

ALYSSA Y. STARK

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EDUCATION

- 2014 **Ph. D. Integrated Bioscience**, University of Akron, OH
Dissertation: *The effect of water on the gecko adhesive system*
Advisors: Dr. Peter H. Niewiarowski, Department of Biology and Dr. Ali Dhinojwala, Department of Polymer Science
- 2006 **B. S. Animal Biology**, University of California, Davis, CA
Senior Thesis: *Behavioral study of California sea lions (*Zalophus californianus*) suffering from the effects of domoic acid toxicity*
Advisor: Dr. Brenda McCowan, School of Veterinary Medicine
- 2005 **ARAD. Associate of the Royal Academy of Dance**, The Royal Academy of Dance, UK
Advanced II Professional Examination in Ballet
- 2004 **A. A. Associates Degree**, Santa Rosa Junior College, CA

PROFESSIONAL POSITIONS

- 2014-pres. **Postdoctoral Associate**, Department of Biology, University of Louisville, KY
Advisor: Dr. Stephen P. Yanoviak, Department of Biology
- 2013-14 **Ph.D. Fellows Coordinator and Project Manager**, Biomimicry Research and Innovation Center, University of Akron, OH
Advisors: Thomas N. Tyrrell (CEO & Funder, Great Lakes Biomimicry) and Don Knechtges (VP & Director of Economic Development, Great Lakes Biomimicry)
- 2008-13 **Teaching Assistant**, Department of Biology, University of Akron, OH

CONSULTING

- 2015-pres. **Biologist**, Biomimicry Global Design Challenge, The Biomimicry Institute
- 2016-pres. **Leadership Team Member**, Great Lakes Biomimicry

AFFILIATIONS

Society for Integrative and Comparative Biology; The Adhesion Society; The Biomimicry Network; The Royal Academy of Dance

AWARDS AND FUNDING

Submitted

- 2017 NSF IOS. *A sticky situation: mechanisms and functional ecology of ant adhesion in a tropical forest*. Co-PI with S. P. Yanoviak.

Not Funded

- 2016 L'Oréal USA Women in Science Fellowship. *Functional and ecological components of canopy ant adhesion to plant surfaces.*
- 2016 NSF IOS 1625746. *Getting a grip: functional roles of ant adhesion in a tropical forest.* Co-PI with S. P. Yanoviak, D. Schulz, and R. Cohn.
- 2016 Internal RFP, School of Interdisciplinary and Graduate Studies and the Office of Research and Innovation. *Soft Matter: an emergent area of interdisciplinary research at University of Louisville.* Collaborator.
- 2015 NSF IOS 1525572. *Footprints in the forest: functional and ecological components of tropical rainforest ant adhesion to plant surfaces.* Co-PI with S. P. Yanoviak, D. Schulz, and R. Cohn.
- 2015 Human Frontier Science Program, Program Grant. *Adhesion in tropical rainforest canopy ants.* Co-PI with S. P. Yanoviak, D. Schulz, D. Sameoto and R. Cohn.

Received

- 2014 Alan Gent Distinguished Student Paper Award, The Adhesion Society, \$500
- 2014 Peebles Award for Research in Adhesion Science, The Adhesion Society, \$750
- 2011-13 Graduate Student Professional Enrichment Grant, University of Akron, OH, \$900
- 2012 Biomimicry Workshop Scholarship, Talan Products, Inc., OH, \$750
- 2009-11 Choose Ohio First Tiered Mentoring Program, University of Akron, OH, \$9,000
- 2010 Choose Ohio First Bioinformatics Scholarship, University of Akron, OH, \$3,200
- 2009 Graduate Student Government Research Grant, University of Akron, OH, \$1,300
- 2009 Integrative Research in Bioscience Assistantship, University of Akron, OH, \$16,550
- 2005 Lewis Clark Starr Scholarship, University of California, Davis, CA, \$2,500
- 2001-04 Doyle Foundation Scholarship, Santa Rosa Junior College, CA, \$6,850

REFEREED PUBLICATIONS

(denotes undergraduate author; † denotes anchor author)

