

Joshua Jacobs, Ph.D.

Contact

Columbia University
Fu Foundation School of Engineering and Applied Sciences (SEAS)
Department of Biomedical Engineering
1210 Amsterdam Avenue
Mail Code (MC) 8904
New York, NY 10027
FAX: 212.854.8725 *e-mail*: joshua.jacobs@columbia.edu

Professional

- 2015–present, Assistant Professor, Department of Biomedical Engineering, Columbia University.
- 2010–2014, Assistant Professor, School of Biomedical Engineering, Science, and Health Systems, Drexel University.
- 2013–present, Assistant Professor (courtesy appointment), Department of Psychology, School of Arts and Sciences, Drexel University.
- 2009–2010, Postdoctoral researcher, University of Pennsylvania.
- 2002–2003, Senior Unix Software Developer, Bloomberg L.P., NY.

Education

- 2004–2008, Ph.D., University of Pennsylvania (Neuroscience). Thesis: *Brain oscillations as a window into human cognition*. Awarded best dissertation in neuroscience.
- 2001–2002, M.Eng., Massachusetts Institute of Technology (Computer Science). Thesis: *Improving memory performance through runtime optimization*.
- 1997–2001, S.B., Massachusetts Institute of Technology (Computer Science).

Publications

- Lega, B. C., Burke, J. F., **Jacobs, J.**, and Kahana, M. J. Slow theta-to-gamma phase amplitude coupling in human hippocampus supports the formation of new episodic memories. In press at *Cerebral Cortex*.
- Burke, J. F., Merkow, M., **Jacobs, J.**, Kahana, M. J., and Zaghoul, K. Brain computer interface to enhance episodic memory in human participants. In Press at *Frontiers in Human Neuroscience*.
- Ritaccio, A., Brunner, P., Gunduz, A., Hermes, D., Hirsch, L., **Jacobs, J.**, Kamada, K., Kastner, S., Knight, R.T., Lesser, R., Miller, K., Sejnowski, T., Worrell, G., Schalk, G. (2014). Proceedings of the Fifth International Workshop on Advances in Electrocorticography. *Epilepsy and Behavior* 41, 183-192.
- Misra, A., Burke, J.F., Ramayya, A., **Jacobs, J.**, Sperling, M.R., Moxon, K., Kahana, M., Evans, J. and Sharan, A.D. (2014). Methods for implantation of micro-wire bundles and optimization of single/multi-unit recordings from human mesial temporal lobe. *Journal of Neural Engineering*. 11, 2, 026013.
- **Jacobs, J.** (2014). Hippocampal theta oscillations are slower in humans than in rodents: Implications for models of spatial navigation and memory. *Philosophical Transactions of the Royal Academy of Sciences B*. 369: 20130304.
- Merzagora-Rodriguez, A., Coffey, T., Sperling, M., Sharan, A., **Jacobs, J.** (2014). Repeated stimuli elicit diminished high-gamma electrocorticographic responses. *Neuroimage*. 85, 844–852.
- Miller, J., Neufang, M., Solway, A., Brandt, A., Hefft, S., Mader, I., Polyn, S., **Jacobs, J.**, Kahana, M. Schulze-Bonhage, A. (2013). Neural activity in human hippocampal formation reveals the spatial context of retrieved memories. *Science*, 342, 6142, 1111–1114.

