Elliot Wright Hawkes

Stanford University
ewhawkes@stanford.edu
(850) 443-4223

EDUCATION

Stanford University: Mechanical Engineering
M.S. in Mechanical Engineering, 2011. GPA: 4.07
Ph.D. Candidate with Prof. Mark Cutkosky, To graduate June 2015.
Thesis: "Applying Gecko Adhesives to the Real World."

Harvard University: School of Engineering and Applied Science
BA in Mechanical Engineering (with Highest Honors); Secondary: Organismic and Evolutionary Biology, Biomechanics; 2009. GPA: 3.83; Concentration GPA: 3.88
Thesis: "Paradigm for Building Multi-functional Composite Structures with Embedded Actuation."

POSITIONS HELD

12/09-present **Biomimetic and Dextrous Manipulation Lab, Stanford, with Prof. Mark Cutkosky**
PhD Candidate
-Designed and fabricated ankle mechanism for loading gecko inspired adhesives. Increases adhesive capabilities seven-fold.
-Developed surface grasping mechanism for autonomous quadrotor perching.
-Invented wind-and-release mechanism for autonomous jumpgliding robot.
-Studied gecko adhesive morphology with custom sensor.
-Developed large-scale adhesive device, supporting 100kg.
-Led team that created a human climbing device using gecko adhesives.
-Became first human to climb glass using hand-sized area of gecko adhesives.

1/12-3/13 **Romotive, Inc.**
Design Consultant
-Designed robust mechanism for holding and tilting iPhone for mobile robot.
-Mechanism requirements: DFM injection molding and line assembly, 10,000 cycles minimum life, robust to 2m drop test, positive user experience.

7/12 **Square One Robotics**
Design Consultant
-Consulted on the design of robotic gripper for grasping rock with microspines.

8/07-8/09 **Harvard Microrobotics Laboratory, with Prof. Robert Wood**
Research Assistant
-Designed and fabricated a millimeter-scale multi-segmented spine with integrated actuation and wiring for application in swimming microrobotics
-Ran optimizations for Shape Memory Alloy springs for use as artificial muscles.

6/08-8/08 **Swiss Federal Institute of Technology, Zurich, with Prof. Bradley Nelson**
Research Assistant
-Designed and fabricated actuated module for capsule-sized endoscopic microrobots as part of the Assembling Reconfigurable Endoluminal Surgical (ARES) system
-Established Smart Composite Microstructure infrastructure at Institute of Robotics and Intelligent Systems, allowing creation of foldable fiberglass structures.

9/06-8/09 **Quad Bikes, Non-Profit Community Bicycle Shop**
Mechanic
-Repaired, refurbished, and built bikes at a local shop, 10-12 hr/wk.

6/07-8/07 **National High Magnetic Field Lab, FL, with Prof. Irinel Chiorescu**
National Science Foundation Research Experience for Undergraduates
-Designed, drafted (with CAD), and had machined an interlocking sample holder for quantum chip experiments at 4mK and 10 Tesla.

1/06-5/06 **Harvard Skeletal Biology Laboratory, with Professor Daniel Lieberman**
Research Assistant
-Studied the function and activation of the gluteus maximus in trunk stabilization during running and jumping, running test with EKG, force sensors and rate gyros.

PUBLICATONS

Journal Papers

-Hawkes, E.W., Eason, E.V., Christensen, D.L., and Cutkosky, M.R. "Human Climbing with Efficiently Scaled Gecko-inspired Dry Adhesives." *J. R. Soc. Interface* 201512 20140675; Published 19 November 2014.

-Hawkes, E.W., Jiang, H., and Cutkosky, M.R. "Three Dimensional Dynamic Surface Grasping with Dry Adhesion." *Int. J. Robotics Research, in review.*

-Hawkes, E.W., Eason, E., Asbeck, A., and Cutkosky, M.R. "The Gecko's Toe: Scaling Dry Adhesives for Climbing Applications." *IEEE Transactions on Mechatronics,* 18, no. 2 (2013): 518-526.

-Hawkes, E.W., An, B., Benbernou, N., Tanaka, H., Kim, S., Demaine, E., Rus, D., and Wood, R. J. "Programmable matter by folding." *Proceedings of the Nat'l Academy of Sciences of the United States.* 107.28 (2009) : 12441-12445.

-Eason, E.V., Hawkes, E.W., Windheim, M., Christensen, D.L., Libby, T. and Cutkosky, M.R., "Stress distribution and contact area measurements of a gecko toe using a high-resolution tactile sensor," *Bioinsipration & Biomimetics,* in press.

