

September 20, 2016

Michael J. Kahana, Ph.D.

### Address

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### Personal

Born: May 7, 1969, St. Louis, MO  
Citizenship: USA  
Married to Jessica A. Wachter, Ph.D.  
[finance.wharton.upenn.edu/~jwachter/](http://finance.wharton.upenn.edu/~jwachter/)

Children:

Nathan Abraham, April 26, 2006  
Joseph Morris, February 29, 2008  
Benjamin Aryeh, January 25, 2011  
Samuel Tzvi, May 14, 2013  
Leah Eta Shari, June 19, 2015

### Professional

- 2004 — present, Professor, Department of Psychology, University of Pennsylvania
- 2000 — 2004, Associate Professor, Department of Psychology and Center for Complex Systems, Brandeis University.
- 1994 — 2000, Assistant Professor, Department of Psychology and National Center for Complex Systems, Brandeis University

## Education

- 1989 B. A., Case Western Reserve University.
- 1993 Ph.D., University of Toronto (Psychology); (Ph.D. Thesis: *Interactions between item, associative, and serial order information*, B. B. Murdock, chair).
- 1993–1994 Postdoctoral Fellow, Harvard University (Psychology). Individual National Research Service Award (N.I.H. Grant NS09559, Sponsor: W. K. Estes) *A temporal coding model of human memory*)

## Honors and Awards

- Keynote address, *The 6th International Conference on Memory*
- Troland Award, *National Academy of Sciences*, 2010.
- Fellow, *Society of Experimental Psychologists*, 2008
- Fellow, *American Psychological Society*, 2010
- Plenary address – 40th Annual Meeting of the Society for Mathematical Psychology, Irvine, CA, 2007
- Plenary address – Computational Cognitive Neuroscience Conference, Houston, 2006
- Invited symposium – Society for Neuroscience, Washington, D.C., 2005
- Invited address – American Psychological Society, Chicago, 2004
- Featured Alumnus – Centennial Celebration of the University of Toronto Graduate Program in Psychology, 1997
- Bernstein Fellow, Brandeis University, 1998-1999

## Editorial Activities

- Associate Editor: *Psychological Review*, 2015–
- Associate Editor: *Cognitive Psychology*, 2005 – 2009
- Associate Editor: *Memory & Cognition*, 2001 – 2005
- Guest Editor: *NeuroImage* special issue “New Horizons for Neural Oscillations”, 2014
- Consulting Editor: *Journal of Experimental Psychology: General*, 2008 – 2010
- Consulting Editor: *Journal of Mathematical Psychology*, 2012 –

- Consulting Editor: *Psychonomic Bulletin & Review*, 2005 – 2007.
- Consulting Editor: *Memory & Cognition*, 1997 – 2001.
- Consulting Editor: *Journal of Experimental Psychology: Learning, Memory and Cognition*, 1999 – 2001.

### Other Professional Activities

- Founder and Organizer of the Context and Episodic Memory Symposium, an annual meeting since 2002
- Director of graduate studies, Psychology Graduate Group, University of Pennsylvania, 2008-2011
- Chair of the 2010 meeting of the *Society of Experimental Psychologists*
- Member, BBBP-4 (Cognition and Perception) study section, *Centers for Scientific Review, National Institutes of Health*, 2003–2007
- Member, Advisory Board, Princeton Neuroscience Institute, 2012
- Organizer – 39th Annual Meeting of the Society for Mathematical Psychology, 2006
- Member, Advisory Panel. Doris Duke Charitable Foundation, 2005
- Member, Advisory Panel. N.I.H. Silvio O. Conte Center for Neuroscience Research: Cognitive and Neural Mechanisms of Conflict and Control (Princeton University), 2003
- N.I.M.H. First Award, 1996
- **Invited Colloquia:** Albert Einstein College of Medicine, Albert-Ludwigs-Universität Freiburg, Boston University, Brandeis University, Brown University, California Institute of Technology, Carnegie Mellon University, Columbia University (Psychology), Columbia University (Neuroscience), Courant Institute (NYU), Dartmouth College, Donders Institute, Nijmegen, Netherlands, Duke University, Harvard University, Indiana University, Johns Hopkins University, Max Planck Institute-Berlin, McGill University, Monell Research Institute, Montreal Neurological Institute, National Institute of Neurological Disorders and Stroke, New York University, Northwestern University, Ohio State University, Princeton University, Rutgers University, Salk Institute, Shriver Center, Stanford University, Syracuse University, Thomas Jefferson University, Tufts University, University of California, Davis, University of California, Irvine, U.C.L.A. School of Medicine, U.C.L.A Psychology, University of California, San Diego, University of California at San Francisco, University of Delaware, University of Massachusetts at Amherst, University of Toronto, Washington University,

Williams College, Yale University.

