

## JEFFREY A. RIFFELL CURRICULUM VITAE

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### **EDUCATION**

UC Los Angeles	Ph. D. in Biology	2004
UC Santa Cruz	B.A. in Biology	1997

### **EMPLOYMENT**

Associate Professor	Dept. Biology, Univ. Washington	2015-
Assistant Professor	Dept. Biology, Univ. Washington	2010-2015
Postdoctoral Fellow	University of Arizona	2004-2010
Adjunct Professor	Pima Community College	2004-2007

**RESEARCH INTERESTS:** Sensory-mediated behaviors; Neuroethology; Chemical Ecology.

### **CURRENT RESEARCH GRANTS**

NSF-CBET ( <b>PI</b> ) “MRI: Development of a hyper-sensed environmentally controlled wind tunnel” (\$977,475.00)	2016-2018
NSF-IOS ( <b>PI</b> ) “Symposium: Neuroecology: Neural Mechanisms of Sensory and Motor Processes that Mediate Ecologically Relevant Behaviors”, January 3-7, 2016, Portland, Oregon (\$15,000.00)	2016-2017
Air Force Office of Sponsored Research ( <b>PI</b> ) “Bio-inspired volatile detection systems for human scent detection and discrimination” (\$778,270.00)	2016-2020
Royalty Research Fund ( <b>PI</b> ) “Pollution and Pollinators: The impacts of anthropogenic emissions on pollinator behavior” (\$39,066.00)	2015-2016
NSF-DEB ( <b>CoPI</b> ) “Collaborative Research: Chance or necessity? Adaptive vs. non adaptive evolution in plant-frugivore Interactions” (\$579,874)	2015-2018
NSF-IOE ( <b>PI</b> ) “Olfactory processing and learning of complex scents	

in insects” (\$650,000)	2014-2018
NSF-DMS ( <b>CoPI</b> ) “Inference of network dynamics and architecture in neural systems with data-driven methods” (\$879,377)	2014-2018
NSF-Bioinformatics Postdoctoral Fellowship for Winnie Ho	2015-2017
Air Force Office of Sponsored Research ( <b>CoPI</b> ) “Nature inspired flight technologies and ideas” (\$5,983,000)	2014-2019
Human Frontier Science Program ( <b>PI</b> ) “A neural circuit approach to cognition and its limits in microbrains” (\$350,000)	2014-2017
NIH-NIDCD ( <b>PI</b> w/ A. Fairhall and M. Dickinson) “Decision-making in flying insects using multisensory cues” (\$1,337,027)	2014-2018

### **PREVIOUS RESEARCH GRANTS**

NSF-MPS ( <b>PI</b> ) “Collaborative Research: Physical mechanisms regulating cell behavior” (\$439,300)	2011-2015
UW Royalty Research Fund ( <b>PI</b> ) “Olfactory processing and behaviors in mosquitoes” (\$39,847)	2011-2012
NSF-IOS ( <b>CoPI</b> ) “Neural mechanisms underlying oviposition choice in <i>Manduca sexta</i> moths: from chemical signals to neurons” (\$268,041)	2008-2012
NIH-NIAID #R03AI078430 ( <b>CoPI</b> ) “Olfactory basis of host-seeking in kissing bugs” (\$150,001)	2008-2010

### **Graduate Student Awards:**

Eleanor R Lutz	NSF GRFP (\$132,000)	2015-2018
Yasmeen Hussain	NSF GRFP (\$132,000)	2013-2016
Marie Clifford	NSF-GRFP (\$132,000)	2012-2015
	King Conservation District Grant (\$13,000)	2014
	US Fish and Wildlife Grant (\$1,000)	2014
Kelsey J. P. Byers	NSF-IOS-DDIG ( <b>CoPI</b> with T. Bradshaw) (\$14,000)	2013-2014
	NSF-GRFP (\$132,000)	2010-2012

**PUBLICATIONS** – (\*denote authors contributed equally; authors in blue are UW graduate students; green are UW undergraduates)