-Suresh, A., Christensen, D.L., Hawkes, E.W., and Cutksoky, M.R. "Surface and Shape Deposition Manufacturing for the Fabrication of a Curved Surface Gripper." ASME J. Mechanisms and Robotics, in press.

-Pope, M., Lussier Desbiens, A., Hawkes, E., Christensen, D., and Cutkosky, M. "Design Principles for Efficient, Repeated Jumpgliding." *Journal of Bioinspiration and Biomimetics,* (2014) *accepted.*

-Stirling, L., Yu, C., Hawkes, E.W., Miller, J., Wood, R.J., Goldfield, E., and Nagpal, R. "Applicability of shape memory alloy wire for an active, soft orthotic." *J. Mater. Eng. Perform.,* 20.4 (2011) : 658–662.

-Paik, J. K., Hawkes, E.W., and Wood, R.J. "A novel low-profile shape memory alloy torsional actuator." *Smart Materials and Structures* 19.12 (2010) : 125014.

-Nagy, Z., Harada, K., Fluckiger, M., Susilo, E., Kaliakatsos, I.K., Menciassi, A., Hawkes, E.W., Abbott, J.J., Dario, P., and Nelson, B.J. "Assembling Reconfigurable Endoluminal Surgical Systems: Opportunities and Challenges," *Int'l Journ. of Biomechatronics and Biomedical Robotics (IJBBR),* 1.1 (2008) : 3.

Conference Papers

- Hawkes, E.W., Christensen, D.L., Han, A.K., Jiang, H., and Cutkosky, M.R. "Grasping without Squeezing: Shear Adhesion Gripper with Fibrillar Thin Film," *IEEE Int'l. Conf. Robotics and Automation*, 2015. BEST STUDENT PAPER AWARD.

-Hawkes, E.W., Christensen, D.L., and Cutkosky, M.R. "Vertical Dry Adhesive Climbing with a 100x Bodyweight Payload," *IEEE Int'l. Conf. Robotics and Automation*, 2015, *in review*.

-Hawkes, E.W., et al. "Dynamic surface grasping with directional adhesion." *Intelligent Robots and Systems (IROS), 2013 IEEE/RSJ International Conference on*. IEEE, 2013 (Tokyo).

-Hawkes, E.W., Ulmen, J., Esparza, N., and Cutkosky, M.R. "Scaling Walls: Applying Dry Adhesives to the Real World." *Proc. of the IEEE Int. Conf. on Intelligent Robots and Systems*, Sept. 2011 (San Francisco, CA).

-Christensen, D.L, Hawkes, E.W., and Cutkosky, M.R. "Tugs: Enabling Microrobots to Deliver Macro Forces with Controllable Adhesives," *IEEE Int'l. Conf. Robotics and Automation*, 2015, *in review*.

-Pope, M., Hawkes, E.W., et al. "Control and Design for Dynamic Quadrotor Perching with Gecko-Inspired Adhesive," *IEEE Int'l. Conf. Robotics and Automation*, 2015, *in review*.

-Jiang, H., Hawkes, E.W., et al. "Scaling Controllable Adhesives to Grapple Floating Objects in Space," *IEEE Int'l. Conf. Robot. and Automation*, 2015, *in review*.

-Seitz, B., Goldberg, B.,Doshi, N., Ozcan, O., Christensen, D., Hawkes, E., Cutkosky, M., and Wood, R. "Bio-inspired mechanisms for inclined locomotion in a legged insect-scale robot." *ROBIO, 2014*.

-Estrada, M., Hawkes, E.W., Christensen, D., and Mark Cutkosky "Robust Landing, Perching and Vertical Climbing: Design of a Multimodal Robot," *IEEE Int'l. Conf. Robotics and Automation*, 2014. Best Paper Finalist.

-Jiang, H., Pope, M., Hawkes, E.W., Christensen, D., Estrada, M., and Cutkosky, M.R. "Modeling the Dynamics of Perching with Opposed-Grip Mechanisms," *IEEE Int'l. Conf. Robotics and Automation*, 2014.

-Christensen, D.L, Hawkes, E.W., Wong-Foy, A., Pelrine, R.E., and Cutkosky, M.R., "Incremental Inspection for Microrobotic Quality Assurance," Proc. ASME 2013 IDETC/CIE 2013, Portland, OR.