### Professional Society Memberships:

- Psychonomic Society
- Society for Neuroscience
- Memory Disorders Research Society
- Society for Cognitive Neuroscience,
- Society for Mathematical Psychology,
- Society of Experimental Psychologists

### Grant Support

- NIH Grant R21 AG048233 *A model-based approach to understanding memory impairments*. M. J. Kahana, P.I. August 15, 2015 – May 31, 2017. \$150,000 annual direct costs.
- DARPA RAM Cooperative Agreement N66001-14-2-4-032 *Memory Enhancement with Modeling, Electrophysiology, and Stimulation*. M. J. Kahana, P.I. July 16, 2014 – July 15, 2018. \$3,562,841 annual direct costs.
- NIH Grant 3RO1 MH61975 *Electrophysiology of Spatial Cognition*. M. J. Kahana, P.I. March 1, 2014 – Feb 28, 2019. \$252,687 annual direct costs.
- Educational Testing Grant *EEG Correlates of Engagement*. M. J. Kahana, P.I. August 15, 2013 – December 31, 2014. \$41,445 annual direct costs.
- NIH Grant 4RO1 MH55687 *Associative Processes in Episodic Memory*. M. J. Kahana, P.I. May 1, 2011 – Jan 31, 2021. \$300,386 annual direct costs.
- NSF grant 1058886 *Retrieved Context Models of Episodic Memory*. M. J. Kahana, P.I. June 1, 2011– May 31, 2014. \$94,510 annual direct costs.
- NIH Grant 2RO1 MH61975 *Electrophysiology of Spatial Cognition*. M. J. Kahana, P.I. Sept 26, 2007 – July 31, 2013. \$252,687 annual direct costs.
- NIH Grant 1R21 NS067316 *Intracranial EEG for Neuronal Oscillatory Contingency during Cognitive Tasks*. M. J. Kahana, P.I. September 30, 2009 – August 31, 2011. \$163,228 annual direct costs.
- NIH Grant R90 DA023424 *Integrated Interdisciplinary Training in Computational Neuroscience*. M. J. Kahana, P.I. September 30, 2006 – July 31, 2011. \$296,519 annual direct costs.
- NIH Grant T90 DA022763 *Integrated Interdisciplinary Training in Com-*

*putational Neuroscience*. M. J. Kahana, P.I. September 30, 2006 – July 31, 2011. \$166,888 annual direct costs.

- NIH Grant 2R01 MH68404 *Short Term Visual Episodic Recognition Memory*, R. Sekuler, P.I., M. J. Kahana, Co-I. June 6 2009 – June 5, 2011.
- Dana Foundation Grant *Intracranial EEG for Theta Rhythm Contingency During Cognitive Tasks*. December, 2007 – February, 2011. \$100,000 annual direct costs.
- NIH/NIMH Grant P50 MH062196. Subproject on Conte Center Grant *Retrieval Dynamics in Item and Source Memory*. October 1, 2005 – August 31, 2011
- NIH Grant 3R01 MH55687 *Associative Processes in Episodic Memory*. M. J. Kahana, P.I. February 1, 2007 – Jan 30, 2011.
- NSF grant SBE 0354378 Subproject 14 on Science of Learning Center Grant *CELEST: A Center for Learning in Education, Science, and Technology*. S. Grossberg P.I. October 1, 2004 – September 30, 2009.
- NIH Grant R01 MH68404 *Short Term Visual Episodic Recognition Memory*, R. Sekuler, P.I., M. J. Kahana, Co-P.I.. April 1, 2004 – March 31, 2009.
- Swartz Foundation Grant 2004/10-04 *Electrophysiology of Human Memory Formation*. M. J. Kahana P.I. November 28, 2003 – November 27, 2004.
- NIH Grant 2R01 MH55687 *Associative Processes in Episodic Memory*. M. J. Kahana, P.I. April 1, 2002 – January 30, 2007.
- NIH Grant R29 MH55687 *Mathematical Models of Human Memory*. M. J. Kahana, P.I., April 1, 1997 – March 30, 2002.
- NIH Grant RO1 MH61975 *Using intracranial recordings to study task-dependent theta..* M. J. Kahana, P.I. December 12, 2001 – December 11, 2006.
- AFOSR Grant F49620-03-1-0376 *Model driven study of visual memory*. R. Sekuler, P.I., M. J. Kahana, Co-P.I.. July 1, 2003 – December 31, 2003.
- NIH Grant R01 AG15852 *Aging and the temporal dynamics of self-initiated recall* A. Wingfield, P.I., M. J. Kahana, Co-P.I. August 1, 1998 – July 30, 2003.

