

Jonathan Samir Matthis

Curriculum Vitae

Assistant Professor
Department of Biology
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Education

PhD – Cognitive Science | May 2014 – Rensselaer Polytechnic Institute

MSc – Cognitive Science | May 2011 – Rensselaer Polytechnic Institute

BA – Philosophy | May 2007 – University of Maryland, Baltimore County

Positions Held

July 2019 – Present	Assistant Professor	Northeastern University, Boston MA USA, Dept of Biology
Aug 2014 – June 2019	Post-Doctoral Researcher	University of Texas at Austin, Center for Perceptual Systems

Research Funding

Funded Proposals

NIH 1-K99/R00-EY028229-01A1 – Gaze and the visual control of foot placement when walking over rough terrain, *Principle Investigator* (Sponsor – Mary Hayhoe; Co-Sponsor – Richard Neptune), Submitted: July 2017, Funding period: 2018-2023. Total Cost: \$981,520.00

Rensselaer Humanities, Arts, and Social Sciences Fellowship – The visual control of foot placement, *Fellow* (Advisor – Brett Fajen), Submitted March 2010, Funding period: 2010-2012 (Two years of full support)

Submitted Proposals

NSF 1724416 S&AS: INT – Planning for Dynamics Locomotion, *Key Personnel* (Principle Investigator, Jonathan Hurst), Submitted: Dec 2016

NIH 1-K99-EY028229-01 – Gaze and the visual control of foot placement when walking over rough terrain, *Principle Investigator* (Sponsor – Mary Hayhoe; Co-Sponsor – Richard Neptune) – Submitted: Oct 2016

NIH 1-F32-EY026495-01 – Gaze, gait, and attention when walking over real-world rough terrain, *Principle Investigator* (Sponsor – Mary Hayhoe) – Submitted: Apr 2015

NIH 1-F32-EY026495-01 – Gaze, gait, and attention when walking over real-world rough terrain, *Principle Investigator* (Sponsor – Mary Hayhoe) – Submitted: Apr 2015

NIH F32AG047000-01A1 – The dynamics of visually guided walking, *Principle Investigator* (Sponsor – Dagmar Sternad), Submitted: Dec 2013

NIH F32AG047000-01 – The dynamics of visually guided walking, *Principle Investigator* (Sponsor – Dagmar Sternad), Submitted: Apr 2013

NSF Graduate Research Fellowship Program – The visual control of foot placement, *Fellow* (Advisor – Brett Fajen),
Submitted: Nov 2009

NSF Graduate Research Fellowship Program – The visual control of foot placement, *Fellow* (Advisor – Brett Fajen),
Submitted: Nov 2008

Journal Publications

Bonnen, K.L., **Matthis, J.S.**, Gibaldi, A., Banks, M., Levi, D., Hayhoe, M.M. (In Review PNAS). Binocular Vision and the control of foot placement during walking in natural terrain.

Matthis, J.S., Muller, KS, Bonnen, KL, Hayhoe, M.M. (*In Review, PLoS Comp Bio*). Retinal optic flow during natural locomotion.

Matthis, J.S., Yates, J.L., Hayhoe, M.M. (2018). Gaze and the visual control of foot placement when walking over real-world rough terrain. *Current Biology*. 28. 1224-1233. doi: <https://doi.org/10.1016/j.cub.2018.03.008>

Matthis, J.S., Barton, S.L, Fajen, B.R. (2017). The critical control phase for the visual control of walking over complex terrain. *Proceedings of the National Academy of Sciences*, 114(30) doi: 10.1073/pnas.1611699114

Matthis, J.S., Barton, S.L, Fajen, B.R. (2015). The biomechanics of walking shape the use of visual information during locomotion over complex terrain. *Journal of Vision*. 15(3). 1-13. doi: 10.1167/15.3.10

Matthis, J. S. & Fajen, B. R. (2014). Visual control of foot placement when walking over complex terrain. *Journal of Experimental Psychology: Human Perception and Performance*. 40(1). 106-15. doi: 10.1037/a0033101

Matthis, J. S. & Fajen, B. R. (2013). Humans exploit the biomechanics of bipedal gait during visually guided walking over complex terrain. *Proceedings of the Royal Society B: Biological Sciences*, 280(1762). 1-9. doi: 10.1098/rspb.2013.0700