- **Jacobs, J.**, Weidemann, C., Burke, J., Miller, J., Wei, X., Solway, A., Sperling, M., Sharan, A., Fried, I., Kahana, M. (2013). Direct recordings of grid cells in human spatial navigation. *Nature Neuroscience*. 16(9), 1188–1190.
 - Featured on the journal cover.
 - Reviewed in Whalley, K. (2013), Humans are on the grid. *Nature Reviews Neuroscience*, 14, 667.
- van Gerven, M., Maris, E., Sperling, M., Sharan, A., **Jacobs, J.** (2013). Decoding individual brain states with direct human brain recordings. *NeuroImage*. 70, 223–232.
- Burke, J. F., Zaghoul, K. A., **Jacobs, J.**, Sperling, M. R., Sharan, A. D., and Kahana, M. J. (2013). Synchronous and asynchronous theta and gamma activity during human verbal episodic memory formation. *The Journal of Neuroscience*. 33(1), 292–304.
- **Jacobs, J.**, Lega, B. & Anderson, C. (2012). Explaining how brain stimulation can evoke memories. *Journal of Cognitive Neuroscience*. 24(3), 553–563.
- **Jacobs, J.**, Miller, K., Edwards, E., & Voytek, B. (2011). Spurious report of high-frequency electrocorticographic oscillations. [Electronic response to Nonuniform High-Gamma (60–500 Hz) Power Changes Dissociate Cognitive Task and Anatomy in Human Cortex., Gaona et al.] *The Journal of Neuroscience*. Published online Feb. 28, 2011.
- Lega, B., **Jacobs, J.**, & Kahana, M.J. (2011). Human hippocampal theta oscillations and the formation of episodic memories, *Hippocampus*, 22(4), 748–761.
- **Jacobs, J.**, Kahana, M.J., Ekstrom, A.D., Mollison, M., & Fried, I. (2010). A sense of direction in human entorhinal cortex. *Proceedings of the National Academy of Sciences*. 107(14), 6487–6492.
- **Jacobs, J.**, Kahana, M.J. (2010). Direct brain recordings fuel advances in cognitive electrophysiology. *Trends in Cognitive Sciences*. 14(4), 162–171.
- **Jacobs, J.**, Korolev, I.O., Caplan, J.B., Ekstrom, A.D., Litt, B., Baltuch, G., Fried, I., Schulze-Bonhage, A., Madsen, J. R., & Kahana, M.J. (2010). Right-lateralized brain oscillations in human spatial navigation. *Journal of Cognitive Neuroscience*. 22(5), 824–836.
- **Jacobs, J.**, Manning, J.R., Kahana, M.J. (2010). Response to Miller: “Broadband” vs. “high gamma” electrocorticographic signals. *The Journal of Neuroscience*. 30, online.
- Manning, J.R., **Jacobs, J.**, Fried, I., & Kahana, M.J. (2009). Broadband shifts in LFP power spectra are correlated with single-neuron activity in humans. *The Journal of Neuroscience*. 29(43), 13613–3620.
- **Jacobs, J.**, & Kahana, M.J. (2009). Neural representations of individual stimuli revealed by gamma-band electrocorticographic activity. *The Journal of Neuroscience*, 29(33), 10203–10214.
- **Jacobs, J.**, Kahana, M.J., Ekstrom, A.D. & Fried, I. (2007). Brain oscillations control timing of single-neuron activity in humans. *The Journal of Neuroscience*, 27(14), 3839–3844.
- Geller, A.S., Schleifer, I.K., Sederberg, P.B., **Jacobs, J.**, & Kahana, M.J. (2007). PyEPL: A cross-platform experiment-programming library. *Behavior Research Methods*, 39(4), 950–958.
- Ekstrom, A., Viskontas, I., Kahana, M.J., **Jacobs, J.**, Upchurch, K., Bookheimer, S., & Fried, I. (2007). Contrasting roles of single neuron activity and local field potentials in human memory. *Hippocampus*, 17(8), 606–17.
- **Jacobs, J.**, Hwang-Grodzins, G., Curran, T., & Kahana, M.J. (2006). EEG oscillations and recognition memory: Theta correlates of memory retrieval and decision making. *NeuroImage*, 32, 978–987.
- Hwang-Grodzins, G., **Jacobs, J.**, Geller, A., Danker, J., Sekuler, R., & Kahana, M.J. (2005). EEG correlates of verbal and nonverbal working memory. *Behavioral and Brain Functions*, 1:20.
- Kahana, M.J. & **Jacobs, J.** (2000). Inter-response times in serial recall: Effects of intraserial repetition. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 26, 1188–1197.