**2016:**

49. Vinauger, C., Lahondère, C., Cohuet, A., Lazzari, C.R., and **Riffell, J.A.** 2016. Learning and Memory in Disease Vector Insects. *Trends in Parasitology*, <http://dx.doi.org/10.1016/j.pt.2016.06.003>.
48. Ho, W.W., and Riffell, J. A. 2016. The Olfactory Neuroecology of Herbivory, Hostplant Selection and Plant–Pollinator Interactions. *Integrative and Comparative Biology*, <http://dx.doi.org/10.1093/icb/icw096>.
47. **Rusch, C.**, Broadhead, G.T., Raguso, R.A., and **Riffell, J.A.** 2016. Olfaction in context—sources of nuance in plant-pollinator communication. *Current Opinion in Insect Science*, <http://dx.doi.org/10.1016/j.cois.2016.03.007>.
46. **Hussain, Y.H.**, Guasto, J.S., Zimmer, R.K., Stocker, R. and **Riffell, J.A.** 2016. Sperm chemotaxis promotes individual fertilization success in sea urchins. *Journal of Experimental Biology*, pp.jeb-134924.

**2015:**

45. **Lundin, J.**, **Riffell, J.A.**, and Wasser, S.K. 2015. Polycyclic aromatic hydrocarbons in caribou, moose, and wolf scat samples from three areas of the Alberta oil sands. *Environmental Pollution*, 206: 527–534.
44. Reisenman, C. E., and **Riffell, J.A.** The neural bases of host plant selection in herbivorous insects in a Neuroecology framework. *Frontiers in Physiology*, 6.
43. van Breugal, F., **Riffell, J.A.**, Fairhall, A., and Dickinson, M. H. 2015. Mosquitoes Use Vision to Associate Odor Plumes with Thermal Targets. *Current Biology*, 25: 2123-2129
42. **Fenske, M.P.**, Hazelton, K.D., **Hempton, A.K.**, Shim, J.S., **Riffell, J.A.**, and Imaizumi, T. 2015. The circadian clock gene *LATE ELONGATED HYPOCOTYL* directly regulates the timing of floral scent emission in *Petunia*. *Proceedings of the National Academy of Sciences, USA*; 131:9775-9780.

**2014:**

41. **Riffell, J.A.**, Shlizerman, E., **Sanders, E.** Abrell, L., Medina, B. **Hinterwirth, A.J.**, Kutz, J.N. 2014. Flower discrimination by pollinators in a dynamic chemical environment. *Science*, 344:1515-1518.  
[Featured in: *Science Perspectives*, New York Times, BBC, NPR National, CBS, NBC, CNN, Science Daily, Phys.org, UW Daily, others: “Fumes Keep Moths From Finding Flowers”]
40. **Riffell, J.A.** and Hildebrand J.G. 2014. Insect olfactory filters in mediating natural, ecologically relevant behaviors. *Insect Neuroethology*, ed. E. Warrant.
39. Shlizerman, E., **Riffell, J.A.**, and Kutz, J.N. 2014. Data-driven inference of network connectivity for modeling the dynamics of neural codes in the insect antennal lobe. *Frontiers in Computational Neuroscience*. doi: 10.3389/fncom.2014.00070.

38. Vinauger, C., **Lutz, E.K.**, **Riffell, J.A.** 2014. Olfactory learning and memory in the disease vector mosquito, *Aedes aegypti*. *Journal of Experimental Biology*. 217, 2321-2330.
37. **Byers, K.J.R.P.**, Bradshaw, H.D., **Riffell, J.A.** 2014. Three floral volatiles contribute to differential pollinator attraction in monkeyflowers (*Mimulus*). *Journal of Experimental Biology*. 217: 614-623.
36. **Byers, K.J.**, **Vela, J.**, **Riffell, J.A.**, Bradshaw, H.D. 2014. Floral volatile alleles can contribute to pollinator-mediated reproductive isolation in monkeyflowers (*Mimulus*). *The Plant Journal*. 80, 1031-1042.

