

Eatai Roth

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Education

- Johns Hopkins University**, Baltimore, MD Spring 2006 – June 2012
PhD in Mechanical Engineering, May 2012
Advisor: Prof. Noah J. Cowan
Thesis: Task-level Models for Image-stabilization Behaviors in Animals
- University of Pennsylvania**, Philadelphia, PA Fall 2005
PhD program in Mechanical Engineering and Applied Mechanics.
Withdrew from program (transferred to JHU) Spring 2006.
- University of Pittsburgh**, Pittsburgh, PA May 2005
Bachelor of Science (*Summa Cum Laude*) in Mechanical Engineering
- Washington University**, St. Louis, MO May 2001
Bachelor of Fine Arts (with Honors) in painting and art history

Research Experience

- Washington Research Foundation**
Innovation Postdoctoral Research Fellow in Neuroengineering Dec 2013 – Present
University of Washington, Seattle, WA
Researching flight behaviors in hawkmoths, translating tools from robotics and control theory towards understanding neural control paradigms of animal flight.
Supervisor: Prof. Thomas L. Daniel
Funding: Washington Research Foundation Innovation Postdoctoral Fellowship in Neuroengineering, AFOSR Center of Excellence in Nature-inspired Flight Technologies and Ideas
- Postdoctoral Research Associate** Sep 2012 – Dec 2013
University of Washington, Seattle, WA
Researched the spatio-temporal dynamics of visual processing in fruit flies.
Supervisor: Prof. Michael H. Dickinson
- Graduate Researcher, LIMBS Lab** Spring 2006 – June 2012
Laboratory for Computational Sensing and Robotics
Johns Hopkins University, Baltimore, MD
Researched in the area of mathematical modeling of animal locomotor behaviors and the biological mechanisms for sensing and control.
Supervisor: Prof. Noah J. Cowan
Funding: NSF Graduate Research Fellowship, ARCS Scholarship Washington Metro Chapter
- Graduate Researcher, ModLab** Summer – Fall 2005
University of Pennsylvania, Philadelphia, PA
Developed computer simulation for reconfiguration of modular robots.
Supervisor: Prof. Mark Yim

Undergraduate Researcher, Center for Biomolecular Modeling Summer 2003, Summer 2004
Milwaukee School of Engineering, Milwaukee, WI

Designed and prototyped functional carbon nanostructure models for chemistry education as part of the NSF Research Experience for Undergraduates program.

Provisional Patent Application No. 60/557,425, patent awarded in December 2008.

Supervisors: Prof. Anne-Marie Nickel, Dr. Timothy Herman

Undergraduate Researcher, Sound, Systems and Structures Lab Summer 2004
University of Pittsburgh, Pittsburgh, PA

Designed and implemented signal conditioning circuitry.

Supervisor: Prof. Jeffrey S. Viperman

Current and Pending Support

Washington Research Foundation Oct 2014 – Oct 2016

University of Washington Institute for Neuroengineering
Postdoctoral Innovation Fellowship in Neuroengineering \$155,000

Air Force Research Laboratories (co-PI) Full proposal requested, 2 yr
Cyber-physical environments for identifying multi-sensory control policies in animal flight \$427,000

Awards and Honors

Burroughs Wellcome Fund Career Award at the Scientific Interface, Semifinalist March 2016

WRF Postdoctoral Innovation Fellowship in Neuroengineering Oct 2014 – Present

ARCS Foundation Scholarship, Metro Washington Area 2009 – 2011

National Science Foundation Graduate Research Fellowship June 2006 – June 2009

ASME Outstanding Senior Award, University of Pittsburgh 2005

Manuscripts in Preparation or Review

E. Roth and S. A. Burden. "Toward experimental validation of a model for human sensorimotor learning and control in teleoperation." (Submitted, to Micro- and Nanotechnology Sensors, Systems, and Applications IX, part of SPIE Defense and Security)

C. Rusch, **E. Roth**, C. Vinauger, J.A. Riffell. "Colour and shape learning in tethered walking honeybees" (submitted, *J Exp Biol*)

Peer-reviewed Journal Publications

I.S. Kim, S. Jenni, M.L. Stanifer, **E. Roth**, S.P.J. Whelan, A. van Oijen, S.C. Harrison. "Mechanism of membrane fusion catalyzed by vesicular stomatitis G protein." *Proceedings of the National Academy of Sciences*, 14:201618883, December 2016.

