, Harvard Medical School. January 27th, 2014.

A neural signature of movement initiation, *The Assembly and Function of Neuronal Circuits*, 29th September 4th - October, 2013, Monte Verità, Ascona, Switzerland.

A neural signature of movement initiation, *EPFL Life Science Symposium 2013 – Motor Control*, August 29th, 2013, Lausanne, Switzerland.

The neural dynamics of movement generation, *University of Newcastle Neuroscience Seminar Series*, June 20th, 2013, Newcastle England.

The neural dynamics of movement generation, *Temporal Dynamics in Learning: Networks and Neural Data*, Janelia Farm, May 14th, 2013.

The neural dynamics of movement generation, *Cold Spring Harbor Neuroscience Seminar Series*, Cold Spring Harbor, NY, March 15th, 2013.

The neural dynamics of movement generation, *Queen's University*, Canada, February 6th, 2013.

The neural dynamics of movement generation, *Swartz Seminar Series, Yale University*, January 25th, 2013

The neural dynamics of movement generation, *Janelia Farm Systems Neuroscience Seminar Series*, Janelia Farm, Ashburn VA, Nov 14th 2012.

The neural dynamics of movement generation. *Champalimaud Neuroscience Programme Seminar Series, Champalimaud Centre for the Unknown*, September 6th, 2012.

Analysis of neural dynamics. *Swartz/Janelia/Gatsby Workshop on dimensionality reduction methods*. HHMI Janelia Farm Research Campus, Ashburn VA, July 25-27 2012.

Motion from rhythm. *Columbia University Dept. of Psychiatry Grand Rounds.* New York NY, July 20, 2012.

How the motor cortex plans and generates movement. *Telluride Neuromorphic Cognition Engineering Workshop 2012*. July 1-21, 2012, Telluride, Colorado.

Primate motor cortex: a *central*, central pattern generator? *28th Symposium on the Computational Foundations of Perception and Action.* University of Rochester. June 1, 2012.

Motor cortex and the dynamics of neural pattern generation. Boston University Seminar Series. April 6th, 2012.

Motor cortex and the dynamics of neural pattern generation. Johns Hopkins School of Medicine. February 16, 2012.

A conserved principle underlying movement generation. *The Neural Basis of Motor Control*, HHMI Janelia Farm Research Campus. Oct. 30 – Nov. 2, 2011.

Visualizing the neural correlate of decisions in real time. *Meeting of Gatsby Neuroscience Grantees*. London, UK, Oct 17-19, 2011.

Motor cortex and the dynamics of neural pattern generation. *Columbia Neuroscience Program* Semi-Annual Retreat. Mohonk Mountain House, Sept. 10, 2011.

Stimulus onset quenches neural variability: a widespread cortical phenomenon *Meeting on Neuronal Response Variability and Cortical Computation* The Banbury Center, Cold Spring Harbor Laboratory, April 3-6, 2011

Conserved principles of movement generation: a dynamical systems perspective. *U Penn Bioengineering Seminar Series*. Philadelphia PA, March 30, 2011

Conserved principles of movement generation. *Craik Club Seminar*. Cambridge University. Feb 11, 2011.

Conserved principles of movement generation. *Institute of Movement Neuroscience & Sobell Department of Motor Neuroscience and Movement Disorders (UCL) seminar series.* University College London. Feb 8, 2011.

Motor cortex: the central, central pattern generator. Seminar, University of Texas at Austin, Dec 16, 2009.

Motor cortex: the central, central pattern generator. Seminar, University of Pittsburgh, Pittsburgh PA, Oct 6, 2009.

Quantifying neural variability (in Neural Computation and Statistical Analysis of Neural Data). *Biomedical Engineering Society annual meeting.* Pittsburgh PA, Oct 7-10, 2009.

A pan-cortical stimulus-driven decline in neural variability. *Columbia University Center for Theoretical Neuroscience weekly seminar*. June 26, 2009

Motor control: dynamics versus tuning. (plenary lecture) *Coherent Behavior in Neuronal Networks Workshop*, October 17-20, 2007. Mallorca, Spain.

Neural dynamics during movement preparation and generation. *Smith-Kettlewell Colloquium.* Smith Kettlewell Eye Research Institute. April 12, 2007.