**2013:**

35. **Riffell, J.A.**, Lei, H., Abrell, A., Hildebrand, J.G. 2013. Neural basis of a pollinator's buffet: olfactory specialization and learning in *Manduca sexta*. *Science* 339: 200-204.  
[Recommended by Faculty of 1000; featured in: e!Science News, Science Daily, Phys.org, others: "Moths wired two ways"]
34. **Riffell, J.A.** 2013. Neuroethology: Lemon-fresh scent makes flies lay eggs. *Current Biology*, 23, R1108-R1110.
33. Sprayberry, J.D.H., Ritter, K.A., **Riffell, J.A.** 2013. The effect of olfactory exposure to non-insecticidal agrochemicals on bumblebee foraging behavior. *PLoS ONE* 8(10): e76273. doi:10.1371/journal.pone.0076273
32. Martin, J.P., Lei, H., **Riffell, J.A.**, Hildebrand, J.G. 2013. Enhanced synchrony of antennal-lobe projection neurons encodes the behaviorally effective ratio of sex-pheromone components in male *Manduca sexta*. *Journal of Comparative Physiology A* 199: 963-979.
31. **Riffell, J.A.** and Alarcon, R. 2013. Multimodal floral signals and moth foraging decisions. *PLoS-ONE* 8(8): e72809. doi:10.1371/journal.pone.0072809.
30. **Clifford, M.R.**, **Riffell, J.A.** 2013. Mixture and odorant processing in the olfactory systems of Insects: a comparative perspective. *Journal of Comparative Physiology A*. 199:911-928. doi: 10.1007/s00359-013-0818-6
29. **Fricke, E.C.**, Simon, M.J., Reagan, K.M., Haak, D.C., Levey, D.J., **Riffell, J.A.**, and Tewksbury, J.J. 2013. When condition trumps location: seed consumption by fruit-eating birds removes pathogens and predator attractants. *Ecology Letters* 16:1031-1036.
28. **Riffell, J.A.**, Reisenman, C.A., Hicks, M. 2013. Chemical ecology and olfactory preferences of ovipositing *Manduca sexta* moths. *Journal of Chemical Ecology* 39:76-89. doi: 10.1007/s10886-012-0228-1
27. **Byers, K.J.**, **Sanders, E.**, **Riffell, J.A.** 2013. Identification of olfactory volatiles using gas chromatography-multi-unit recordings (GCMR) in the insect antennal lobe. *Journal of Visualized Experiments* e4381, doi:10.3791/4381.

**2012:**

26. Dacks, A.M., **Riffell, J.A.**, Martin, J.P., Gage, S.L., Nighorn, A. 2012. Olfactory modulation by dopamine in the context of aversive learning. *Journal of Neurophysiology* 108: 539-550. **[cover article]**

25. **Riffell, J.A.** 2012. Olfactory ecology and the processing of complex mixtures. *Current Opinion in Neurobiology* 22: 236-242, <http://dx.doi.org/10.1016/j.conb.2012.02.013>.

**2011:**

24. Martin, J.P., Beyerlein, A., Dacks, A.M., Reisenman, C.E., **Riffell, J.A.**, Lei, H., Hildebrand, J.G. 2011. The neurobiology of insect olfaction: Sensory processing in a comparative context. *Progress in Neurobiology*, 95: 427-447.
23. **Agrawal, S.**, and **Riffell, J.A.** 2011. Behavioral neurobiology: the bitter life of male flies. *Current Biology*, 21, R470-R472.
22. **Riffell, J.A.** 2011. The neuroecology of a pollinator's buffet: olfactory preferences and learning in insect pollinators. *Integrative and Comparative Biology*. 51: 781-793.
21. **Riffell, J.A.\*** and Zimmer, R.K. 2011. Extrinsic mechanisms driving sperm-egg interactions. *Proceedings of the National Academy of Sciences, USA*, 108: 13200-13205. \*authors contributed equally
20. **Riffell, J.A.\***, Veitinger, T. \*, Zimmer, R.K., Hatt, H., Spehr, M. 2011. Chemosensory Ca<sup>2+</sup> fingerprints define diverse behavioral phenotypes in human sperm. *Journal of Biological Chemistry*, 286: 17311-17325. \*authors contributed equally
19. Himes, J., **Riffell, J.A.**, Zimmer, C.A., Zimmer, R.K. 2011. Sperm chemotaxis as revealed with live and synthetic eggs. *Biological Bulletin*, 220: 1-5.

