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Personal

Born 7.7.70, Philadelphia, PA
Married to Sharon L. Botnovcan, four children

Professional Positions

- 2002— , Assistant Professor, Department of Psychology, Syracuse University
- 2003— , Senior Scientist, Center for Health and Behavior, Syracuse University
- 2004— , Adjunct, Biomedical and Chemical Engineering, Syracuse University
- 2005— , Adjunct, Neuroscience and Physiology, SUNY Upstate Medical University

Education

- 2001-2002 Postdoctoral Fellow, Department of Psychology, Boston University, Michael E. Hasselmo, advisor, Computational neuroscience.
- 1999-2001 Postdoctoral Fellow, Department of Psychology, Brandeis University, M. J. Kahana, advisor, Cognitive neuroscience.
- 1999 Ph.D. Brandeis University, Neuroscience; Thesis: *Temporal context in human memory*, M. J. Kahana, chair.
- 1992 B.A. Rutgers University, Magna Cum Laude, Physics.

Publications

- Probyn, J. P., Sliwinski, M. J. & Howard, M. W. (in press). Effects of age on contextually mediated associations in paired associate learning. *Psychology and Aging*.
- Howard, M. W., Youker, T. E., and Venkatadass, V. (in press). The persistence of memory: Contiguity effects across several hundred seconds. *Psychonomic Bulletin & Review*.
- Howard, M. W. (in press). Computational models of working memory. L. R. Squire, T. D. Albright, F. E. Bloom, F. H. Gage and N. C. Spitzer (Eds), *The New Encyclopedia of Neuroscience*, Elsevier.
- Howard, M. W., Venkatadass, V., Norman, K. A., and Kahana, M. J. (in press). Associative processes in immediate recency. *Memory & Cognition*.

- Kahana, M. J., Howard, M. W., & Polyn, S. M. (in press). Associative retrieval processes in episodic memory. In, H. L. Roediger, (Ed), *Learning and Memory - A Comprehensive Reference*, Elsevier.
- Howard, M. W., Addis, K. A., Jing, B. and Kahana, M. J. (2007), Semantic structure and episodic recall, in Landauer, McNamara, Dennis, & Kintsch (Eds) *LSA: A Road Towards Meaning*, Laurence Erlbaum Associates: Mahwah, NJ, pp. 121-141.
- Siekmeier, P. J., Hasselmo, M. E., Howard, M. W., and Coyle, J. T. (2007). Modeling of context dependent retrieval in hippocampal region CA1: Implications for cognitive function in schizophrenia. *Schizophrenia Research*, **89**, 177-190.
- Zaromb, F. M., Howard, M. W., Dolan, E. D., Sirotin, Y. B., Tully, M., Wingfield, A. and Kahana, M. J. (2006). Temporally-based false memories in free recall. *Journal of Experimental Psychology: Learning, Memory and Cognition*, **32**, 792-804.
- Howard, M. W., Wingfield, A. and Kahana, M. J. (2006). Aging and contextual binding: Modeling recency and lag-recency effects with the temporal context model, *Psychonomic Bulletin & Review*, **13**, 439-445.
- Howard, M. W., Bessette-Symons, B. A., Zhang, Y., and Hoyer, W. J. (2006). Aging selectively impairs recollection in recognition memory for pictures: Evidence from modeling and ROC curves, *Psychology and Aging*, **21**, 96-106.
- Howard, M. W. and Natu, V. S. (2005). Position from time: Spatial precision in the temporal context model, *Neural Networks*, **18**, 1150-1162.
- Schwartz, G., Howard, M. W., Jing, B., and Kahana, M. J. (2005). Shadows of the past: Temporal retrieval effects in recognition memory, *Psychological Science*, **16**, 898-904.
- Kahana, M. J. and Howard, M. W. (2005). The spacing and lag effect in free recall, *Psychonomic Bulletin & Review*, **12**, 159-164.
- Howard, M. W., Fotedar, M. S., Datey, A. V. and Hasselmo, M. E. (2005). The temporal context model in spatial navigation and relational learning: Toward a common explanation of medial temporal lobe function across domains, *Psychological Review*, **112**, 75-116.
- Howard, M. W. (2004). Scaling behavior in the temporal context model, *Journal of Mathematical Psychology*, **48**, 230-238.
- Sederberg, P. B., Kahana, M. J., Howard, M. W., Donner, E., and Madsen, J. R. (2003). Theta and gamma oscillations during encoding predict subsequent recall, *Journal of Neuroscience*, **23**, 10809-14.
- Howard, M. W., Rizzuto, D. S., Madsen, J. R., Lisman, J. E., Aschenbrenner-Scheibe, R., Schulze-Bonhage, A. and Kahana, M. J. (2003). Gamma oscillations correlate with working memory load in humans, *Cerebral Cortex*, **13**, 1369-1374.
- Sherman, S. J., Atri, A., Hasselmo, M. E., Stern, C. E. and Howard, M. W. (2003). Scopolamine impairs human recognition memory: Data and modeling. *Behavioral Neuroscience*, **117**, 526-539.