E. Roth, R.W. Hall, T.L. Daniel, S. Sponberg. "The integration of parallel visual and mechanosensory pathways resolved through sensory conflict." *Proceedings of the National Academy of Sciences*, 113.45:12832-12837, October 2016.

N.J. Cowan, M.M. Ankarali, J.P. Dyhr, M.S. Madhav, **E. Roth**, S. Sefati, S. Sponberg, S.A. Stamper, E.S. Fortune, and T.L. Daniel. "Feedback control as a framework for understanding tradeoffs in biology." *Integrative and Comparative Biology*, 54.2:223-237, July 2014.

E. Roth, S. Sponberg, and N.J. Cowan. "A comparative approach to closed-loop computation." *Current Opinion in Neurobiology*, 25:54-62, April 2014.

B. Schnell, P.T. Weir, **E. Roth**, A.L. Fairhall and M.H. Dickinson. "Cellular mechanisms for integral feedback in visually guided behavior." *Proceedings of the National Academy of Sciences*, 111.15:5700-5705, April 2014.

S. Sefati, I.D. Neveln, **E. Roth**, T. Mitchell, J.B. Snyder, M.A. MacIver, E.S. Fortune, and N.J. Cowan. "Mutually opposing forces during locomotion can eliminate the tradeoff between maneuverability and stability." *Proceedings of the National Academy of Sciences*, 110.47:18798-18803, November 2013.

S.A. Stamper, **E. Roth**, N. J. Cowan, and E. S. Fortune. "Active sensing via movement shapes spatiotemporal patterns of sensory feedback". *Journal of Experimental Biology*, 215:1567-1574, May 2012.

E. Roth, K. Zhuang, S. A. Stamper, E. S. Fortune, N. J. Cowan. "Stimulus predictability mediates a switch in locomotor smooth pursuit performance for *Eigenmannia virescens*." *Journal of Experimental Biology*. 214:1170-1180, April 2011. (featured on the cover)

S. G. Carver, **E. Roth**, N. J. Cowan, and E. S. Fortune. "Synaptic plasticity can produce and enhance direction selectivity." *PLoS Computational Biology*, February 2008.

Peer-reviewed Conference Articles

E. Roth, M.B. Reiser, M.H. Dickinson, and N.J. Cowan. "A task-level model for optomotor yaw regulation in *Drosophila melanogaster*: a frequency-domain system identification approach." In *IEEE 51st Annual Conference on Decision and Control*, 3721-3726, 2012.

E. Roth, S. Carver, E.S. Fortune and N.J. Cowan. "Mechanisms for encoding velocity in the electrosensory system of the weakly electric fish." *Adaptive Motion in Animals and Machines*, Cleveland, OH, June 2008.

Contributed Abstracts

E. Roth, S. Sponberg, T.L. Daniel. "Robustness via redundancy: multi-sensory control of flight in hawkmoths." *Society for Integrative and Comparative Biology (SICB)*, New Orleans, LA, Jan 2017. (oral presentation)

E. Roth, R.W. Hall, T.L. Daniel, S. Sponberg. "Parallel visual and mechanosensory pathways mediate flower-tracking in the hawkmoth *Manduca sexta*." *Society for Integrative and Comparative Biology (SICB)*, Portland, OR, Jan 2016. (oral presentation)

E. Roth, R.W. Hall, T.L. Daniel, S. Sponberg. "Identifying visual and mechanosensory pathways in a hawkmoth flower-feeding behavior." *IEEE International Conference on Robotics and Automation (ICRA)*, Seattle, WA, May 2015. (poster)

B.H. Dickerson, Y. Munk, **E. Roth**, T.L. Daniel. "Wing mechanosensing enhances flight response to visual pitch stimuli." *Society for Integrative and Comparative Biology (SICB)*, Austin, TX, January 2015.

E. Roth, M.B. Reiser, M.H. Dickinson, and N.J. Cowan. "How fruit flies fly straight: system identification of yaw regulation in *Drosophila*." Winter workshop in locomotion, Princeton, NJ, January 2012.