Neural dynamics during movement preparation and generation: data and ideas. *Neurobiology Seminar series, Columbia School of Physicians and Surgeons*, Columbia University. February 2, 2006.

Motor preparation and voluntary movement. *Neuroscience Institute at Stanford* retreat. Asilomar, May 19, 2006.

Neural mechanisms of movement planning: A Role for Recurrent Networks. *Sloan-Swartz Seminar*, Sloan-Swartz Center for Theoretical Neurobiology at the Salk Institute. April 5, 2005.

The neural basis of an illusory increase in speed produced by apparent motion. *Weekly seminar series*, NASA AMES Research Center, Human Factors Research and Technology Division. 2001.

***Oral conference presentations:***

Panel presentation: *Motor sequence preparation and control: From population dynamics to whole brain representations.* NCM Annual Meeting. Toyama, Japan. April 24, 2019.

Leveraging dynamical smoothness to predict motor cortex population activity. *Simons Collaboration on the Global Brain Annual Meeting*. New York NY. September 5-7 2018

Why motor cortex responses don't look like they should. *Klingenstein-Simons Annual Meeting*. New York NY. May 9-10, 2018.

Division of labor between the hemispheres during movement generation. *Computational and Systems Neuroscience (COSYNE) Workshops: Brain-wide neuronal dynamics and inter-area communication: Recordings, analysis, and theory.* Breckenridge CO, March 6, 2018

Relating motor cortex activity to movement; the enduring challenge of reversing causality. *Computational and Systems Neuroscience (COSYNE) Workshops: New methods for understanding neural dynamics and computation.* Snowbird UT, February 28, 2017

How does motor cortex activity relate to movement. *Grossman Center for the Statistics of Mind* annual workshop. Columbia University, New York, NY. April 20-21, 2017

The neural events preceding voluntary movement. McKnight Conference on Neuroscience. May 20-23, 2016, Minneapolis Minnesota.

The versatile brain: neural signatures of flexible computations. *Simons Collaboration on the Global Brain Annual Meeting***,** September 10–12 2015, New York NY

What Are the Neural Events that Initiate Voluntary Movement? *Searle Scholars Annual Meeting*. April 12-15 2015, Chicago IL

A Neural Signature of Movement Initiation. *Quantifying structure in large neural datasets*, *Grossman Center for the Statistics of Mind* annual workshop, Sept 22-23, 2014, Columbia University, New York, NY.

Tensor-based dimensionality reduction for data exploration. *Computational and Systems Neuroscience (COSYNE) Workshops: Reducing the Complexity of Sensorimotor Control.* Snowbird UT, March 3-4, 2014

What have we learned form a century of studying primary motor cortex? *Platform presentation, 23$^{nd}$ Annual Meeting of the Society for the Neural Control of Movement.* San Juan, Puerto Rico, April 15 - 20, 2013.

Primate motor cortex: a central central pattern generator? *Platform presentation, 22$^{nd}$ Annual Meeting of the Society for the Neural Control of Movement.* Venice, Italy, April 23 - 29, 2012.

Dynamical underpinnings of movement generation. *Platform presentation, 21$^{th}$ Annual Meeting of the Society for the Neural Control of Movement.* San Juan, Puerto Rico, April 26-30, 2011.

Neural variability and movement variability (in workshop of the same name) *COSYNE*, March 2-3 2009, Snowbird, Utah.

Neural dynamics during movement planning and execution. In *Computational and neural mechanisms for the control of goal directed movement in primates* (symposium). FENS Forum of European Neuroscience, Geneva, Switzerland, July 13, 2008.

Neural dynamics during motor preparation. *Platform presentation, 17th Annual Meeting of the Society for the Neural Control of Movement.* Seville, Spain, March 25-30, 2007.

Neural dynamics during movement planning and execution. *4th Annual Computational and Systems Neuroscience (COSYNE) Workshops: Reducing the Complexity of Sensorimotor Control.* Park City UT, Feb. 26-27, 2007

Neural variability in premotor cortex provides a signature of motor preparation. *Platform presentation, 2nd annual Computational and Systems Neuroscience (COSYNE) meeting.* Salt Lake City UT, March 17-20, 2005

Settling recurrent networks underlie motor planning in the primate brain. *NIPS workshop: The Neurobiology of planning and deciding: studies from many levels of brain organization* Whistler, Canada, Dec. 16-18, 2004

Role of movement preparation in movement generation. *SFN satellite meeting: Advances in Computational Motor Control III,* San Diego CA, Oct. 22, 2004

***Abstracts not yet published as full papers:***

Ames KC, Abbott LF, **Churchland MM** (2018). Neural activity in primate motor cortex during bimanual versus unimanual rhythmic movements. 224.01 *Society for Neuroscience Annual Meeting*, San Diego CA.