## Postdoctoral Supervision

- Dan Kimball, J.D., Ph.D. (Postdoc, 2002 – 2003). Morris Associate Professor, Department of Psychology, *University of Oklahoma*.

- Sean Polyn, Ph.D. (Postdoc, 2005 – 2008). Associate Professor, Department of Psychology, *Vanderbilt University*.
- Christoph Weidemann, Ph.D. (Postdoc, 2006 – 2010). Assistant Professor, Department of Psychology, *Swansea University*
- Kareem Zaghloul, M.D. Ph.D. (Postdoc, 2007 – 2008). Assistant Professor, Department of Neurosurgery, *National Institutes of Health and George Washington University*.
- Mijail Serruya, M.D., Ph.D. (Postdoc, 2009 – 2011). Assistant Professor, Department of Neurology, *Jefferson Hospital*.
- Brad Lega, M.D. (Postdoc, 2009 – 2011). Assistant Professor, Department of Neurosurgery, *University of Texas, Dallas*.
- Karl Healey, Ph.D. (Postdoc, 2011 – 2016 ). Assistant Professor, Department of Psychology, *Michigan State University*
- Max Merkow, M.D. (Postdoc, 2013 – 2016). Neurosurgeon, Bayarea Neurosciences, *John Muir Hospital*
- Youssef Ezzyat, Ph.D. (Postdoc, 2014 –).
- James Kragel, Ph.D. (Postdoc, 2015 –).

## Doctoral Supervision

- Marc W. Howard, Ph.D. (1995 – 2000). Associate Professor, Psychology, *Boston University*. Thesis Title: *Temporal Context in Free Recall*
- Jeremy B. Caplan, Ph.D. (1997 – 2002). Associate Professor, Psychology, *University of Alberta*. Thesis Title: *Serial and navigational learning: behavior, theory and the roles of theta oscillations*.
- Daniel S. Rizzuto, Ph.D. (1997 – 2002). Director of Cognitive Modulation, University of Pennsylvania. Thesis Title: *The computational and electrophysiological foundation of item and associative memory*.
- Arne D. Ekstrom, Ph.D. (2001 – 2004). Professor, Psychology and Neuroscience, *University of California, Davis*. Thesis Title: *The Cellular Networks Underlying Human Spatial Navigation*.
- Kelly Addis, Ph.D. (2000 – 2004). Thesis Title: *Constraining models of serial learning*.
- Per Sederberg (2001 – 2006). Associate Professor, Department of Psychology, *Ohio State University*.
- Grace Hwang, Ph.D. (2002 – 2005). Engineer, Mitre Corporation.
- Marieke van Vugt, Ph.D. (2003 – 2008). Assistant Professor, Cognitive

Science, *University of Groningen*.

- Joshua Jacobs, Ph.D. (2004 – 2008). Assistant Professor, Bioengineering, *Columbia University*.
- Jeremy Manning, Ph.D. (2006 – 2011). Assistant Professor, Psychological and Brain Sciences, *Dartmouth University*.
- Lynn Lohnas, Ph.D. (2007 – 2012). Postdoctoral Fellow, *New York University*.
- John Burke, Ph.D. (2010 – 2013). Resident in Neurosurgery *U.C.S.F*
- Ashwin Ramayya (2011 – 2014). Resident in Neurosurgery, MD/Ph.D. *University of Pennsylvania*.
- Nicole Long (2010 – 2015). Postdoctoral Fellow, *University of Oregon*.
- Ethan Solomon (2015 –). Neuroscience MD,Ph.D. student, *University of Pennsylvania*.
- Rivka Cohen (2016 –). Graduate Student, *University of Pennsylvania*.