**2010:**

18. Alarcón, R.A., **Riffell, J.A.**, Davidowitz, G., Bronstein, J.L., and Hildebrand J.G. 2010. Sex-dependent variation in the floral preferences of a hawkmoth (*Manduca sexta*). *Animal Behavior*, 80: 289-296.
17. Reisenman, C.E., **Riffell, J.A.**, Bernays, E., and Hildebrand, J.G. 2010. Floral odor signals and context-dependent behaviors in female *Manduca sexta* moths. *Proceedings of the Royal Society B: Biological Sciences* 277: 2371-2379.
16. Lei, H., Oland, L., **Riffell, J.A.**, Beyerlein, A., and Hildebrand, J.G. 2010. Microcircuits in the *Manduca sexta* antennal lobe. In *Handbook of brain microcircuits*, eds Shepherd, G. and Grillner, S. Oxford University Press.

**2009:**

15. **Riffell, J.A.**, Lei, H., and Hildebrand J.G. 2009. Neural correlates of behavior in the moth *Manduca sexta* in response to complex odors. *Proceedings of the National Academy of Sciences, USA* 106: 19219-19226.
14. Reisenman, C.E., **Riffell, J.A.**, and Hildebrand J.G. 2009. Neuroethology of oviposition behavior in the moth *Manduca sexta*. *Annals of the New York Academy of Sciences* 1170: 462-470.
13. Krug, P.J., **Riffell J.A.**, and Zimmer R.K. 2009. Dynamics of sperm attractant production and release from an abalone egg. *Journal of Experimental Biology* 212: 1092-1100.

12. Lei, H., **Riffell, J.A.**, Gage, S.L., and Hildebrand J.G. 2009. Contrast enhancement of stimulus intermittency in a primary olfactory network and its behavioral significance. *Journal of Biology* 8:2,21: 1-16.
11. **Riffell, J.A.**, Lei, H., Christensen T.C., and Hildebrand J.G. 2009. Characterization and coding of complex olfactory stimuli. *Current Biology* 19: 335-340.

**2008:**

10. **Riffell, J.A.**, Alarcón, R., Abrell, L., Davidowitz, G., Bronstein, J.L., and Hildebrand J.G. 2008. Behavioral consequences of innate preferences and olfactory learning in hawkmoth-flower interactions. *Proceedings of the National Academy of Sciences, USA* 105: 3404-3409.
9. **Riffell, J.A.**, Abrell, L., and Hildebrand J.G. 2008. Physical processes and real-time chemical measurement of the insect olfactory environment. *Journal of Chemical Ecology* 34: 837-853.
8. **Riffell, J.A.** and Hildebrand J.G. 2008. Preface to the special issue on Olfactory Ecology. *Journal of Chemical Ecology* 34: 820-821.
7. **Riffell, J.A.**, Alarcón, R., and Abrell, L. 2008. Floral trait associations in hawkmoth-specialized and mixed pollination systems: *Datura wrightii* and *Agave* spp. in the Sonoran Desert. *Communicative & Integrative Biology* 1: 6-8.

**2007:**

6. **Riffell, J.A.** and Zimmer R.K. 2007. Sex and flow: the consequences of fluid shear for sperm-egg interactions. *Journal of Experimental Biology* 210: 3644-3660.

**2006:**

5. Spehr, M., Schwahn, K., **Riffell, J.A.**, Zimmer, R.K., and Hatt H. 2006. Odorant receptors and olfactory-like signaling mechanisms in mammalian sperm. *Molecular and Cellular Endocrinology* 250(1-2): 128-136.

**2004:**

4. Spehr, M., Schwahn, K., **Riffell, J.A.**, Barbour, J., Zimmer, R.K., Neauhaus, E.M., and Hatt H. 2004. Olfactory receptor-mediated chemotaxis in human sperm: key role of particulate adenylate cyclase. *Journal of Biological Chemistry* 279(40): 40194-40203.
3. **Riffell, J.A.**, Krug P.J., and Zimmer R.K. 2004. The ecological and evolutionary consequences of sperm chemoattraction. *Proceedings of the National Academy of Sciences, USA* 101(13): 4501-4506.