Russo AA, Khajeh R, Bittner SR, Perkins S, Cunningham JP, Abbott LF, **Churchland MM** (2018). The supplementary motor area, but not motor cortex, produces neural trajectories consistent with a network that can autonomously generate long-timescale sequences. 310.05 *Society for Neuroscience Annual Meeting*, San Diego CA.

Zimnik AJ and **Churchland MM** (2018). Preparation of movement sequences in motor cortex. 310.06 *Society for Neuroscience Annual Meeting*, San Diego CA.

Perkins SM, Schroeder KE, Wang Q, **Churchland MM** (2018). Decoding sustained cyclic movements from low-dimensional neural states. 312.21 *Society for Neuroscience Annual Meeting*, San Diego CA.

Schroeder KE, Perkins SM, Wang Q, **Churchland MM** (2018). Virtual navigation via a closed-loop brain-machine interface. 590.11 *Society for Neuroscience Annual Meeting*, San Diego CA.

Zimnik AJ, Lara AH, **Churchland MM** (2017). Preparatory activity in motor cortex and supplementary motor area does not reflect the instantaneous probability of choosing to move. *Society for Neuroscience Annual Meeting*, Washington DC.

Marshall NJ, Abbott LF, **Churchland MM** (2017). Optimal force production by an idealized motor pool necessitates a flexible interplay between size and speed principles. *Society for Neuroscience Annual Meeting*, Washington DC.

***Edited volumes:***

Motor Circuits and Action (2015). *Current Opinion in Neurobiology*

***Publications*** *(full list available at https://scholar.google.com/citations?hl=en&user=AtknMf0AAAAJ )*

Schroeder KE, Perkins SM, Cunningham JP, **Churchland MM** (in preparation) Real-time BMI control of virtual locomotion based on rhythmic motor cortex activity.

Saxena S, Russo AA, Abbott LF, Cunningham JP, **Churchland MM** (in preparation) Motor cortex population dynamics across movement speeds.

Ames KC, Abbott LF, **Churchland MM** (in preparation) Structure of motor cortex population activity during bimanual movement.

Russo AA, Khajeh R, Bittner SR, Cunningham JP, Abbott LF, **Churchland MM** (under review, preprint available) Neural trajectories in the supplementary motor area and primary motor cortex exhibit distinct geometries, compatible with different classes of computation.

Ames KC and **Churchland MM** (2019). Motor cortex signals for each arm are mixed across hemispheres and neurons yet partitioned within the population response. *eLife*. Oct 9. doi: https://doi.org/10.7554/eLife.46159.001

Zimnik AJ, Lara AH, **Churchland MM** (2019) Perturbation of macaque supplementary motor area produces context-independent changes in the probability of movement initiation. *J. Neurosci*. Feb 12. doi: 10.1523/JNEUROSCI.2335-18.2019

Lara AH, Elsayed GF, Zimnik AJ, Cunningham JP, **Churchland MM** (2018) Conservation of preparatory neural events in monkey motor cortex regardless of how movement is initiated. *eLife* Aug 22;7. doi: 10.7554/eLife.31826

Lara AH, Cunningham JP, **Churchland MM** (2018) Different population dynamics in the supplementary motor area and motor cortex during reaching. *Nature Communications* 9(1). DOI: 10.1038/s41467-018-05146-z

Russo AA, Bittner SR, Perkins SM, Seely JS, London BM, Lara AH, Miri A, Marshall NJ, Kohn A, Jessell TM, Abbott LF, Cunningham JP, **Churchland MM** (2018) Motor cortex embeds muscle-like commands in an untangled population response. *Neuron*. 97(4):953-966