## Other Trainees

- Etan Cohen. Director/Screenwriter.
- Emily Dolan, Ph.D. Evaluation Coordinator, *VA Puget Sound*.
- Gennady Erlikhman, Ph.D. Postdoctoral Fellow, *University of Nevada, Reno*.
- Lynne Gauthier, Ph.D. Assistant Professor, *Ohio State University*.
- Aaron Geller, M.D. Resident Physician (Neurology), *New York University*.
- Roger Khazan, Ph.D. Research Staff, *MIT Lincoln Laboratory*.
- Matt Kirschen, M.D., Ph.D. Attending Physician, *Children's Hospital of Pennsylvania*.
- Igor Korolev, Ph.D. O.D. Student, *Michigan State University*.
- Richard Lawrence. Ph.D. Student, *U.C. Berkley*.
- Eben Lazarus. Ph.D. Student, *Harvard University*.
- Ningcheng Li. M.D. Student, *Yale University*.
- Jonathan Miller, Ph.D. Postdoctoral Fellow, *Columbia University*
- Matt Mollison, Ph.D. Data Scientist, *Silicon Valley Data Science*.
- Neal Morton. Ph.D. Postdoctoral Fellow, *Vanderbilt University*.
- Ehren Newman, Ph.D. Assistant Professor, *Indiana University*.

- Peter Pantelis, Ph.D. Postdoctoral Researcher, *Indiana University-Bloomington*.
- Eric Pressman. Usability Group Sr. Team Lead, *MathWorks*.
- Colin Sauder. Postdoctoral Fellow, *University of Texas*.
- Greg Schwartz, Ph.D. Assistant Professor, *Northwestern University*.
- Yevgeniy Sirotin, Ph.D. Human Factors Scientist, *Scitor Corporation*.
- Alec Solway, Ph.D. Postdoctoral Associate, *The Virginia Tech Carilion School of Medicine and Research Institute*.
- Jessica Spencer, M.D., M.Sc. Assistant Professor, *Emory School of Medicine*.
- Michelle Tully Tine, Ph.D. Assistant Professor, *Dartmouth College*.
- Daniil Utin. Research Staff, *MIT Lincoln Laboratory*.
- Brad Wyble, Ph.D. Assistant Professor, *Penn State University*.
- Robert Yaffe. Ph.D. Student, *NINDS*.
- Franklin Zaromb, Ph.D. Research Scientist, *ETS*.

## Monographs

- Kahana, M. J. (2012). *Foundations of Human Memory*. Oxford University Press.

## Working Papers

1. Huang, J., Kahana, M. J., and Sekuler, R. Similarity effects in name-face recognition: A dual-process, summed-similarity account. *Submitted*.
2. Kahana, M. J. and Adler, M. Note on the power law of forgetting. *Submitted*.
3. Merkow, M.B., Burke, J.F., Ramayya, A.G., Sharan, A.D., Kahana, M.J., Sperling, M.R. Stimulation of the human medial temporal lobe between learning and recall selectivity enhances forgetting. *Submitted*.
4. Healey, M.K. and Kahana, M.J. Age-Related Changes in the Dynamics of Memory Encoding Processes Provide a Biomarker of Successful Aging . *Submitted*.
5. Polyn, S. M., McCluey, J. D., and Burke, J. F. Altering the flow of mental time. *Submitted*.
6. Jacobs, J., Miller, J., Lee, S.A., Coffey, T., Watrous, A.J., Sperling, M.R., Sharan, A., Worrell, G., Berry, B., Lega, B., Jobst, B., Davis, K., Gross, R.E., Sheth, S.A., Ezzayat, Y., Das, S.R., Stein, J., Gorniak, R., Kahana, M.J., Rizzuto, D. Direct electrical stimulation of human entorhinal cortex



impairs memory. *Submitted*.