- 20. Garner, A. M., **A. Y. Stark**, S. A. Thomas & P. H. Niewiarowski. 2017. Geckos go the distance: water's effect on gecko locomotor performance. *Journal of Herpetology* (in press)
- 19. Spicer, M. E., **A. Y. Stark**, B. J. Adams, R. Kneale & S. P. Yanoviak. 2017. Thermal constraints on foraging of tropical canopy ants. *Oecologia* (in press) doi:10.1007/s00442-017-3825-4
- 18. **Stark, A. Y.** 2016. Biomimicry: what's in it for us? A biologist's perspective on how biomimicry can inform studies of the natural world. *Zygote Quarterly* 17(3):80-93 (refereed opinion piece)
- 17. **Stark, A. Y.**, M. Klittich, M. Sitti, P. H. Niewiarowski & A. Dhinojwala. 2016. The effect of temperature and humidity on adhesion of a gecko-inspired adhesive: implications for the natural system. *Scientific Reports* 6(30936) doi:10.1038/srep30936
- 16. Yanoviak, S. P., C. Silveri, **A. Y. Stark**, J. T. Van Stan II & D. F. Levia, Jr. 2016. Surface roughness affects the running speed of tropical canopy ants. *Biotropica* (in press) doi:10.1111/btp.12349
- 15. Walker, C. S., R. L. Ethington & **A. Y. Stark**†. 2016. Who is your champion? A look at the structure and function of animals to help solve a problem. *Science and Children* 53: 39-45

14. **Stark, A. Y., S. Subarajan, D. Jain, P. H. Niewiarowski & A. Dhinojwala.** 2016. Superhydrophobicity of the gecko toe pad: biological optimization verses laboratory maximization. *Philosophical Transactions of the Royal Society A* 374: 20160184 doi:10.1098/rsta.2016.0184
13. Niewiarowski, P. H., **A. Y. Stark** & A. Dhinojwala. 2016. Sticking to the story: outstanding challenges in gecko-inspired adhesives. *Journal of Experimental Biology* 219: 912-919 doi:10.1242/jeb.080085
12. **Stark, A. Y., A. M. Palecek, C. Argenbright, C. Bernard, A. Brennan, P. H. Niewiarowski & A. Dhinojwala.** 2015. Gecko adhesion on wet and dry patterned substrates. *PLoS ONE* 10(12) doi:10.1371/journal.pone.0145756
11. **Stark, A. Y., D. M. Dryden, J. Olderman, K. A. Peterson, P. H. Niewiarowski, R. H. French & A. Dhinojwala.** 2015. Adhesive interactions of geckos with wet and dry fluoropolymer substrates. *Journal of the Royal Society Interface* 12: 20150464 (Cover) doi:10.1098/rsif.2015.0464
10. **Stark, A. Y., J. Ohlemacher, A. Knight & P. H. Niewiarowski.** 2015. Run don't walk: locomotor performance of geckos on wet surfaces. *Journal of Experimental Biology* 218: 2435-2441(Cover) doi:10.1242/jeb.120683
9. Jain, D., **A. Y. Stark**, P. H. Niewiarowski, T. Miyoshi & A. Dhinojwala. 2015. NMR spectroscopy reveals the presence and association of lipids and keratin in adhesive gecko setae. *Scientific Reports* 3(9594) doi:10.1038/srep09594
8. Astrop, T. I., V. Sahni, T. A. Blackledge & **A. Y. Stark**[†]. 2015. Mechanical properties of the chitin-calcium-phosphate clam shrimp carapace (Order Spinicaudata): implications for taphonomy and fossilization. *Journal of Crustacean Biology* 35(2): 123-131 doi:10.1163/1937240X-00002332
7. Badge, I., **A. Y. Stark**, **E. L. Paoloni**, P. H. Niewiarowski & A. Dhinojwala. 2014. The role of surface chemistry on adhesion and wetting of gecko toe pads. *Scientific Reports* 4(6643) doi:10.1038/srep06643
6. **Stark, A. Y., N. A. Wucinich, E. L. Paoloni**, P. H. Niewiarowski & A. Dhinojwala. 2014. Self-drying: A gecko's innate ability to remove water from wet toe pads. *PLoS ONE* 9(7) doi:10.1371/journal.pone.0101885
5. **Stark, A. Y., B. McClung**, P. H. Niewiarowski & A. Dhinojwala. 2014. Reduction of water surface tension significantly impacts gecko adhesion underwater. *Integrative and Comparative Biology* 54(6): 1026-1033 (Cover) doi:10.1093/icb/icu066