-Kim, S., Hawkes, E.W., Cho, K., Joldaz, M., Foley, J., and Wood, R.J. "Micro artificial muscle fiber using niti spring for soft robotics," *Proc. of the IEEE Int. Conf. on Intelligent Robots and Systems*, 2009, pp. 2228-34 (St. Louis, MO).
-Cho, K., Hawkes, E., Quinn, C., and Wood, R.J. "Design, fabrication and analysis of a body-caudal fin propulsion system for a microrobotic fish," *IEEE Int'l. Conf. Robotics and Automation*, 2008, pp. 706-11.

Theses
-Harvard School of Engineering and Applied Sciences: Mechanical Engineering- Highest Honors Thesis: "Paradigm for Building Multi-functional Composite Structures with Embedded Actuation," 2009.
-Stanford Department of Mechanical Engineering: PhD Thesis: "Applying Dry Adhesives to the Real World," 2015.

Patents
-Hawkes, E.W., Pope, M., Christensen, D.L., and Cutkosky, M.R. "Velocity-dependent magnetic averaging for one-way clutch," (No. 61/924,140, Non-provisional).
-Hawkes, E.W., Jiang, H., and Cutksoky, M.R. "Passive surface grasping mechanism using directional adhesives," (No. 62/000,747, Non-provisional).
-Hawkes, E.W., Eason, E.V., Christensen, D.L, and Cutkosky, M.R. "Device for Human Climbing with Gecko Inspired Dry Adhesives," (No. 61/984,946, Provisional).
-Hawkes, E.W., Christensen, D.L, and Cutkosky, M.R. "A method of enabling anisotropic directional dry adhesion enabling a simple one degree of freedom climbing robot," (No. 62/103184, Provisional).
-Hawkes, E.W., Christensen, D.L, and Cutkosky, M.R. "Shear Controlled Dry Adhesive Film," (No. 62/103165, Provisional).
-Christensen, D.L, Hawkes, E.W., and Cutkosky, M.R. "Enhancing ground reaction forces substantially beyond friction using dry adhesives," (No. 62/103175, Provisional).
-Hawkes, E.W., Choi, K.J., Wood, R.J. "Multi-segmented spine with integrated actuation," No. 12/784,899, US20100295417A1.

TEACHING
-TA for both undergraduate and graduate levels, ME 161/261: Control, Vibration, and Design of Dynamic Systems, with Paul Mitiguy
-Recognized as Outstanding TA by members of ME 161/261.
-Guest lecturer for ME 310: Design Innovation.

AWARDS/HONORS
-Best Student Paper Award, IEEE ICRA 2015
-National Science Foundation Graduate Research Fellowship Program, 2012-2014
-Best Conference Paper Award Finalist Co-author, IEEE ICRA 2014
-National Defense Science and Engineering Graduate fellowship, 2009-2012
-Harvard Team Member: DARPA's "Programmable Matter;" Phase II, $1 mil, 2009

-Rhodes Scholarship Finalist, 2008
-Research Experience for Undergraduates recipient, Summer 2007- $3800
National Science Foundation
-Herschel Smith Undergraduate Research Program Award, Summer 2008- $6000
Herschel Smith Foundation, Harvard University
-First Place and new Harvard school record, Model Bridge Contest (5400lbs.), 2007
School of Engineering and Applied Sciences, Harvard University
-Harvard College Research Program funding, Summer 2007, Fall 2007, Fall 2008- $4800
Faculty of Arts and Sciences, Harvard University

PRESS for RESEARCH
-Science Mag News: Gecko inspired adhesives allow people to climb walls
-The Guardian: Geckos inspire scientists in US military-developed Spider-Man suit project
-Newsweek: Gecko gloves let scientist climb sheer glass walls
-Popular Mechanics: Scientists have created gecko-inspired spider man gloves
-Stanford News: Stanford engineers climb walls using gecko-inspired climbing device
-Huffington Post: Scientists Figure Out How To Scale Walls Like Spider-Man
-Washington Post: Inspired by geckos (and possibly 'Mission Impossible'), researchers unveil adhesives that allow humans to scale walls
-BBC News: Geckos inspire 'Spider-Man' gloves
-Fox News: Gecko-inspired adhesive enables people to scale buildings
-MIT TechReview: An Artificial Adhesive Outgrips the Gecko
-Boston Globe: A new invention that helps you climb like a gecko
-San Jose Mercury News: Stanford 'lizard brains' create gecko-like paws that allow humans to scale glass walls
-NY Times: Climbing a Glass Building? Try a Gecko's Sticky Pads