7. Healey, M.K., Kahana, M.J. Contiguity in Episodic Memory. *Submitted*
8. Gifford, A.M., Kahana, M.J., Cohen, Y.E. Dynamic changes in acoustic spectral regularity is represented in neural phase alignment across cortex. *Submitted*
9. Ramayya, A.G., Pedisch, I., Levy, D., Lyalenko, A., Wanda, P., Baltuch, G., Kahana, M.J. Microstimulation near fast-spiking human substantia nigra neurons impairs reinforcement learning. *Submitted*
10. Kragel, J.E., Ezzyat, Y., Sperling, M.R., Gorniak, R., Worrell, G.A., Berry, B.M., Inman, C., Lin, J., Davis, K.A., Das, S.R., Stein, J.M., Jobst, B.C., Zaghoul, K.A., Sheth, S.A., Rizzuto, D.S., Kahana, M.J. Core episodic encoding and retrieval processes revealed by dynamics of neural activity. *Submitted*
11. Ezzyat, Y., Kragel, J.E., Burke, J.F., Levy, D.F., Lyalenko, A., Sperling, M.R., Sharan, A.D., Worrell, G.A., Kucewicz, M.T., Davis, K.A., Lucas, T.H., Inman, C.S., Lega, B.C., Jobst, B.C., Sheth, S., Zaghoul, K., Stein, J.M., Das, S., Gorniak, R., Rizzuto, D.S., Kahana, M.J. Targeted brain stimulation to modulate memory performance in humans. *Submitted*
12. Kucewicz, M.T., Berry, B.M., Kremen, V., Brinkmann, B.H., Sperling, M.R., Sharan, A., Jobst, B.C., Gross, R.E., Lega, B., Sheth, S., Stein, J.E., Das, S.R., Stead, S.M., Rizzuto, D.S., Kahana, M.J., Worrell, G.A. Dissecting gamma frequency activities in humans - narrowband oscillations and broadband power increases. *Submitted*

## Refereed Journal Articles

1. Long, N.M. and Kahana, M.J. Modulation of task demands suggests that semantic processing interferes with the formation of episodic associations. *In press*.
2. Weidemann C.T. and Kahana, M.J. (2016) Assessing recognition memory using confidence ratings and response times. *Royal Society Open Science*, 3 (4),150670
3. Healey, M. K. and Kahana, M. J. (2015). A Four-Component Model of Age-Related Memory Change. *Psychological Review*, 123 (1), 23-69.
4. Merkow, M.B., Burke, J.F., Kahana, M.K. (2015). The human hippocampus contributes to both the recollection and familiarity components of recognition memory. *Proceedings of the National Academy of Sciences*, 1-6.

5. Long, N.M. and Kahana, M.J. (2015). Successful memory formation is driven by contextual encoding in the core memory network. *NeuroImage*, 119, 332-337
6. Ramayya, A.G., Pedisich, I., and Kahana, M.J. (2015). Expectation modulates neural representations of valence throughout the human brain. *NeuroImage*, 115, 214-223
7. Greenberg, J.A., Burke, J.F., Haque, R., Kahana, M. J. and Zaghoul, K. (2015). Decreases in theta and increases in high frequency activity underlie associative memory encoding. *NeuroImage*, 114, 257-263
8. Long, N.M., Danoff, M.S., Kahana, M.J. (2015). Recall dynamics reveal the retrieval of emotional context. *Psychonomic Bulletin & Review*, 22 (5), 1328-1333.
9. Lohnas, L. J., Polyn, S. M., and Kahana, M. J. (2015). Expanding the scope of memory search: Modeling intralist and interlist effects in free recall. *Psychological Review*, 122 (2), 337-363
10. Burke, J., Merkow, M., Jacobs, J., Kahana, M.J., Zaghoul, K. (2015). Brain computer interface to enhance episodic memory in human participants. *Frontiers in Human Neuroscience*, 8, 1-10
11. Burke J. F., Ramayya, A. G., and Kahana, M. J. (2015). Human intracranial high-frequency activity during memory processing: neural oscillations or stochastic volatility? *Current Opinion in Neurobiology*, 31, 104-110.
12. Manning, J.R., Kahana, M.J., Norman, K.A. (2015). The role of context in memory. To appear in Gazzaniga M, Ed. *The Cognitive Neurosciences, Fifth Edition.*, Cambridge, MA:MIT Press.
13. Lega, B., Burke, J., Jacobs, J. and Kahana, M.J. (2015). Slow theta-to-gamma phase-amplitude coupling in human hippocampus supports the formation of new episodic memories. *Cerebral Cortex*, 26 (1), 268-278.
14. Merkow, M.B., Burke, J.F., Stein, J.M. and Kahana, M.J. (2014). Pre-stimulus theta in the human hippocampus predicts subsequent recognition but not recall. *Hippocampus*, 24, 1562-1569.
15. Ramayya, A.G., Zaghoul, K.A., Weidemann, C.T., Baltuch, G.H., and Kahana, M.J. (2014). Electrophysiological evidence for functionally distinct neuronal populations in the human substantia nigra. *Frontiers in Human Neuroscience*, 8, 1-9.
16. Geller, A. S., Burke, J. F., Sperling, M. R, Sharan, A.D., Litt, B., Baltuch, G. H., Lucas, T.H., and Kahana, M.J. (2014) Eye closure causes widespread low-frequency power increase and focal gamma attenuation in the human electrocorticogram. *Clinical Neurophysiology*, 9, 1764-1773.

