CURRICULUM VITAE

David J. Foster, Ph.D. Nov 14, 2019

DEMOGRAPHIC INFORMATION

Current Appointments

Associate Professor, Department of Psychology, University of California, Berkeley.
Associate Professor, Helen Wills Neuroscience Institute, University of California, Berkeley.
Adjunct Associate Professor, Deparment of Neuroscience, Johns Hopkins University School Of Medicine.

Personal Data

Helen Wills Neuroscience Institute,
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Education and Training (in chronological order)

Undergraduate
1989-1992 B.Sc.(Hons), Physics, Imperial College London, U.K.

Doctoral/graduate
1992-1993 Research Consultant, BT Labs, Martlesham, U.K.
1993-1994 M.Sc.(Hons), Neural Computation, Stirling University, U.K.
1994-1995 Research Associate, Dept. of Experimental Psychology, Oxford University, U.K. (Mentor: Edmund Rolls)
1995-2000 Ph.D., Computational Neuroscience, Edinburgh University, U.K. (Mentors: Richard Morris, Peter Dayan)

Postdoctoral - (internship, residency, fellowship etc.)
1999-2000 Postdoctoral associate, Computational Neuroscience, Gatsby Computational Neuroscience Unit, University College London, U.K. (Mentor: Peter Dayan)
2000-2007 Postdoctoral associate, Behavioral Neurophysiology, Massachusetts Institute of Technology, Cambridge, MA. (Mentor: Matt Wilson)

Professional Experience

2008- 2015 Assistant Professor, Department of Neuroscience, Johns Hopkins University School of Medicine, Baltimore, MD
2015- 2016 Associate Professor, Department of Neuroscience, Johns Hopkins University School of Medicine, Baltimore, MD
2017- 2018 Acting Associate Professor, Department of Psychology and Helen Wills Neuroscience Institute, University of California, Berkeley, Berkeley CA
2018- Associate Professor, Department of Psychology and Helen Will Neuroscience Institute, University of California, Berkeley, Berkeley CA

RESEARCH ACTIVITIES
Peer Reviewed Original Science Publications

1. Rolls ET, Treves A, Foster D, Perez-Vicente C. (1997) Simulation studies of the CA3 hippocampal subfield modeled as an attractor neural network. ***Neural Networks*** 10(9): 1559-1569.
2. Foster DJ, Morris RGM, Dayan P. (1998) Hippocampal model of rat spatial abilities using temporal difference learning. ***Advances in Neural Information Processing Systems*** 10:145-151.
3. Foster DJ, Morris RGM, Dayan P. (2000) A temporal difference model of hippocampally dependent, one-trial spatial learning. ***Hippocampus*** 10:1-16.
4. Foster DJ, Dayan P. (2002) Structure in the space of value functions. ***Machine Learning*** 49:325-346.
5. Foster DJ, Wilson MA. (2006) Reverse replay of behavioral sequences in hippocampal place cells during the awake state. ***Nature*** 440: 680-683.
6. Foster DJ, Wilson MA. (2007) Hippocampal theta sequences. ***Hippocampus*** 17(11): 1093-1099.
7. Foster DJ, Knierim JJ. (2012) Sequence learning and the role of the hippocampus in rodent navigation. ***Current Opinion in Neurobiology*** 22(2):294-300.
8. Pfeiffer BE, Foster DJ. (2013) Hippocampal place-cell sequences depict future paths to remembered goals. ***Nature*** 497(7447):74-79.
9. Suh J*, Foster DJ*, Davoudi H., Wilson MA., Tonegawa S. (2013) Impaired hippocampal ripple-associated replay in a mouse model of schizophrenia. ***Neuron*** 80(2):484-493. *equal contribution.
10. Wu X, Foster DJ. (2014) Hippocampal replay captures the unique topological structure of a novel environment. ***Journal of Neuroscience*** 34(19):6459-6469.
11. Feng T, Silva D, Foster DJ. (2015) Dissociation between the experience-dependent development of hippocampal theta sequences and single-trial phase precession. ***Journal of Neuroscience*** 35(12):4890-4902.
12. Altimus CM, Harrold JB, Jaaro-Peled H, Sawa A, Foster DJ. (2015) Disordered ripples are a common feature of genetically distinct mouse models relevant to schizophrenia. ***Molecular Neuropsychiatry*** 1(1):52-59.
13. Pfeiffer BE, Foster DJ. (2015) Autoassociative dynamics in the generation of sequences of hippocampal place cells. ***Science*** 349(6244):180-183.
14. Silva D*, Feng T*, Foster DJ (2015) Trajectory events across hippocampal place cells require previous experience. ***Nature Neuroscience*** 18(12):1772-1779.
15. Schiller D, Eichenbaum H, Buffalo EA, Davachi L, Foster DJ, Leutgeb S, Ranganath C. (2015) Memory and space: towards an understanding of the cognitive map. ***Journal of Neuroscience*** 35(41):13904-13911.
16. Ambrose RE, Pfeiffer BE, Foster DJ. (2016) Reverse replay of hippocampal place cells in uniquely modulated by changing reward. ***Neuron*** 91(5):1124-1136.
17. Maboudi K, Ackermann E, de Jong LW, Pfeiffer BE, Foster D, Diba K, Kemere C. (2018) Uncovering temporal structure in hippocampal output patterns. ***Elife*** e34467
18. Boone CE, Davoudi H, Harrold JB, Foster DJ. (2018) Abnormal sleep architecture and hippocampal circuit dysfunction in a mouse model of fragile X syndrome. ***Neuroscience*** 384:275-289.
19. Davoudi H, Foster DJ. (2019) Acute silencing of hippocampal CA3 reveals a necessary role in place field responses. ***Nature Neuroscience***, 22(3):337-342.