Barton, S. L., **Matthis, J. S.**, & Fajen, B. R. (2019). Control strategies for rapid, visually guided adjustments of the foot during continuous walking. *Experimental Brain Research*, <https://doi.org/10.1007/s00221-019-05538-7>

Hayhoe, M.M., **Matthis, J.S.**, (2018) Control of gaze in natural environments: effects of rewards costs uncertainty and memory in target selection. *Royal Society Interface Focus*. (8), doi: 10.1098/rsfs.2018.0009

Barton, S. L., **Matthis, J. S.**, & Fajen, B. R. (2017). Visual regulation of gait: Zeroing in on a solution to the complex terrain problem. *Journal of Experimental Psychology: Human Perception and Performance*. 43(10). 1773-1790. doi: 10.1037/xhp0000435

Fajen, B. R., Parade, M. S., & **Matthis, J. S.** (2013). Humans perceive object motion in world coordinates during obstacle avoidance. *Journal of Vision*, 13(8), 1-13. doi: 10.1167/13.8.25

Fajen, B. R., & **Matthis, J. S.** (2013). Visual and non-visual contributions to the perception of object motion during self-motion. *PLoS ONE* 8(2), 1-12. doi: 10.1371/journal.pone.0055446

Fajen, B. R., & **Matthis, J. S.** (2011). Direct perception of action-scaled affordances: The shrinking gap problem. *Journal of Experimental Psychology: Human Perception and Performance*, 37(5), 1442-1457. doi: 10.1037/a0023510

Invited Talks

- Matthis, J.S., (2020). *"Retinal optic flow and the visual control of locomotion"* Talk presented to the New England School of Optometry
- Matthis, J.S., (2019). *"Retinal optic flow and the visual control of locomotion"* Talk presented to the Perception and Action Seminar at Brown University
- Matthis, J.S., (2019). *"Retinal optic flow and the visual control of locomotion"* Talk presented to the Department of Biology at Northeastern University.
- Matthis, J.S., (2019). *"Retinal optic flow and the visual control of locomotion"* Talk presented to the Boston Dynamics Robotics Lab.
- Matthis, J.S., (2019). *"Retinal optic flow and the visual control of locomotion"* Talk presented to the Sensorimotor Systems lab at the NIH Bethesda campus.
- Matthis, J.S., (2018). *"The visual control of foot placement in natural terrain."* Talk presented to the Department of Biology at Northeastern University.
- Matthis, J.S., (2017). *"Optic flow and the visual control of foot placement in natural terrain."* Talk presented to the Center for Vision Research at Rochester University.
- Matthis, J.S., (2017). *"Optic flow and the visual control of foot placement in natural terrain."* Talk presented to the Center for Imaging Research at Rochester Institute of Technology.
- Matthis, J.S., (2017). *"Optic flow and the visual control of foot placement in natural terrain."* Talk presented to the Action Club at Pennsylvania State University.
- Matthis, J.S. (2017). *"Gaze and the visual control of foot placement when walking over real-world rough terrain."* Talk in the Lynn W. McCraw lecture series in the Department of Kinesiology at the University of Texas at Austin.
- Matthis, J.S. (2017). *"Gaze and the visual control of foot placement when walking over real-world rough terrain."* Talk in the Department of Bioengineering at the University of Colorado Denver, Anschutz Medical Campus
- Matthis, J.S., (2016). *"The coupling of gaze and gait when walking over real-world rough terrain."* Talk presented to the Robotics Institute at Oregon State University.
- Matthis, J.S., (2015). *"The critical phase for visual control of walking over complex terrain."* Talk presented to the humanoid robotic locomotion research group at the Boston Dynamics Robotics Lab.
- Matthis, J.S., Fajen, B.R. (2014). *"The visual control of walking over complex terrain."* Talk presented at the CLPS Perception and Action Seminar Series at Brown University.
- Matthis, J.S. (2013). *"Visual control of precise foot placement when walking over complex terrain."* Talk presented at the Robotics Institute of Carnegie Mellon University.
- Matthis, J.S., Fajen, B.R. (2013). *"Visually guided locomotion in complex and dynamic environments."* Talk presented at the Action Club at Northeastern University.