Publications pending

- Miller, J., Fried, I., **Jacobs, J.** Repeating Spatial Activations in Human Entorhinal Cortex. In review at *Nature Communications*.

Current funding

- Brain and Behavior Research Foundation (formerly NARSAD). \$60,000, 1/2013–12/2014.
- NIMH R01-MH061975. Title: “Electrophysiology of human spatial navigation and memory.” Subcontract \$497,666. 5/2014–4/2019.
- DARPA Restoring Active Memory (RAM). Title: “Memory Enhancement with Modeling, Electrophysiology, and Stimulation (MEMES).” \$1,200,250 7/2014–6/2019.

Pending funding

- NIMH R01. Title: “Role of grid and place cells in human spatial navigation and memory.” In review. Jacobs, primary investigator. Funds requested: \$2,664,846.01.

Previous funding

- Drexel Human Cognition Enhancement Program. \$10,000, (11/2011–10/2012).
- NIH Neuroimaging training grant postdoctoral fellowship (1/2009–8/2010).
- NIH Predoctoral National Research Service Award (5/2008–12/2008).
- NIH Computational Neuroscience Training fellowship (5/2007–4/2008).
- NSF Integrative Graduate Education and Research Traineeship (IGERT) fellowship (11/2005–5/2007).

Awards

- Outstanding Dissertation in Neuroscience (2009). Saul Winegrad, M.D., Award.
- Computational Cognitive Neuroscience Annual Meeting, selected as one of the top posters (2009).
- Westinghouse (Intel) Science Talent Search Finalist (1997).
- International Science and Engineering Fair: Second Place in Social Science & Naval Science Award (1997).

Teaching

- 2011, 2012, 2013, & 2014 (Spring), Principles in Neuroengineering (BMES-478/BMES-711). Average rating: 4.9 out of 5.
- 2013 & 2014 (Winter), Research Methods in Biomedical Engineering (BMES-315/515). Average rating 4.5/10.
- 2012 (Winter), Programming and Modelling for Biomedical Engineering (BMES-202). Average rating: 4.6/5.
- 2009, 2010, 2011, & 2012. Director of the University of Pennsylvania’s Undergraduate Summer Training Program in Computational Neuroscience (sponsored by NIH grant T90 DA 22763-01).

Advisees:

- Ph.D. student: Honghui Zhang (12/2010–present). Project: Travelling theta waves in the human neocortex.
- Ph.D. student: Jonathan Miller (9/2011–present). Project: Context reinstatement in spatial memory.
- Ph.D. student: Tom Coffey (6/2012–present). Project: Deep brain stimulation stimulation and human spatial memory.
- Masters student: Shady El Damaty (9/2011–6/2013). Project: Electroencephalographic representation of letters and words in working memory.
- Postdoctoral Fellow: Anna Merzagora Rodriguez (12/2011–8/2012). Project: Electroencephalographic representation of repetition suppression.