Invited Reviews
1. Pfeiffer BE, Foster DJ. (2015) Discovering the brain's cognitive map. ***JAMA Neurology*** 72(3):257-258.
2. Foster DJ. (2017) Replay comes of age. ***Annu Rev Neurosci.*** 40:581-602.
3. Widloski J, Foster DJ (2018) Spoiled for choice, pressed for time. ***Nature Neuroscience*** 21(11):1501-1503.

Book Chapters
1. Foster DJ (2018) Electrical signals in the brain are strangely comprehensible. In: "***Think Tank: Forty Neuroscientists Explore The Biological Roots Of Human Experience***", Linden D, ed.,Yale University Press, New Haven and London.

Conference Proceedings
1. Foster DJ, Morris RGM, Dayan P. Hippocampal model of rat spatial abilities using temporal difference learning. *Society for Neuroscience Abstracts*. 1997
2. Foster DJ, Morris RGM, Dayan P. Hippocampal model of rat spatial abilities using temporal difference learning. *Advances in Neural Information Processing Systems* 1998.

3. Foster DJ*, Suh J*, Wilson MA, Tonegawa S. Altered hippocampal neural activity during rest periods in a mouse model of schizophrenia. *Society for Neuroscience Abstracts* 2006. *(* joint first author)*
4. Pfeiffer BE, Foster DJ. Hippocampal replay expresses multiple behavioral aspects of experience. *Society for Neuroscience Abstracts* 2011.
5. Silva D, Feng T, Foster DJ. Disruption of hippocampal replay by a competitive NMDA receptor antagonist. *Society for Neuroscience Abstracts* 2011.
6. Feng T, Silva D, Pfeiffer BE, Foster DJ. Rapid development of hippocampal theta sequences with experience. *Society for Neuroscience Abstracts* 2011.
7. Wu X, Foster DJ. Hippocampal replay develops rapidly in an environment with novel spatial structure. *Society for Neuroscience Abstracts* 2011.
8. Pfeiffer BE, Ambrose E, Foster DJ. Hippocampal replay during an open field spatial task. *Society for Neuroscience Abstracts* 2011.
9. Feng T, Silva D, Foster DJ. Sequential activation of hippocampal place cells during replay slows down with experience. *Society for Neuroscience Abstracts* 2012.
10. Altimus C, Harrold J, Foster DJ. Ripple events in mouse hippocampal EEG reflect prior behavioral experience. *Society for Neuroscience Abstracts* 2012.
11. Wu X, Foster DJ. Hippocampal replays modulate prefrontal neuronal activities in a spatial alternation task. *Society for Neuroscience Abstracts* 2012.
12. Suh J*, Foster DJ*, Davoudi H, Wilson MA, Tonegawa S. Selective impairment of hippocampal sharp wave ripples and memory reactivation in a mouse model of cognitive disease. *Society for Neuroscience Abstracts* 2012. *(* joint first author)*
13. Wu X, Foster DJ. Parsing of extended hippocampal replays in a Y maze. *Society for Neuroscience Abstracts* 2012.
14. Pfeiffer BE, Foster DJ. Selective retrieval of neuronal sequences reflecting paths to a remembered goal during a spatial memory task. *Society for Neuroscience Abstracts* 2012.
15. Silva D, Feng T, Foster DJ. Replay memory requires NMDA receptors for encoding but not retrieval, and persists without degradation for many hours after the encoding experience. *Society for Neuroscience Abstracts* 2012.
16. Pfeiffer BE, Foster DJ. Place-cell sequences depict behaviorally relevant trajectories during sleep. *Society for Neuroscience Abstracts* 2013.
17. Foster DJ, Harrold J, Altimus CM, Jaaro-Peled H, Sawa A. C-terminal truncated Disc1 shows altered hippocampal ripple events: Implication in adult onset major mental illness. *Society for Neuroscience Abstracts* 2013.