- Kahana, M. J., Howard, M. W., Zaromb, F. M., and Wingfield, A. (2002). Age dissociates recency and lag-recency effects in free recall. *Journal of Experimental Psychology: Learning, Memory and Cognition*, **28**, 530-540.
- Howard, M. W. and Kahana, M. J. (2002). A distributed representation of temporal context. *Journal of Mathematical Psychology*, **46**, 269-299.
- Howard, M. W. and Kahana, M. J. (2002). When does semantic similarity help episodic retrieval? *Journal of Memory and Language*, **46**, 85-98.
- Howard, M. W. and Kahana, M. J. (1999). Contextual variability and serial position effects in free recall. *Journal of Experimental Psychology: Learning, Memory and Cognition*, **25**, 923-941.

Working papers

- Rao, V. A. and Howard, M. W. (submitted). Retrieved context and the discovery of semantic structure. *Advances in Neural Information Processing Systems*.
- Howard, M. W., Jing, B., Rao, V. A., Probyn, J. P., & Datey, A. V. (revised). Bridging the gap: Transitive associations between items presented in similar temporal contexts.
- Manns, J. R., Howard, M. W., & Eichenbaum, H. B. (revised). Hippocampal neurons encode the order of events in unique experiences.
- Bridge, D. J., Probyn, J. P., Zhang, Y., & Howard, M. W. (in revision). Memory processes and gender influences: A matter of context.
- Sherman, S. J., Howard, M. W., Hasselmo, M. E. and Stern, C. E. (in revision). Contributions of the hippocampus and adjacent medial temporal lobe structures to recollection and familiarity, *Hippocampus*.

Support/Awards

- 2004 Society for Mathematical Psychology New Investigator Award.
- Principal Investigator, Retrieved Context in Episodic and Semantic Memory, 1-R01 MH069938-01, 2004-2008. \$770,000 in direct costs.
- Consultant, Hippocampal and cortical coding in memory, Howard Eichenbaum, Boston University, Principal Investigator (funded).
- Mediated associations in episodic and semantic memory. Center for Health and Behavior seed grant. \$5,000 (2/03-9/03).
- Consultant, Associative Processes in Episodic Memory, 2-RO1MH55687. Michael Kahana, University of Pennsylvania, Principal Investigator. (Performed co-investigator duties in preparing this proposal. Also served as co-investigator on this award for 2002-2003.)
- Principal Investigator, Toward the neural basis of episodic memory. 1F32 MH65841-01 (Individual NRSA). Michael Hasselmo, sponsor. 01/02—01/05. \$145,000 (terminated early to accept faculty position).