4. **Stark, A. Y.**, I. Badge, N. A. Wucinich, T. W. Sullivan, P. H. Niewiarowski & A. Dhinojwala. 2013. Surface wettability plays a significant role in gecko adhesion underwater. *Proceedings of the National Academy of Sciences USA* 110(16): 6340-6345 (Cover)
doi:10.1073/pnas.1219317110
3. **Stark, A. Y.**, T. Sullivan & P. H. Niewiarowski. 2012. The effect of surface water and wetting on gecko adhesion. *Journal of Experimental Biology* 215(17): 3080-3086 (Cover)
doi:10.1242/jeb.070912
2. Niewiarowski, P. H., **A. Stark**, B. McClung, B. Chambers & T. Sullivan. 2012. Faster but not stickier: invasive house geckos can out-sprint resident mournful geckos in Moorea, French Polynesia. *Journal of Herpetology* 46(2): 194-197 doi:10.1670/11-148
1. Hsu, P. Y., L. Ge, X. Li, **A. Y. Stark**, C. Wesdemiotis, P. H. Niewiarowski & A. Dhinojwala. 2011. Direct evidence of phospholipids in gecko footprints and spatula-substrate contact interface detected using surface-sensitive spectroscopy. *Journal of the Royal Society Interface* 9(69): 657-664 (Cover) doi:10.1098/rsif.2011.0370

MANUSCRIPTS SUBMITTED OR IN PREPARATION

(denotes undergraduate author; † denotes anchor author)

2. Niewiarowski, P. H., **A. Y. Stark** & A. Dhinojwala. A bibliometric analysis of gecko adhesion: a view of its origins and current directions. *In review as a book chapter for Bio-inspired Structured Adhesives*, edited by Longjian Xue, Lars Heepe and Stanislav Gorb.
1. **Stark, A. Y.**, B. J. Adams, J. Fredley & S. P. Yanoviak. Out on a limb: the thermal microenvironment of tropical arboreal ants. *In preparation*.

PROFESSIONAL PRESENTATIONS

Invited Academic Presentations

- 2017 **Stark, A. Y.** *Wet and dry biological adhesives in complex environments: learning from ants and geckos*. Oral presentation, Gordon Research Conference on Science of Adhesion, Mount Holyoke, MA (upcoming)
- 2016 Ditsche, P., **A. Y. Stark** & D. J. Irschick. *Biological attachment mechanisms; from dry to wet: examples and applications*. Tandem oral presentation, International Congress of Vertebrate Morphology, symposium on interdisciplinary and evolutionary approach to vertebrate biological materials, Washington DC
- 2016 **Stark, A. Y.** *Animal tracks: do living organisms leave behind chemical clues to adhesive success?* Keynote speaker and panel member, Central Regional Meeting of the American Chemical Society, session on bio-inspired chemistry: inspiring solutions, sponsored by Procter & Gamble Co., Covington, KY
- 2015 **Stark, A. Y.** *The effect of water on the gecko adhesive system: behavioral implications*. Oral presentation, Smithsonian Tropical Research Institute, behavior discussion group, Panama City, Panama

2014 **Stark, A. Y.** *The effect of water on the gecko adhesive system.* Seminar speaker, Department of Biology, University of Louisville, Louisville, KY

Invited Industry Presentations

- 2016 **Stark, A. Y.** *Wet and dry biological adhesives in complex environments: learning from ants and geckos.* Oral presentation, 1st Annual National Biomimicry Summit and Education Forum for Aerospace, in collaboration with NASA, Cleveland, OH
- 2015 **Stark, A. Y.,** P. H. Niewiarowski, A. Dhinojwala & M. Sitti. *The effect of temperature and humidity on gecko-inspired synthetic adhesives.* Oral presentation, Adhesive and Sealant Convention Spring Conference and Expo., Nashville, TN
- 2013 **Stark, A. Y.** *Nanomechanical study of gecko setae and clam shrimp shells.* Oral presentation, Agilent Technologies Nanomechanical Properties Workshop, University of Akron, OH
- 2012 **Stark, A. Y.** & D. Keeble. *Biomimicry and attachment.* Oral Presentation and discussion, Talan Products, Inc., Cleveland, OH
- 2011 **Stark, A. Y.,** P. Hsu, P. H. Niewiarowski & A. Dhinojwala. *The gecko adhesive system: analysis of lipid footprints.* Oral presentation, Biannual Meeting of the Akron Functional Materials Center, University of Akron and the Austen Bioinnovation Institute, Akron, OH
- 2009 Sethi, S., I. Badge & **A. Y. Stark.** *Gecko adhesion and application.* Demonstration, World President's Organization, University of Akron, OH

Conference Presentations

I attend at least two professional meetings per year, typically the Society for Integrative and Comparative Biology and the Adhesion Society annual meetings. Below is a list of the most recent talks in each of my research areas. A complete list of presentations is available upon request. Undergraduate student presenters are underlined.