17. Misra, A., Burke, J., Ramayya, A., Jacobs, J., Sperling, M., Moxon, K., et al. (2014). Methods for implantation of micro-wire bundles and optimization of single/multiunit recordings from human mesial temporal lobe. *Journal of Neural Engineering*, 11(2), 1-13
18. Healey, M. K. and Kahana, M. J. (2014) Is memory search governed by universal principles or idiosyncratic strategies? (2014). *Journal of Experimental Psychology: General*, 143, 575-596.
19. Burke, J., Sperling, M.R., Sharan, A.D., Evans, J.J., Ramayya, A., Healy, M.K., Beck, E.N., Davis, K.A., Lucas, T.H. and Kahana, M.J. (2014) Theta and high-frequency activity mark spontaneous recall of episodic memories. *Journal of Neuroscience*, 34, 11355-11365
20. Healey, M. K., Crutchley, P., and Kahana, M. J. Individual differences in memory search and their relation to intelligence. (2014) *Journal of Experimental Psychology: General*, 143, 1553-1569.
21. Manning, J., Lew, T. F., Li, N., Sekuler, R., and Kahana, M. J. (2014) MAGELLAN: A cognitive map-based model of human wayfinding. *Journal of Experimental Psychology: General*, 143, 1314-1330.
22. Ramayya, A., Misra, A., Baltuch, G., and Kahana, M. J. (2014). Microstimulation of the human substantia nigra alters reinforcement learning. *Journal of Neuroscience*, 20, 6887-6895.
23. Lohnas, L. J. and Kahana, M. J. (2014) A retrieved context account of spacing and repetition effects in free recall. *Journal of Experimental Psychology: Learning, Memory & Cognition*, 40, 755-764.
24. Dube, C., Zhou, F., Kahana, M.J., and Sekuler, R. (2014). Similarity-based distortion of visual short-term memory is due to perceptual averaging. *Vision Research*, 96, 8-16.
25. Serruya, M.D., Sederberg, P.B., and Kahana, M. J. (2014) Power shifts track serial position and modulate encoding in human episodic memory. *Cerebral Cortex*, 24, 403-413.
26. Lohnas, L. J., and Kahana, M. J. (2014). Compound cueing in free recall. *Journal of Experimental Psychology: Learning, Memory & Cognition*, 12-24.
27. Burke, J. F., Long, N.M., Zaghoul, K.A., Sharan, A.D., Sperling, M.R., and Kahana, M.J. (2014). Human intracranial high-frequency activity maps episodic memory formation in space and time. *NeuroImage*, 85, 834-843.
28. Long, N. M., Burke, J. F., and Kahana, M.J. (2014). Subsequent memory effect in intracranial and scalp EEG, *NeuroImage*, 84, 488-494.