Recent Invited Talks

- “Toward a mesoscopic model of declarative memory,” Center for Memory and Brain, Boston University, Memory Lunch, June 2007.
- “The temporal context model as a description of the function of the medial temporal lobe: Neurobiological constraints on cognitive theory” New investigator award address, Society for Mathematical Psychology, August 2005, Memphis, TN.
- “Neurobiological constraints on cognitive modeling: The temporal context model as a description of medial temporal lobe function,” Neurofest, April 2005, Skaneateles, New York.
- “Semantic representation in the temporal context model,” Context and Episodic Memory Symposium, March 2005, Philadelphia, PA.
- “A theoretical perspective on memory encoding and retrieval.” Symposium on Cortical Oscillatory Activity and Memory, Annual Meeting of the Society for Psychophysiological Research, Santa Fe, October 2004.
- “Semantic structure and episodic recall” (co-authors Kelly M. Addis and Michael J. Kahana). Workshop for *LSA: A Road Towards Meaning*. Boulder, May 2004.
- “The temporal context model in spatial navigation and relational learning: Toward a common explanation of medial temporal lobe function across domains,” Ebbinghaus Empire, University of Toronto, May 2004.
- “Mediated associations in theory and experiment: Towards a common explanation of episodic and semantic memory,” 2nd Annual Episodic Memory Symposium, New Orleans, November 2003.
- “A description of the entorhinal place code based on the temporal context model,” Bioengineering and Neuroscience Departmental Seminar, Syracuse University, September 2003.
- “Mediated associations, theory and data,” Center for Memory and Brain, Boston University, Memory Lunch, March 2003.

Professional Activities

- Co-founder of SNO, the Syracuse Neuroscience Organization (<http://sno.syr.edu>).
- Syracuse University Department of Psychology Colloquium Committee 2003—. Cognitive/Experimental Search Committee, Fall 2006; Computer Committee Fall 2006—; Experimental Program Admissions Coordinator, Spring 2007—.
- Syracuse University Department of Psychology Executive Committee 2004-2005.
- Center for Health and Behavior Computer Consultant Search Committee Fall 2005.
- *ad hoc* reviewer for *Psychological Review*, *Journal of Neuroscience*, *Journal of Experimental Psychology: General*, *Trends in Cognitive Science*, *Journal of Experimental Psychology: Learning, Memory and Cognition*, *Memory & Cognition*, *Cognitive Science*, *Cognitive Psychology*, *Journal of*

Neurophysiology, Cerebral Cortex Psychonomic Bulletin and Review, Journal of Memory and Language, Hippocampus, PLoS One, Acta Psychologica, NeuroImage, IEEE Transactions on Neural Networks, Neural Networks, Journal of the International Neuropsychological Society, Experimental Aging Research, Autonomous Robots

- *ad hoc* reviewer for NIMH B/Start mechanism, September, 2004.
- Department of Education Program on Research in Reading Comprehension review panel, July, 2002.
- Department of Psychology Undergraduate Poster Session Committee Spr 2004.
- Member, Society for Neuroscience, American Psychological Society, Psychonomic Society, Society for Mathematical Psychology
- ΣΠΣ Physics Honor Society.

Teaching and Mentoring

- Developed PSY 373, Human Memory
- Team-teaching NEU 401/601, Advanced Neuroscience (Cognitive neuroscience module), Fall 2005
- PSY 400, Memory and the Brain
- PSY 622, Memory and Attention; PSY 611, Experimental Proseminar; PSY 730, Seminar in Experimental Psychology: Cognitive Neuroscience of Memory
- Ph.D. committees: Chitra Basak, Serge Onyper, Carlos Panahon (School Psych), Grace Hwang-Grodzins (Biophysics, Brandeis University), Sean Davidson (Biomedical and chemical engineering), Norbou Buchler, Kara Bopp, Seth Sherman (Boston University)
- Ph.D. qualifying exam committees: Christina Wasylshyn, Rob Stawski, Chitra Basak, Serge Onyper
- M.S. committees: Jennifer Probyn (chair), Yaofei Zhang (chair), Serge Onyper, Sean Davidson (Biomedical and chemical engineering)
- Other graduate student research supervision: Beth Flynn (MS student, Biomedical and Chemical Engineering), Aditya Datey (MS student, Computer Engineering), Aniruddha Karmarkar (MS student, Computer Science), Mrigankka Fotedar (MS student, Computer Science), Vaidehi Natu (MS student, Electrical Engineering)
- Undergraduate research supervision: Mike Mattia (Undergraduate poster session, Allport Applied awardee), George Gerard (Undergraduate poster session awardee), Clarion Mendes (Undergraduate poster session awardee), Diana Hobbins, Radha Modi, Madhura Phadke (Undergraduate poster session awardee), Tess Youker (Undergraduate poster session awardee), Donna Bridge (Allport Research awardee).
- Guest lectures on language and attention, memory systems, and molecular bases of memory (NEU 211), theta oscillations (PSY 426/626, Cognitive Neurochemistry) and cognitive modeling (Comp modeling, Cornell University)
- Advisor to 30-35 undergraduate Psych majors since 2003.