Miri A, Warriner CL, Seely JS, Elsayed GF, Cunningham JP, **Churchland MM**, Jessell TM (2017) Behaviorally Selective Engagement of Short-Latency Effector Pathways by Motor Cortex. *Neuron*. 2017 Jul 19. doi: 10.1016/j.neuron.2017.06.042. PMID: 28735748

Seely JS, Kaufman MT, Ryu SI, Shenoy KV, Cunningham JP, **Churchland MM**. (2016) Tensor Analysis Reveals Distinct Population Structure that Parallels the Different Computational Roles of Areas M1 and V1. *PLoS Comput Biol* 12 (11): e1005164. doi:10.1371/journal.pcbi.1005164

Elsayed GF, Lara AH, Kaufman MT, **Churchland MM**, Cunningham JP (2016). Reorganization between preparatory and movement population responses in motor cortex. *Nat Commun*. 10.1038/ncomms13239

Kaufman MT, Seely JS, Sussillo D, Ryu SI, Shenoy KV, **Churchland MM** (2016). The Largest Response Component in the Motor Cortex Reflects Movement Timing but Not Movement Type. *eNeuro*. Aug 30;3(4). DOI: 10.1523/ENEURO.0085-16.2016. PMID: 27761519

Kao JC, Nuyujukian P, Ryu SI, **Churchland MM**, Cunningham JP, Shenoy KV (2015). Single-trial dynamics of motor cortex and their applications to brain-machine interfaces. *Nat Commun*. Jul 29;6:7759. doi: 10.1038/ncomms8759.

Kiehn O and **Churchland MM** (2015) Editorial overview: Motor circuits and action. *Current Opinion in Neurobiology* http://dx.doi.org/10.1016/j.conb.2015.06.004

Kaufman MT, **Churchland MM**, Ryu SI, and Shenoy KV (2015) Vacillation, indecision and hesitation in moment-by-moment decoding of monkey motor cortex. *eLife* doi: 10.7554/eLife.04677

Sussillo D, **Churchland MM**, Kaufman MT, and Shenoy KV (2015) A neural network that finds naturalistic solutions for the production of muscle activity. *Nature Neuroscience* doi: 10.1038/nn.4042

**Churchland MM** and Cunningham JP (2015) A dynamical basis set for generating reaches. *Cold Spring Harbor Symposium Volume 79: Cognition.* doi: 10.1101/sqb.2014.79.024703

**Churchland MM** (2015) Using the precision of the primate to study the origins of movement variability. *Neuroscience*, doi:10.1016/j.neuroscience.2015.01.005

Kaufman MT, **Churchland MM,** Ryu SI, and Shenoy KV (2014) Cortical activity in the null space: permitting preparation without movement. *Nature Neuroscience* 17(3):440-8

Shenoy KV, Sahani M, **Churchland MM** (2013) Cortical control of arm movements: a dynamical systems perspective. *Annual Review of Neuroscience* 36:337-359.

Kaufman MT, **Churchland MM,** Shenoy KV (2013) The roles of monkey M1 neuron classes in movement preparation and execution. *Journal of Neurophysiology* 110:817-825.

Cowley BR, Kaufman MT, Butler ZS, **Churchland MM**, Ryu SI, Shenoy KV, Yu BM (2013) DataHigh: graphical user interface for visualizing and interacting with high-dimensional neural activity. *J Neural Eng* Dec;10(6):066012. doi: 10.1088/1741-2560/10/6/066012

Gilja V, Nuyujukian P, Chestek CA, Cunningham JP, Yu BM, Fan JM, **Churchland MM**, Kaufman MT, Kao JC, Ryu SI, and Shenoy KV (2012). A high-performance neural prosthesis enabled by control algorithm design. *Nature Neuroscience* 15:1752-1757.

**Churchland MM** & Abbott LF (2012) Two layers of neural variability. News and Views, *Nature Neuroscience*. 15(11): 1472-1474.

**Churchland MM***, Cunningham JP* (contributing equally), Kaufman MT, Nuyujukian P, Foster JD, Ryu SI, and Shenoy KV (2012) Neural population dynamics during reaching. *Nature*. 487: 51-56.

Shenoy KV, Kaufman MT, Sahani M, **Churchland MM** (2011) A dynamical systems view of motor preparation: implications for neural prosthetic system design. Prog Brain Res. 192: 33-58.