18. Altimus CM, Harrold JB, Reeves RH, Foster DJ. Hippocampal ripple events reflect learning of prior spatial environments providing an assay of hippocampal function in awake, behaving mice. *Society for Neuroscience Abstracts* 2013.
19. Feng T, Silva D, Foster DJ. Mechanisms contributing to experience-dependent changes in the structure of hippocampal replay sequences. *Society for Neuroscience Abstracts* 2015.
20. Pfeiffer BE, Foster DJ. Auto-associative dynamics in the generation of sequences of hippocampal place cells. *Society for Neuroscience Abstracts* 2015.
21. Davoudi H, Foster DJ. Hippocampal area CA3 is necessary for the induction of sharp-wave ripples in area CA1. *Society for Neuroscience Abstracts* 2015.
22. Ambrose RE, Pfeiffer BE, Foster DJ. Rate of reverse, but not forward hippocampal replay increases with a relative increase in reward. *Society for Neuroscience Abstracts* 2015.
23. Altimus CE, Ambrose RE, Pfeiffer BE, Harrold JB, Foster DJ. Motivation and validation of an EEG-based estimate of hippocampal replay content. *Society for Neuroscience Abstracts* 2015.
24. Davoudi H, Foster DJ. Hippocampal area CA3 is necessary for ripples and place field responses. *Society for Neuroscience Abstracts* 2017.
25. Kleinman MR, Foster DJ. The spatial localization of reward-related changes in hippocampal sharp-wave ripple rate requires normal dopamine signaling. *Society for Neuroscience Abstracts* 2019.
26. Widloski J, Foster DJ. Hippocampal replay rapidly and repeatedly adapts to recofigurations of barrier wall structure in a changing complex maze. *Society for Neuroscience Abstracts* 2019.
27. Croughan WD, Foster DJ. Fast triggering of brain stimulation contingent on the trajectory content of online-detected hippocampal replay. *Society for Neuroscience Abstracts* 2019.
28. Berners-Lee A, Wu X, Foster DJ. Prefrontal neurons are tuned to the spatial trajectory information content of hippocampal neurons during non-local hippocampal representation of future and past places, but not during local hippocampal representation of current place. *Society for Neuroscience Abstracts* 2019.

ORGANIZATIONAL ACTIVITIES

Institutional Administrative Appointments

2009 – 2016	Johns Hopkins Neuroscience department vivarium committee, co-chair
2011-2013	Member, Search committee for BSI faculty search (three years)
2012-2016	Member, Baltimore Chapter of Society for Neuroscience Organizing Committee
2013-2014	President, Baltimore Chapter of Society for Neuroscience (covering Johns Hopkins University, University of Maryland, National Institute on Aging, National Institute on Drug Abuse, Stevenson University, Morgan State University and Goucher College)
2014-2015	Member, Hopkins Kavli Institute planning committee
2015 – 2016	Member, Hopkins Kavli Institute steering committee
2015 – 2016	Johns Hopkins Biomedical Engineering graduate admissions committee
2015 – 2016	Johns Hopkins Neuroscience Dept graduate admissions committee
2017 –	Member, UC Berkeley Helen Wills Neuroscience Institute graduate admissions committee
2017 –	Member, UC Berkeley Department of Psychology Faculty Lectures Committee
2018 --	Member, UC Berkeley Department of Psychology Futures Committee

Editorial Activities

Journal Reviewer for:

Nature
Science
Neuron
Nature Neuroscience
Elife
Journal of neuroscience
Journal of neurophysiology
Hippocampus
Proceedings of the National Academy of Sciences
PLoS One
Cerebral Cortex
Current Biology
Biological Cybernetics
Adaptive Behavior
Frontiers