Functional Morphology, Chemistry and Biological Materials

- 2015 Sandman, R., **A. Y. Stark,** D. Schultz & S. P. Yanoviak. *The contribution of lipids to ant adhesion.* Poster presentation, Kentucky Academy of Science Annual Meeting.
- 2015 Jain, D., **A. Y. Stark,** P. H. Niewiarowski, T. Miyoshi & A. Dhinojwala. *Tracing lipids and their association with keratin in the adhesive gecko setae by NMR spectroscopy.* Poster presentation, Biophysical Society Annual Meeting.
- 2011 Astrop, T. I., **A. Y. Stark,** & V. Sahni. *Poking holes in shrimp: an integrated investigation into preservation bias in the fossil record of Spinicaudata.* Tandem oral presentation, Brown Bag Seminar, University of Akron, OH.
- 2011 **Stark, A. Y.** *Molecular modeling of β -keratin in an aqueous environment.* Poster presentation, Conference for Undergraduate and Graduate Student Research, University of Akron, OH.

2010 **Stark, A. Y.**, T. A. Blackledge, A. Dhinojwala & P. H. Niewiarowski. *Mechanical properties of the gecko setal shaft*. Poster presentation, First Semi-Annual Symposium on Biomaterials, College of Polymer Science and Polymer Engineering, University of Akron, and The Austen BioInnovation Institute, Akron, OH.

Adhesive Performance

2017 **Stark, A. Y.** *Variation in static and dynamic adhesive performance of ants and geckos in challenging environmental conditions*. Oral presentation, Adhesion Society Annual Meeting.

2017 **Stark, A. Y.** & S. P. Yanoviak. *Slippery when wet: adhesion and running velocity of a tropical canopy ant on wet substrates*. Oral presentation, Society for Integrated and Comparative Biology Annual Meeting.

2016 **Stark, A. Y.** & S. P. Yanoviak. *Normal and shear adhesion of ants on hot, wet and rough substrates*. Oral presentation, Adhesion Society Annual Meeting.

2016 **Stark, A. Y.** & S. P. Yanoviak. *Move it or lose it: adhesion and running velocity on rough substrates in a tropical canopy ant*. Oral presentation, Society for Integrated and Comparative Biology Annual Meeting.

2015 **Stark, A. Y.** *The effect of water on the gecko adhesive system*. Oral presentation, Smithsonian Tropical Research Institute, BAMBI seminar, Barro Colorado Island, Panama.

Biomimicry and Bio-inspired Design

2015 **Stark, A. Y.**, P. H. Niewiarowski, A. Dhinojwala & M. Sitti. *The effect of temperature and humidity on gecko-inspired synthetic adhesives*. Oral presentation, Adhesion Society Annual Meeting.

Ecology and Behavior

2009 **McClung, B., T. Sullivan, A. Y. Stark** & P. H. Niewiarowski. *Faster but not stickier: a comparison of an invasive gecko and the native species it is displacing*. Poster presentation, Choose Ohio First Tiered Mentoring Poster Competition, University of Akron, OH. (First Place Winner)

2009 **Stark, A. Y.** *Harmful algal blooms: can California sea lions (*Zalophus californianus*) be used as an indicator species?* Oral presentation, Brown Bag Seminar, University of Akron, OH.

TEACHING EXPERIENCE

Courses Taught

Fall 2015 **Co-Instructor**, *Conservation Biology*, University of Louisville, KY

Spring 2013 **Teaching Assistant**, *Animal Behavior Lab*, University of Akron, OH

Fall 2008-12 **Teaching Assistant**, *Principles of Biology Lab*, University of Akron, OH

Fall 2005 **Undergraduate Teaching Assistant**, *Domestic Animal Behavior*, University of California, Davis, CA

Guest Lectures

- Fall 2016 *The next steps in ant chemical ecology*, Chemical Ecology, University of Louisville, KY
Fall 2015 *Biomimicry*, Biology 102 (biology for non-majors), University of Louisville, KY
July 2015 *Functional morphology of geckos and ants*, Tropical Field Ecology, Organization for Tropical Studies, Barro Colorado Island, Panama
Fall 2014 *Biomimicry and conservation biology*, Conservation Biology, University of Louisville, KY

Undergraduate Mentoring

Over the last eight years I have mentored 42 undergraduate students in research as part-time assistants, volunteers, and honors students. Student participation includes animal husbandry, experimental design, data collection and analysis, presentation of results at scientific meetings, and preparation of manuscripts for publication. Names of students and their respective projects are underlined in the refereed publications section above.