**2003:**

2. Spehr, M., Gusselman G., Poplawski, A., **Riffell J.A.**, Zimmer R.K., and Hatt H. 2003. A novel testicular odor receptor controls human sperm chemotaxis. *Science* 299: 2054-2058.

**2002:**

1. **Riffell, J.A.**, Krug P.J., and Zimmer R.K. 2002. Fertilization in the sea: The chemical identity of an abalone sperm attractant. *Journal of Experimental Biology* 205: 1439-1450.

## **HONORS, FELLOWSHIPS AND AWARDS**

Kavli Frontiers of Science Fellow	2011
International Society for Neuroethology, Young Investigator Award	2010
Polak Young Investigator Award, AChemS	2009
Cota-Robles Fellow, UC Los Angeles	1998-2000

## **ACADEMIC PRESENTATIONS (2010-present)**

- 2016 •Society for Integrative and Comparative Biology, Portland OR (**Symposium organizer**)
- Univ. Florida, Dept. Biology, Gainesville (**invited**)
  - Penn State Univ., Dept. Entomology, State College, PA (**invited**)
  - Univ. Cincinnati, Dept. Biology, Cincinnati OH (**invited**)
  - Univ. Lund and Alnarp Univ., Dept. Biology, Alnarp Sweden (**invited**)
  - International Symposium of Olfaction and Taste, Yokohama Japan (**invited**)
  - North Carolina State Univ., Depts. Entomology and Biology, Raleigh NC (**invited**)
  - International Congress of Entomology, Orlando FL (**invited**)
- 2015 •Univ. Washington, Dept. Atmospheric Sciences, Seattle (**invited**)
- Max Planck Institute, Schloss-Ringberg, Germany (**invited**)
  - UC Davis, Department of Neurobiology and Behavior, Davis CA (**invited**)
  - American Chemosensory Society, Ft. Myers, FL
  - Human Frontiers Science Program, La Jolla, CA (**invited**)
  - Society of Integrative and Comparative Biology, Palm Beach FL
- 2014 •UC Berkeley, Dept. Integrative Biology (**invited**)
- European Entomological Society, York UK (**invited**)
  - International Society for Chemical Ecology, Urbana IL USA (**invited**)
  - UC Riverside Department of Entomology (**invited**)
  - International Symposium on State of the Art Review for Bio-inspired flight, Seattle, WA USA (**invited**)
  - Gordon Conference for Plant Volatiles (**invited**)
- 2013 •Odor Spaces Workshop, Hannover Germany (**invited**)
- American Chemosensation Society, Huntington Beach CA
  - Entomological Society of America, Tahoe CA (**invited**)
  - Indiana University, Bloomington IA (**invited**)
- 2012 •Neurobiology and Behavior Graduate Seminar, Seattle WA (**invited**)
- Western Apiculture Society Annual Conference, Seattle WA (**invited**)
  - Gordon Research Conference on Plant Volatiles, Ventura CA (**invited**)
  - Riffell is the session organizer on pollinator behaviors
  - International Symposium on Olfaction and Taste, Stockholm Sweden (**invited**)
  - University of Würzburg, Germany (**invited**)
- 2011 •International Symposium for Insect Chemoreception, Beijing China (**invited**)

- Gordon Research Conference on Neuroethology, Eaton MA
- International Symposium on State of the Art Review for Bio-inspired flight, Southampton, UK (**invited**)
- National Academy of Sciences-Kavli Frontiers of Science symposium, Newport Beach, CA (**invited**)
- Society for Integrative and Comparative Biology, Salt Lake City UT (**invited**)
- 2010 •University of Nevada, Las Vegas (**invited**)
- International Congress of Neuroethology, Salamanca Spain (**invited**)
- University of Notre Dame, Division of Biology, South Bend IN (**invited**)
- University of Washington, Department of Biology, Seattle WA (**invited**)

**UNIVERSITY OF WASHINGTON SERVICE AND ACTIVITIES**

Member of the Research Committee	2016-current
Reviewer for the Mary Gates URP	2016-current
Member of the Neuroscience Admissions Committee	2014-2016
Member of the Biology Department’s Diversity Committee	2012-2014
Royalty Research Fund review committee member	2011-2013