Selected conference presentations

- *The neural basis of cortical-stimulation-induced memory retrieval in humans*. 2010. Society for Neuroscience Annual Meeting. San Diego, CA. Presenting author: Josh Jacobs.
- American Association of Neurological Surgery (4/2011). Presented by my collaborator Dr. Bradley Lega.
- Presented at Workshop on *High Frequency Oscillations in Cognition and Epilepsy*. Montreal, CA. (5/2011).
- *Habituation effects in human electrocorticographic recordings*. 2011. Society for Neuroscience Annual Meeting. Washington, DC. Presenting author: Anna Merzagora.
- *Electrocorticographic correlates of abstract cognitive states*. 2011. Society for Neuroscience Annual Meeting. Washington, DC. Presenting author: Josh Jacobs.
- *Asynchronous high-frequency activity marks successful memory encoding*. 2011. Society for Neuroscience Annual Meeting. Washington, DC. Presenting author: John Burke.
- *Human single-neuron activity encodes direction and location in a complex virtual environment*. 2012. Society for Neuroscience Annual Meeting. New Orleans, NO. Presenting author: Jonathan Miller.
- *Synchronous and asynchronous theta activity mark human episodic memory encoding*. 2012. Society for Neuroscience Annual Meeting. New Orleans, NO. Presenting author: John Burke.
- *A non-linear relation between human neuronal spiking and broadband high frequency power in the local field potential*. 2012. Society for Neuroscience Annual Meeting. New Orleans, NO. Presenting author: Ashwin Ramayya.
- *Probing the timing and amplitude of neural adaptation with human electrocorticography*. 2012. Society for Neuroscience Annual Meeting. New Orleans, NO. Presenting author: Anna Merzagora.
- *Traveling waves in human neocortex revealed with electrocorticography*. 2012. Society for Neuroscience Annual Meeting. New Orleans, NO. Presenting author: Honghui Zhang.
- *High gamma band activity reveals lexical cohorts in human electrocorticographic recordings*. 2013. Society for Neuroscience Annual Meeting. San Diego, CA. Presenting Author: Shady El Damaty.
- *Traveling alpha waves in the human electrocorticogram*. 2013. Society for Neuroscience Annual Meeting. San Diego, CA. Presenting Author: Honghui Zhang.
- *Patterns of oscillatory phase relations in human electrocorticography can be explained by temporal delays*. 2013. Society for Neuroscience Annual Meeting. San Diego, CA. Presenting Author: Roemer van Der Meij.
- *Reinstatement of place-responsive cell activity during episodic memory retrieval*. 2013. Society for Neuroscience Annual Meeting. San Diego, CA. Presenting Author: Jonathan Miller.
- *An analysis of human navigation-related theta oscillations using spike triggered field potentials and autocorrelations*. 2014. Society for Neuroscience Annual Meeting. Washington, D.C. Presenting Author: Tom Coffey.
- *Human hippocampal theta oscillations are traveling waves*. 2014. Society for Neuroscience Annual Meeting. Washington, D.C. Presenting Author: Honghui Zhang.
- *Human entorhinal neurons activate at multiple related locations in an environment*. 2014. Society for Neuroscience Annual Meeting. Washington, D.C. Presenting Author: Jonathan Miller.

Invited Talks

- Princeton University (March, 2011)
- Hahnemann Hospital (March, 2011)
- University of Pennsylvania Computational Neuroscience Retreat (April, 2011).
- Drexel University Medical School (May, 2011),
- Drexel Human Cognition Enhancement Program Annual Symposium (May, 2011)

- Workshop on High Frequency Oscillations. Montreal Neurological Institute. (May 2011).
- University of Pennsylvania Department of Psychiatry's Workshop on Gamma oscillations (October 2011).
- University of Wisconsin, Milwaukee (December, 2011)
- Drexel Chronobiology and Sleep Symposium (September, 2012)
- University of Pennsylvania Center for Cognitive Neuroscience (September, 2012)
- Space in the Brain, Royal Society, UK (May, 2013).
- Brandeis University (September, 2013).
- Fifth International Workshop on Advances in Electroencephalography (November, 2013).
- NeuroFutures. Seattle. (June, 2014).
- Single-neuron studies of the human brain. Johns Hopkins University. (November, 2014)

Society memberships

- Society memberships: Society for Neuroscience (2003–present).
- Cognitive Neuroscience Society (2004–present).

Collaborators:

- Michael Sperling, Joseph Tracy, Aswhini Sharan, Mijail Serruya (Thomas Jefferson University).
- Brian Litt, Gordon Baltuch, Tim Lucas, & Michael Kahana (University of Pennsylvania).
- Barbara Jobst (Dartmouth–Hitchcock Medical Center).
- Jeffrey Ojemann (University of Washington).
- Robert Gross (Emory University).
- Itzhak Fried (University of California, Los Angeles).
- John Lisman (Brandeis University).

Last updated: January 7, 2015