Conference Presentations

Matthis, J.S., Hayhoe, M.M., *“Retinal optic flow and the visual control of locomotion.”* Talk presented at 2019 Natural Environments Tasks and Intelligence (NETI) workshop.

Matthis, J.S., Hayhoe, M.M., *“The dynamic of optic flow during real-world locomotion.”* Talk presented at 2018 meeting on Dynamic Walking.

Matthis, J.S., Hayhoe, M.M., *“The visual control of foot placement in natural terrain.”* Talk presented at 2017 Ohio State Mathematical and Biosciences Institute workshop on Sensori-motor control of animals and robots. Columbus, OH, USA.

Matthis, J.S., Muller, K.S., Hayhoe, M.M., *“Optic flow and self-motion information during real-world locomotion* Talk presented at 2017 meeting of the Vision Sciences Society (VSS). St Pete’s, FL, USA.

Matthis, J. S., Hayhoe, M.H., *“Gaze and the visual control of foot placement when walking over real-world rough terrain.”* Talk presented at the 2017 meeting of the European Conference on Eye Movements (ECEM)

Matthis, J.S., Zhao, Y., Barton, S.L., Hayhoe, M.H., Sentis, L., *“Towards understanding visually guided locomotion over complex and rough terrain: A phase-space planning method.”* Talk presented at the 2017 meeting of the IEEE Workshop on Advanced Robotics and its Social Impacts (ARSO).

Matthis, J.S., Muller, K.M., Bonnen, K., Hayhoe, M.M., *“Optic Flow and self-motion information during real-world locomotion.”* Talk presented at the 2017 meeting of the Vision Sciences Society (VSS).

Matthis, J.S., Hayhoe, M.M., *“The coupling of gaze and gait when walking over real world rough terrain.”* Talk presented at the 2016 meeting on Dynamic Walking.

Matthis, J.S., Hayhoe, M.M., *“Gaze and foot placement when walking over real world rough terrain.”* Talk presented at the 2015 meeting on Dynamic Walking.

Matthis, J.S., Hayhoe, M.M., *“The coupling of gaze and gait when walking over real world rough terrain.”* Talk presented at the 2016 meeting of the Vision Sciences Society (VSS).

Matthis, J.S., Barton, S.B., Fajen, B.R. (2014). *“The critical period for the visual control of foot placement occurs during the preceding step.”* Talk presented at 2014 meeting of the Vision Science Society (VSS).

Matthis, J.S., Barton, S.B., Fajen, B.R. (2013). *“Visual control of precise foot placement when walking over complex terrain.”* Talk presented at 2013 meeting of the Vision Science Society (VSS).

Matthis, J.S., Fajen, B.R. (2012). *“Humans exploit the biomechanics of bipedal gait during visually guided walking over complex terrain.”* Talk presented at the 2012 meeting on Dynamic Walking.

Matthis, J.S., Fajen, B.R. (2012). *“Humans exploit the biomechanics of bipedal gait during visually guided walking over complex terrain.”* Talk presented at the 2012 meeting of the Vision Science Society (VSS).

Conference Papers and Published Abstracts

Kothari, R., Binaee, K., **Matthis, J.S.**, Bailey, R., Diaz G. Novel apparatus for the investigation of eye-movements when walking in the presence of 3D projected obstacles. Proceedings of the 2016 meeting of the *Eye Tracking Research & Applications (ETRA) Symposium*.