Presentations at Scientific Meetings

- Howard, M. W., Properties of episodic association, *Psychonomic Society*, Houston, TX, November, 2006.
- Onyper, S. V., Zhang, Y., & Howard, M. W., Dual-process signal detection theory in item recognition: Evidence for some-or-none recollection, Poster presented to the *Psychonomic Society*, Houston, TX, November, 2006.
- Howard, M. W., Looking for physiological evidence for temporal coding in human memory, Poster presented at the 2nd Annual Computational Cognitive Neuroscience meeting, Houston, TX, November, 2006.
- Howard, M. W., Youker, T. E., Venkatadass, V., The persistence of memory: temporally defined retrieval effects observed over hundreds of seconds, poster presented to the *Society for Neuroscience*, Atlanta, GA, October, 2006.
- Manns, J., Eichenbaum, H. and Howard, M., Hippocampal neurons encode the order of events in unique experiences, Poster presented to the *Society for Neuroscience*, Atlanta, GA, October, 2006.
- Howard, M. W., Iyer, S., & Rao, V. Toward a common explanation of semantic and episodic memory, *Society for Mathematical Psychology*, Vancouver, BC, July, 2006.
- Zhang, Y. & Howard, M. W., Reconciling single-process and dual-process accounts of item recognition, Poster presented to the *Society for Mathematical Psychology*, Vancouver, BC, July, 2006.
- Probyn, J. P., Sliwinski, M. J. & Howard, M. W., Age differences in transitive associations, Poster presented to the *Society for Mathematical Psychology*, Vancouver, BC, July, 2006.
- Howard, M. W.. Two-process theory in recognition memory: Evidence from zROC curves and temporally-defined associations, Poster presented at the 46th Annual Meeting of the Psychonomic Society, Nov. 2005, Toronto, ON.
- Sederberg, P.B., Howard, M.W. and Kahana, M.J., Temporal context model with accumulating retrieval dynamics, *Society for Mathematical Psychology*, August 2005, Memphis, TN.
- Zaromb, F.M, Howard, M.W., Dolan, E., Sirotnin, Y., Tully, M., Wingfield, A. and Kahana, M.J. Temporal associations and prior-list intrusions in free recall, *12th Annual Meeting of the Cognitive Neuroscience Society*, April 2005, New York, NY.
- Sederberg, P.B., Howard, M.W. and Kahana, M.J. Extending the temporal context model, *Context and Episodic Memory Symposium*, March 2005, Philadelphia, PA.
- Howard, M. W., Datey, A. V., and Gai, H. Semantic structure and episodic context: The analogy between LSA and TCM, *Psychonomic Society*, November, 2004, Minneapolis, MN.
- Howard, M. W., Natu, V. S. and Fotedar, M. S., Positional reconstruction from a distributed representation of recent trajectory, *Society for Neuroscience*, October, 2004, San Diego, CA.
- Sherman, S. J., Atri, A., Howard, M. W., Hasselmo, M. E. and Stern, C. E., Cholinergic modulation affects encoding activation that predicts later recognition: fMRI and behavioral modeling, *Society for Neuroscience*, October, 2004, San Diego, CA.