Chestek CA, Gilja V, Nuyujukian P, Foster JD, Fan JM, Kaufman MT, **Churchland MM**, Rivera-Alvidrez Z, Cunningham JP, Ryu SI, Shenoy KV. (2011) Long-term stability of neural prosthetic control signals from silicon cortical arrays in rhesus macaque motor cortex. *J Neural Eng* Aug;8(4):045005. doi: 10.1088/1741-2560/8/4/045005

**Churchland MM**, Cunningham JP, Kaufman MT, Ryu SI, and Shenoy KV (2010) Cortical preparatory activity: representation of movement or first cog in a dynamical machine? *Neuron.* 68(3):387-400

Kaufman MT, **Churchland MM**, Santhanam G, Yu BM, Afshar A, Ryu SI, and Shenoy KV (2010). The roles of monkey premotor neuron classes in movement preparation and execution. *J Neurophysiol,* 104(2): 799-810.

**Churchland MM***, Yu BM* (contributing equally), Cunningham JP, Sugrue LP, Cohen MR, Corrado GS, Newsome WT, Clark AM, Hosseini P, Scott BB, Bradley DC, Smith MA, Kohn A, Movshon JA, Armstrong KM, Moore T, Chang SW, Snyder LH, Lisberger SG, Priebe NJ, Finn IM, Ferster D, Ryu SI, Santhanam G, Sahani M, and Shenoy KV (2010) Stimulus onset quenches neural variability: a widespread cortical phenomenon. *Nat. Neurosci*. 13(3): 369-78

**Churchland MM**, Yu BM, Sahani M and Shenoy KV (2007) Techniques for extracting single-trial activity patterns from large-scale neural recordings. *Curr Opin Neurobiol.* 17:609-18

Chestek CA, Batista AP, Santhanam G, Yu BM, Afshar A, Cunningham JP, Gilja V, Ryu SI, **Churchland MM** and Shenoy KV (2007) Single-neuron stability during repeated reaching in macaque premotor cortex. *J. Neurosi.* 27:10742-50

**Churchland MM**, and Shenoy KV (2007) Temporal complexity and heterogeneity of single-neuron activity in premotor and motor cortex. *J. Neurophysiol.* 97: 4235-57

**Churchland MM**, Afshar A, Shenoy KV (2006) A central source of movement variability. *Neuron* 52: 1085-96

**Churchland MM** and Shenoy KV (2006) Delay of movement caused by disruption of cortical preparatory activity. *J Neurophysiol.* 97: 348-59

**Churchland MM**, Santhanam G, Shenoy KV (2006) Preparatory activity in premotor and motor cortex reflects the speed of the upcoming reach. *J Neurophysiol.* 96:3130-46

**Churchland MM**, Yu BM, Ryu SI, Santhanam G, Shenoy KV (2006) Neural variability in premotor cortex provides a signature of motor preparation. *J Neurosci.* 26: 3697-712

**Churchland MM**, Priebe NJ and Lisberger SG (2005) Comparison of the spatial limits on direction selectivity in visual areas MT and V1. *J. Neurophysiol.* 93:1235-45

**Churchland MM**, Chou IH and Lisberger SG (2003) Evidence for object permanence in the smooth-pursuit eye movements of monkeys. *J Neurophysiol.* 90: 2205-18

Priebe NJ, **Churchland MM** and Lisberger SG (2002) Constraints on the source of short-term motion adaptation in macaque area MT: I. The role of input and intrinsic mechanisms. *J Neurophysiol* 88: 354-69

**Churchland MM** and Lisberger SG (2001) Shifts in the population response in the middle temporal visual area parallel perceptual and motor illusions produced by apparent motion. *J Neurosci* 21: 9387-9402

Priebe NJ*, **Churchland MM*** (contributing equally), and Lisberger SG (2001) Reconstruction of target speed for the guidance of pursuit eye movements. *J Neurosci* 21: 3196-206

**Churchland MM** and Lisberger SG. (2001) Experimental and computational analysis of monkey smooth pursuit eye movements. *J Neurophysiol* 86: 741-59

**Churchland MM** and Lisberger SG. (2000) Apparent motion produces multiple deficits in visually guided smooth pursuit eye movements of monkeys. *J Neurophysiol* 84: 216-35