Advisory Committees, Review Groups/Study Sections

January 2013	Ad-hoc Member, Learning and Memory (LAM) NIH Study Section, Santa Barbara CA
Feb 2013	Ad-hoc Member, NIH Special emphasis panel
May 2013	Ad-hoc Member, NIH Special emphasis panel
Feb 2014	Ad-hoc Member, NIH Special emphasis panel
Oct 2014	Ad-hoc Member, NIH Special emphasis panel
Feb 2015	Ad-hoc Member, NIH Special emphasis panel
March 2015	Reviewer, Fellowship application, Boehringer Ingelheim Fonds
October 2015	Ad-hoc Member, Learning and Memory (LAM) NIH Study Section, Santa Barbara CA
July 2016 – 2020	Standing Member, Learning and Memory (LAM) NIH Study Section
Dec 2018	Invited external participant, HHMI Janelia planning workshop on Mechanistic Cognitive Neuroscience
July 2019	Advisory Panel Reviewer for career evaluation of HHMI Janelia Farms Group Leaders
April 2020	Invited external review, Allen Brain Institute

Professional Societies

Oct 2013 – Oct 2014	President, Baltimore Chapter of Society For Neuroscience
1995 – present	Member, Society for Neuroscience

Conference Organizer, Session Chair

October 2010	Session organizer "Space and architecture", Johns Hopkins University BSi Science of the Arts Event, Baltimore.
December 2014	Organizer and chair, Baltimore Chapter of Society for Neuroscience Annual regional meeting, Johns Hopkins Medical School, Baltimore
April 2015	Session Co-chair, Austin Conference on Learning and Memory, Austin, TX

RECOGNITION

Awards, Honors

1995	Holdsworth Scholarship, Faculty of Medicine, University of Edinburgh
1996	Oxford University, McDonnell-Pew Scholarship Travel Grant.
2006	Paper awarded highest rating by Faculty of 1000 Biology
2009	Alfred P. Sloan Research Fellow
2009	NARSAD Young Investigator Award
2012	Plenary Lecture, AAN annual meeting.
2013	Freedman Prize Honorable Mention, Brain & Behavior Research Foundation
2014	NARSAD Independent Investigator Award
2015	McKnight Memory and Cognitive Disorders Award
2016	Standing membership, LAM (Learning & Memory) NIH Study Section
2017	Invited review, Annual Review of Neuroscience

Invited Talks, Panels

Fall, 1997,	U. Mass, Amherst, MA.
Spring, 1998,	Dept. of Brain and Cognitive Sciences, M.I.T.
Spring, 2005,	Picower Centre for Learning and Memory, M.I.T.
Spring, 2005,	Cold Spring Harbor Laboratory, Learning & Memory.
March 14, 2006,	Harvard University Psychology Department.
January 18, 2007,	Department of Neuroscience, The Johns Hopkins University School of Medicine.
February 1, 2007,	Biology Department, University of Pennsylvania.
February 26, 2007,	Department of Neurobiology & Behavior, University of California, Irvine.
March 19, 2007.	Department of Neuroscience, Baylor College of Medicine.
April 11, 2007.	Department of Neurobiology, University of Chicago.
March 3, 2008.	Computational and Systems Neuroscience (COSYNE) 2008, Workshop (Neurophysiology in awake, behaving rodents).
June, 2009.	2009 Spring Hippocampal Research Conference, Verona, Italy.
March 2011.	Psychiatry Department, Johns Hopkins University
April 2011	Guest at Indo-U.S. Kavli Frontiers of Science Symposium, Irvine, CA
June 2011.	2011 Spring Hippocampal Research Conference, Verona, Italy.
May 2012.	Plenary Lecture, American Academy of Neurology annual conference, New Orleans.
May 2012	Guest at President's Circle annual meeting, The National Academies, Washington DC
December 2013.	Sigma Xi guest lecture, Swarthmore College, PA.
June 2013.	2013 Spring Hippocampal Research Conference, Taormina, Sicily, Italy.
October 9, 2013.	Howard Hughes Janelia Farm Research Campus, VA
December 2, 2013.	Neuroscience Course on "Hippocampus and decision making", Champalimaud Center for the Unknown, Lisbon, Portugal
January 6, 2014.	Winter Conference on Neurobiology of Learning and Memory, Park City, Utah
February 7, 2014.	Kavli Instititute Course of Neurophysics, Santa Barbara, CA
March 1, 2014.	Brain Awareness Day, Center for Genomics, University of Chicago
March 24, 2014	Krasnow Institute for Advanced Study, George Mason University, Fairfax, VA
April 3, 2014.	Neuroscience Dept., Mount Sinai School of Medicine, Mt Sinai Hospital, New York City
May 28, 2014.	Neuroscience Dept., Dartmouth College, NH.