University of Akron, OH

2008-14 Mentored 37 undergraduate students

- 15 co-authored or will co-author at least one refereed publication with me
- 16 enrolled in graduate programs or relevant industry careers

University of Louisville, KY

2014-pres. Mentored 5 undergraduate students

- 4 co-authored or will co-author at least one refereed publication with me
- 1 has graduated and is enrolled in a graduate program

SERVICE

Professional Service

Manuscript Reviews

Tissue and Cell; Sensors & Actuators: B. Chemical; Proceedings of the Royal Society B; Journal of Experimental Biology; Bioinspiration & Biomimetics; Proceedings of the National Academy of Sciences; Journal of Morphology; Functional Ecology; ACS Nano; ACS Applied Materials & Interfaces; "Contamination Mitigation Polymeric Coatings for Extreme Environments" (book); eLife; Journal of Insect Science; Friction

Conference Organization

- 2015-17 **Co-chair**, *Bioinspired adhesives session*, Adhesion Society Annual Meeting
2015-17 **Co-chair/Developer**, *Women's networking social*, Adhesion Society Annual Meeting
2016 **Co-chair**, *Adhesion and robotics session*, Adhesion Society Annual Meeting
2015 **Co-organizer**, *Wastestock: converting waste streams into resources*, Louisville, KY
2015 **Symposium Organizer**, *Biomimicry: how does nature inspire technology?*, Louisville, KY
2015 **Session Moderator**, *Adhesion*, Society for Integrative and Comparative Biology Annual Meeting

Professional Development and Involvement

- 2016-pres. **Chair**, Bioadhesion Division, Adhesion Society (co-developed division)
2015 & 2011 **Participant**, Biomimicry Education Summit, The Biomimicry Institute
2012 **Participant**, Backyard Biomimicry Workshop, The Biomimicry Institute

Community Service/Outreach

High School Student Researchers

Aparna Narendrula, Hathaway Brown, Shaker Heights, OH

Misbah Mlokhandwala, Laurel School, Shaker Heights, OH

K-12 Teachers Involved in Research

Sharon Kaffen

Science Learning Coach, National Inventors Hall of Fame STEM Middle School, Akron, OH

Caryn Walker

Science Goal Clarity Coach, Jefferson County Public Schools, Louisville, KY

Roberta Ethington

3rd Grade Teacher, St. Matthews Elementary, Louisville, KY

Outreach Presentations

- 2015 Walker, C. S., R. L. Ethington & **A. Y. Stark**. *Ants on the move*. Four day 4th grade science lesson on functional morphology and biomimicry. St. Matthews Elementary, Louisville, KY
- 2014 **Stark, A. Y.** *Geckos and biomimicry: how can geckos help us?* Oral presentation in aid of earning "Animal Helpers Badge", Girl Scouts of NE Ohio Cadette Troop #90115
- 2013 **Stark, A. Y.** *The effect of water on the gecko adhesive system*. Watters Science Seminar Speaker, Lakewood High School, Cleveland, OH
- 2013 & 2012 **Stark, A. Y.** *Geckos and biomimicry*. Honors College Colloquium Speaker, University of Akron, OH
- 2011 **Stark, A. Y.** *The gecko adhesive system: implications and applications*. Oral presentation, STEM High School Student Orientation, University of Akron, OH
- 2009 **Stark, A. Y.** *Geckos, spiders and polymers!* Demonstration, Polymer Family Night (grades 6-8), Our Lady of the Elms Girls School, Akron, OH

SELECTED MEDIA ATTENTION

National Geographic (with video); Discovery Channel (CA) (with video); Science Daily and Science NOW; AAAS Science Update; Smithsonian; National Science Foundation; BBC; Huffington Post; Science Illustrated; The Plain Dealer (with video); The University of Akron (with video); Biomimicry 3.8 - "Meet a Biomimic"

REFERENCES

Dr. Stephen P. Yanoviak

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Dr. Peter H. Niewiarowski

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Dr. Ali Dhinojwala

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Dr. Todd A. Blackledge

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