E. S. Fortune, S. A. Stamper, E. D. Tytell, **E. Roth**, and N. J. Cowan. "Role of direction selective responses in locomotor control." *Society for Neuroscience (SfN)*, Washington, DC, November 2011. (poster)

S. A. Stamper, **E. Roth**, N. J. Cowan, and E. S. Fortune. "Multisensory cues for an image stabilization task." *Society for Neuroscience (SfN)*, Washington, DC, November 2011. (poster)

E. Roth, E. S. Fortune, and N. J. Cowan. "Electric knifefish feedback controller adapts to stimulus dynamics in a locomotor tracking behavior." *Society for Industrial and Applied Mathematics (SIAM) Conference on Control Theory and its Applications*, Baltimore, MD, July 2011. (invited symposium)

E. Roth, K. Zhuang, S. A. Stamper, E. S. Fortune, and N. J. Cowan. "Stimulus predictability mediates a switch in locomotor smooth pursuit performance for *Eigenmannia virescens*." *Computational and Systems Neuroscience (COSYNE)*, Salt Lake City, UT, February 2011. (poster)

E. Roth, K. Zhuang, S. A. Stamper, E. S. Fortune, N. J. Cowan. "Modeling tracking behavior in weakly electric knifefish: differences in processing of predictable versus pseudo-random stimuli." *Society for Integrative and Comparative Biology (SICB)*, Seattle, WA, January 2010. (oral presentation)

M. S. Madhav, S. A. Stamper, **E. Roth**, N. J. Cowan, and E. S. Fortune. "Balancing the jamming avoidance response: closed-loop identification of an unstable sensorimotor behavior." *Society for Neuroscience (SfN)*, Chicago, IL, November 2009. (poster)

E. Roth, M. B. Reiser, N. J. Cowan. "Reconciling open- and closed-loop experiments in sensorimotor control of *Drosophila*." *Society for Integrative and Comparative Biology (SICB)*, Boston, MA, January 2009. (oral presentation)

K. Zhuang, **E. Roth**, E. S. Fortune, N. J. Cowan. "Linear modeling of tracking behavior in weakly electric fish." *Society for Integrative and Comparative Biology (SICB)*, Boston, MA, January 2009. (poster)

E. Roth, S. G. Carver, E. S. Fortune, N. J. Cowan. "Mechanisms for encoding velocity in the electrosensory systems of weakly electric fish." *Adaptive Motion in Animals and Machines (AMAM)*, Cleveland, OH, May 2008. (poster)

E. Roth, A. M. Nickel, T. Herman. "Modeling Carbon Nanostructures." *American Chemical Society (ACS)*, Anaheim, CA, March 2004. (poster)

Invited Talks

State of the Art Review on Nature-Inspired Flight Technologies and Ideas <i>Baltimore, MD</i>	May 2016
Center for Interdisciplinary Bio-inspiration in Education and Research (CiBER) <i>University of California, Berkeley, CA</i>	Scheduled April 2016
Human Frontiers Science Program <i>To bee or not to bee: Information processing in a minibrain Symposium</i> <i>University of Washington, Seattle, WA</i>	September 2015

Patents

"Molecular models." Eatai Roth, Anne-Marie Nickel, Timothy Herman. Patent Number US 7,465,169. December 2008.

Teaching Experience

Co-instructor, <i>Biomechanics</i> (undergrad) <i>University of Washington Dept. of Biology</i>	Fall 2015
Teaching assistant, <i>Neural Systems and Behavior Summer Course</i> <i>Marine Biological Laboratory</i>	Summer 2012
Teaching assistant, <i>Adaptive Systems and System Identification</i> (graduate)	Spring 2012
Teaching assistant, <i>Introduction to Linear Dynamical Systems</i> (graduate)	Fall 2008
Teaching assistant, <i>Electronics and Instrumentation</i> (undergraduate) <i>Johns Hopkins University, Dept. of Mechanical Engineering</i>	Fall 2006
Teaching assistant, <i>Kinematics of Machinery</i> (undergraduate) <i>University of Pittsburgh, Dept. of Mechanical Engineering</i>	Fall 2005
Teaching assistant, <i>Logic and Discrete Mathematics</i> (undergraduate) <i>Washington University in St. Louis, Dept. of Computer Science</i>	Spring 1999

Organizations

Society for Integrative and Comparative Biology (SICB), Member	2008 – Present
Mechanical Engineering Graduate Association, Johns Hopkins University Co-founder, treasurer (2007-10), and lab representative	2007 – 2011
LCSR Graduate Steering Committee, Johns Hopkins University Co-founder and LIMBS Lab representative	2008 – 2011

References

Thomas L. Daniel

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University of Washington

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