- Matthis, J.S.**, Hayhoe, M.M. (2017). Optic flow and self-motion information during real-world locomotion. *Journal of Vision*.
- Matthis, J.S.**, Hayhoe, M.M. (2016). The functional coupling of gaze and gait when walking over real world rough terrain. *Journal of Vision*.
- Matthis, J.S.**, Hayhoe, M.M. (2015). Eye, head, and foot tracking during locomotion over real-world complex terrain. *Journal of Vision*. 15(12).
- Matthis, J.S.**, Barton, S.B., Fajen, B.R. (2014). The critical period for the visual control of foot placement occurs during the preceding step. *Journal of Vision*. 14(10). 3.
- Matthis, J.S.**, Barton, S.B., Fajen, B.R. (2013). Visual control of precise foot placement when walking over complex terrain. *Journal of Vision*. 13(9). 121.
- Matthis, J.S.**, Fajen, B.R. (2012). Humans exploit the biomechanics of bipedal gait during visually guided walking over complex terrain. *Journal of Vision*. 12(9). 1118.
- Matthis, J.S.**, Fajen, B.R. (2011). Visual control of foot placement when walking over rough terrain. *Journal of Vision*. 11(11). 915.
- Parade, M.S., **Matthis, J.S.**, Fajen, B.R., (2011). Non-visual self-motion information influences perception of object motion while walking. *Journal of Vision*. 11(11). 898.
- Possidente, P., Phillips, F., **Matthis, J.S.**, Diaz, G. (2011). Anticipation of sabre fencing attacks. *Journal of Vision*. 11(11). 957.
- Matthis, J.S.**, Fajen, B.R. (2010). Visual information about locomotor capabilities and the perception of possibilities for action. *Journal of Vision*. 10(7). 1019.
- Fajen, B.R., **Matthis, J.S.**, Cramer, C. (2009). Do actors pick up information on the fly to perceive possibilities for action? *Journal of Vision*. 9(8). 1142.

Teaching Experience

Fall 2020 – Northeastern University – Biol2299 – *Inquiries in Biological Sciences: Locomotion*

Spring 2020 – Northeastern University – Biol2299 – *Inquiries in Biological Sciences: Locomotion*

Fall 2017 – University of Texas at Austin – PSY 394U – *Intro to Sensory-Motor Systems*
Invited Guest Lecturer (Instructor Mary Hayhoe)

Spring 2017 – University of Texas at Austin – PSY 394U – *Eye Movements and Language*
Invited Guest Lecturer (Instructor Zenzi Griffin)

Spring 2014 - Rensselaer Polytechnic Institute – COGS/PHIL/PSYC 2120 – *Introduction to Cognitive Science*
Co-Instructor (w/ Bram Van Heuveln)

Spring 20017 – University of Maryland, Baltimore County – IS 304 – *Ethical Issues in Information Technology*
Teaching Assistant, Discussion Leader (Instructor Richard Wilson)

Academic and Professional Honors

- Travel Grant to attend 2012 meeting of Dynamic Walking group (May 2012)
- Travel Grant to attend 2011 meeting of Dynamic Walking group (August 2011)
- Travel Grant to attend Centre for Vision Research Conference (June 2009)
- Glenn M. Trawinski Student Leadership Award (UMBC, Spring 2007)
- *Best in Conference* Award (SIUE Undergraduate Philosophy Conference, November 2006)
- Graduated *Magna Cum Laude* (UMBC, May 2007)
- Graduated with Departmental Honors (UMBC, May 2007)

Academic Service

- School of Humanities Arts and Social Sciences, Dean search committee (Summer 2011)

Invited Manuscript Reviews

- *Healthy Aging Research*
- *IEEE Conference on Robotics & Automation*
- *International Journal of Humanoid Robotics*
- *Journal of Experimental Biology*
- *Journal of Experimental Psychology: Human Perception & Performance*
- *Journal of Gait & Posture*
- *Journal of Vision*
- *Perception*
- *Public Library of Science: One*

Public Communication of Science

In my spare time I create short animations that highlight basic biomechanical principles that underlie the actions of highly skilled athletes. In their various forms, these animations have gathered over 10 million estimated views, and been incorporated into the curricula and training plans of multiple high school teachers, college professors, and NCAA coaches. They were also featured in the 2017 National Biomechanics Day presentation, which is an outreach program aimed at high school students and teachers. In addition, my research has been featured in two science-themed online magazines.

List of Animations

Available at <http://jonmatthis.com/animations/>

Popular Science features.

Barclay, Eliza. (August 2016). *Handstands, Explained*. Published in *Vox:Science*. Retrieved from: <http://www.vox.com/2016/8/11/12132588/balancing-hands-handstand-secret>

Schramski, Sam. (July 2016). *Running is always blind*. Published in *Nautilus*. Retrieved from: <http://nautilus-web-602376506.us-east-1.elb.amazonaws.com/issue/38/noise/running-is-always-blind>