29. Solway, A., Miller, J. F., and Kahana, M. J. (2013). PandaEPL: A library for programming spatial navigation experiments. *Behavior Research Methods*, 45, 1293-1312.
30. Lohnas, L. J. and Kahana, M. J. (2013). Parametric effects of word frequency on recall and recognition. *Journal of Experimental Psychology: Learning, Memory & Cognition*, 39, 1943-1946.
31. Miller, J.F. \*, Neufang, M. \*, Solway, A., Brandt, A., Hefft, S., Trippel, M. Mader, I., Polyn, S.M., Jacobs, J., Kahana, M. J. \*, and Schulze-Bonhage, A\*. (2013). Neural activity in human hippocampal formation reveals the spatial context of retrieved memories, *Science*, 342, 1111-1114. (\* denotes equal contributions).
32. Morton, N. W., Kahana, M. J., Rosenberg, E. A., Sperling, M. R., Sharan, A. D., and Polyn, S. M. (2013). Category-specific neural oscillations predict recall organization during memory search. *Cerebral Cortex*, 23, 2407-2422.
33. Miller, J. F., Lazarus, E., Polyn, S. M., and Kahana, M. J. (2013). Spatial clustering during memory search. *Journal of Experimental Psychology: Learning, Memory & Cognition*, 39, 773-781.
34. Jacobs, J., Weidemann, C.T., Miller, J., Solway, A., Wei, X., Suthana, N., Sperling, M., Sharan, A. D., Fried, I., and Kahana, M. J. (2013). Direct recordings of grid-like neuronal activity in human spatial navigation. *Nature Neuroscience*, 16, 1188-1190.
35. van Vugt, M. K., Sekuler, R., Wilson, H. R., and Kahana, M. J. (2013). An electrophysiological signature of summed similarity in visual working memory. *Journal of Experimental Psychology: General*, 142, 412-425.
36. Burke, J. F., Zaghoul, K.A., Jacobs, J., Williams, R. B., Sperling, M. R., Sharan, A. D., and Kahana, M. J. (2013). Synchronous and asynchronous theta and gamma activity during episodic memory formation. *Journal of Neuroscience*, 33, 292-304.
37. Han, X., Byrne, P., Kahana, M. J., and Becker, S. (2012). When do objects become landmarks? A VR study of the effect of task relevance on spatial memory, *PLoS One*, 7(5), e35940.
38. Manning, J. R. and Kahana, M. J. (2012). Interpreting semantic clustering effects in free recall. *Memory*, 20, 511-517.
39. Manning, J. R., Sperling, M. R., Sharan, A., Rosenberg, E. A., and Kahana, M. J. (2012). Spontaneously reactivated patterns in frontal and temporal lobe predict semantic clustering during memory search. *Journal of Neuroscience*, 32, 8871-8878.

40. Miller, J. F., Weidemann, C. T., and Kahana, M. J. (2012) Recall termination in free recall. *Memory & Cognition*, 4, 540–550.
41. Solway, A., Murdock, B.B., and Kahana, M.J. (2012). Positional and temporal clustering in serial order memory. *Memory & Cognition*, 40(2), 177–190.
42. van der Meij, R., Kahana, M., and Maris, E. (2012). Phase-amplitude coupling in human ECoG is spatially distributed and phase diverse. *Journal of Neuroscience*, 32, 111–123
43. Lega, B. C., Jacobs, J. and Kahana. M. J. (2012). Human hippocampal theta oscillations and the formation of episodic memories. *Hippocampus*, 22(4), 748–761.
44. Zaghoul, K., Weidemann, C. T., Lega, B.C., Jaggi, J., Baltuch, G.H., and Kahana, M. J. (2012). Neuronal activity in the human subthalamic nucleus encodes decision conflict during action selection. *Journal of Neuroscience*, 32, 2453–2460.
45. Lega, B.C., Kahana, M. J., Jaggi, J. Baltuch, G. H. and Zaghoul, K. (2011). Neuronal and oscillatory activity during reward processing in the human ventral striatum. *Neuroreport*, 22, 795–800.
46. Lohnas, L. J., Polyn, S. M., and Kahana, M. J. (2011). Contextual variability in free recall. *Journal of Memory and Language*, 64(3), 249–255.
47. Manning, J. R., Polyn, S. M., Baltuch, G., Litt, B., and Kahana, M. J. (2011). Oscillatory patterns in temporal lobe reveal context reinstatement during memory search. *Proceedings of the National Academy of Sciences, USA*, 108(31), 12893–12897.
48. Maris, E., van Vugt, M. and Kahana, M.J. (2011). Spatially Distributed Patterns of Oscillatory Coupling between High-Frequency Amplitudes and Low-Frequency Phases in Human iEEG. *NeuroImage*, 54, 836–850.
49. Polyn, S. M., Erlichman, G., and Kahana, M. J. (2011). Semantic cuing and the scale-insensitivity of recency and contiguity. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 37, 766–775.
50. Jacobs, J., Kahana, M. J., Ekstrom, A. D., Mollison, M. V., and Fried, I. (2010). A sense of direction in human entorhinal cortex. *Proceedings of the National Academy of Sciences*, 107, 6487–6492.
51. Sederberg, P. B., Miller, J. F., Howard, M. W., and Kahana, M.J. (2010). The temporal contiguity effect predicts episodic memory performance. *Memory & Cognition*, 38, 689–699.
52. Jacobs, J. and Kahana, M. J. (2010). Direct brain recordings fuel advances

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