- Howard, M. W. The temporal context model as a description of medial temporal lobe function, *Society for Mathematical Psychology*, July, 2004, Ann Arbor, MI.
- Sederberg, P. B, Howard, M. W. and Kahana, M. J. A neuroanatomical implementation of the TCM framework, *Society for Mathematical Psychology*, July, 2004, Ann Arbor, MI.
- Howard, M. W. and Hasselmo, M. E. Short-term memory and spatial navigation: a model of temporally-varying context captures features of the place code in entorhinal cortex. *Society for Neuroscience*, November 2003, New Orleans, LA.
- Howard, M. W. and Jing, B. Mediated Associations in Paired Associate Learning, *Psychonomic Society*, November 2003, Vancouver, BC.
- Howard, M. W. and Hasselmo, M. E. Bridging the gap: On the basis of transitive association. *Society for Neuroscience*, November 2002, Orlando, FL.
- Sherman, S. J., Howard, M. W., Hasselmo, M. E. and Stern, C. E. Two components of item recognition: Evidence from fMRI. *Society for Neuroscience*, November 2002, Orlando, FL.
- Atri, A., Sherman, S. J., Howard, M. W., Hasselmo, M. E., and Stern, C. E. Scopolamine induces impairment of subsequent item recognition in humans: Data and modeling. *Society for Neuroscience*, November 2002, Orlando, FL.
- Kahana, M. J. and Howard, M. W. Associative Retrieval Processes in Episodic Memory. *Quebec'02 Conference on Short-Term Memory*, Jul, 2002. Quebec, Canada.
- Howard, M. W. and Hasselmo, M. E. (2002). Towards a unified account of medial temporal function. *International Conference on Cognitive and Neural Systems*. May 2002, Boston, MA.
- Kahana, M. J. and Howard, M. W. (2001). Associative retrieval processes in episodic memory. *Psychonomic Society*, November 2001, Orlando, FL.
- Howard, M. W., Rizzuto, D. S., Madsen, J. R., Lisman, J. E., Aschenbrenner-Scheibe, R., Schulze-Bonhage, A. and Kahana, M. J. (2001). Theta and gamma oscillations correlate with working memory load in humans. *Society for Neuroscience*, November 2001, San Diego, CA.
- Howard, M. W., Kahana, M. J. , Rizzuto, D. S. and Wingfield, A. (2001) The scale invariance of associative memory. *Society for Cognitive Neuroscience* March 2001, New York, NY.
- Howard, M. W., Kahana, M. J. , Rizzuto, D. S. and Wingfield, A. (2000) The scale invariance of associative memory, or why neurobiologists still need cognitive theory. *Society for Neuroscience* November 2000. New Orleans, LA.
- Howard, M. W. and Kahana, M. J. Explaining dissociations in episodic memory retrieval: Further applications of the temporal context model (TCM). *Society for Mathematical Psychology*. August, 2000. Kingston, ON, Canada.
- Kahana, M. J. and Howard, M. W. Temporal context model of human memory. *European Society for Mathematical Psychology*. September, 2000. Graz, Austria.

- Kahana, M. J. and Wingfield, A., Howard, M. W., and Zaromb, F. M. A decomposition of the serial position curve in single-trial free recall for young and older adults. *Cognitive Aging*. March, 2000. Atlanta, GA.
- Howard, M. W. and Kahana, M. J. A distributed representation of temporal context. *Society for Mathematical Psychology*. August, 1999. Santa Cruz, CA.
- Howard, M. W. and Kahana, M. J. Contextual variability and serial position effects in free recall. *Society for Mathematical Psychology*. August, 1998. Nashville, TN.
- Kahana, M. J. and Howard, M. W. A temporal coding model of human memory. Invited talk for a workshop on "The hippocampus and episodic memory," S. Becker, R. O'Reilly, and N. Burgess organizers. *Neural Information Processing Systems*. December, 1997. Breckenridge, CO.
- Howard, M. W. and Kahana, M. J. A neural network model of free recall memory. *Society for Mathematical Psychology*. August, 1997. Bloomington, IN.
- Howard, M. W. and Kahana, M. J. A mathematical model of free recall memory. *Society for Mathematical Psychology*. August, 1996. Chapel Hill, NC.