September 5, 2014.	Vespucci Institutes, “Space and the brain”, Lisbon, Portugal.
September 13, 2014.	Japanese Neuroscience Society, Yokohama, Japan
September 16, 2014	RIKEN, Tokyo, Japan.
November 10, 2014	UC Berkeley. Invited lecture in celebration of Edward C. Tolman.
March 10, 2015	Computational and Systems Neuroscience (COSYNE) workshop, Snowbird, Utah.
June 11, 2015.	2015 Spring Hippocampal Research Conference, Taormina, Sicily, Italy.
June 15, 2015	CNRS, Gyf-sur-Yvette, Paris, France.
September 6, 2015.	Kavli Institute for Systems Neuroscience, Trondheim, Norway.
October 19, 2015.	Society for Neuroscience, invited speaker, mini-symposium: “Can We Merge the Divergent Views of Hippocampal Function?"
November 1, 2015.	International symposium on “Prediction and Decision Making”, Tokyo University, Japan.
November 2, 2015	Kyoto University, Kyoto, Japan.
November 8, 2015.	Conference on Hippocampal-Entorhinal Complexities, HHMI Janelia Farms, VA.
December 7, 2015.	Psychology Department, UC Berkeley
February 9, 2016	Neuroscience graduate program, UC San Diego
June 8, 2016	SUNY Downstate, Brooklyn, NY
June 24, 2016	RIKEN Summer School lecturer, Tokyo, Japan
September 15, 2016	EBPS Workshop on Neural Ensembles, Amsterdam.
October 13, 2016	Princeton Neuroscience Institute, Princeton, NJ
October 31, 2016	Dept. of Neuroscience, Yale University School of Medicine, New Haven CT
November 3, 2016	Dept. of Neuroscience, Columbia University, New York NY
June 13, 2017	2017 Spring Hippocampal Research Conference, Taormina, Sicily, Italy.
September 23, 2017	Keynote speaker, UC Davis Neuroscience Retreat
December 2017	Federation of European Neuroscience Societies Winter School, Obergurgl, Austria
March 2018	Computational and Systems Neuroscience Workshop, Breckenridge, CO
April 2018	2018 International Conference on Learning and Memory, UC Irvine, Huntington Beach, CA
June 2018	AREADNE 2018, Research in encoding and decoding neural ensembles, Santorini, Greece
July 2018	Computational and Cognitive Neuroscience Summer School, Shanghai, China
September 2018	Workshop, Bernstein Conference, Berlin, Germany
November 2018	Max Planck Institute for Brain Research, Frankfurt, Germany
December 2018	Planning Talks, HHMI Janelia Workshop on Mechanistic Cognitive Neuroscience, Janelia Farms, Fairfax VA
May 2019	Dept of Neuroscience, UT Southwestern, Dallas TX
June 2019	McKnight Foundation Conference, Aspen, CO
July 2019	Reinforcement Learning and Decision Making, Montreal, Canada
July 2019	Japanese Neuroscience Society, Niigata, Japan

Media interest

New York Times: “Rats in a maze take a moment to remember, but in reverse”, Nicholas Wade., Feb 14, 2006.
Boston Globe: “Is ‘instant replay’ a learning tool?” Carey Goldberg, Feb 20, 2006.
Fox News: “Study: Brains Run Events Backwards to Store Memories” , Ker Than, Feb 13, 2006.
Scientific American “Rat brain’s instant replay may be key to memory”, David Biello, Feb 13, 2006
New Scientist: “Play it again, brain, but in reverse”. Roxanne Khamsi, Feb 13, 2006.
Scientific American Mind “Learn By Reverse Replay”, JR Minkel, April 2006.
Sciencentral: “Coffee break brain” (Video) Victor Limjoco, June 23, 2006.
Neurology Today: “News from the AAN Annual Meeting: A new view on the role of the hippocampus in memory – of the past and planning for the future”. Richard Robinson, August 2, 2012.
El Pais: “Un GPS en el cerebro”. Javier Sampedro, April 17, 2013.
Science Daily: “Going places: rat brain ‘GPS’ maps routes to rewards”. April 17, 2013.
Science Daily: "Scientists 'watch' rats string memories together". July 14, 2015.
Quanta Magazine: "New clues to how the brain maps time". January 26, 2016.
Science Daily: "The brain uses backward instant replays to remember important travel routes" August 25, 2016