**EXTERNAL SERVICE AND ACTIVITIES**

Associate Editor for <i>Frontiers in Behavioral Neuroscience</i>	2016-present
Associate Editor for <i>Frontiers in Ecology and Evolution</i>	2013-present
Nominated to be Program Chair Neurobiology Section of Society of Integrative and Comparative Biology	2016-2018
Organizer of “Neuroecology” symposium for the Society for Integrative and Comparative Biology in Portland, OR	Jan. 2016
Organizer of “Chemical Ecology and Behavior” symposium for the International Congress of Entomology in Orlando, FL	Sept. 2016
Organizer of “Pollinator Behavior” symposium for the Gordon Research Conference on Plant Volatiles in Ventura, CA	Jan. 2012
Organizer of a special symposium on “Neuroecology” for the Ninth International Congress of Neuroethology in Salamanca, Spain	Aug. 2010
Ad-hoc Committee Member for NIH-VB Study Section	2016
Panel member for NSF-IOS	2016, 2014, 2010
Grant Reviewer (10 ad-hoc reviews in 2015/16): National Science Foundation-IOS ( <i>Neural Systems; Animal Behavior</i> ); US-Israel Binational Science Foundation (BSF); Rothamsted Research; NIH Vector Biology Study Section.	



Journal Reviewer (24 reviews in 2015/16): *Science*; *PNAS*; *Frontiers in Neural Circuits*; *BMC Biology*; *Animal Behavior*; *Biological Bulletin*; *Current Biology*; *Ecology*; *Evolution*; *Journal of Chemical Ecology*; *Journal of Comparative Physiology A*; *Journal of Experimental Biology*; *Journal of Neuroscience*; *PLoSOne*

Science Outreach activities: 2) Seattle Expanding Your Horizons; (3) Paws on Science; (4) Visits to the laboratory by elementary and middle schools kids during UW's Lab Day; 5) outreach event during AChemS.

### **MEDIA ATTENTION (2010-present)**

- “Mosquitoes Use Complex Tactics To Seek Human Prey” *The Onion*.
- “Smell, vision and heat: that’s what mosquitoes need for detecting preys” BBC, Time, Reuters.
- BBC’s Beyond Human: The sense of smell (premiered September 2014)
- “Car exhaust keeps moths from smelling the roses” featured in more than 70 online news sources [Yahoo, TheVerge, Reuters, CNN]; in print newspapers like New York Times, and LA Times; featured nationally on TV and Radio via NPR, CBS, NBC, and Fox.
- “UW enlisting Citizen Scientists to help study bee populations” from the Urban Pollination Project, featured on local Seattle TV stations: KIRO7, KING5, and Q13.
- “Moths Wired Two Ways to Take Advantage of Floral Potluck” *e!Science News*, *Science Daily*, *Phys.org*, December 6, 2012
- “Study of abalone yields new insights into sexual reproduction”. *The New Scientist*, August 8, 2011.
- “Giant 'Corpse Flower' draws hundreds; focus of new UW research. *KIROTV*, June 9, 2011.
- “Polluted perfume could put pollinators off the scent”. *The New Scientist*, February 7, 2011.
- “Hunt for the molecules that hold ecosystems together”. *The New Scientist*, January 21, 2011.
- “Three papers make ‘sense’ of scent detection in insects”. *Biotechniques – The International Journal for Life Science Method*, March 3, 2010.

### **TEACHING**

BIO 499/EE 475 “Crowdsensing Capstone” 2016  
 Upper-division honors-type Senior design course through Winter and Spring quarters with 3 EE and 2 BIO students. The course is designed to develop students' skills in bio-inspired innovation, systems engineering, and project management by interfacing EE and BIO student teams for design and testing of environmental monitoring sensors with wireless (cellular) capabilities.

PBIO 527 “Readings in Advanced Physiology and Biophysics” 2015  
 Graduate lecture/seminar course on olfactory neurobiology that uses select readings and problem sets based on current state-of-the-art articles.

**Biology 428 “Sensory Neurophysiology & Ecology” 2011-2016**

Upper-division undergraduate course with 60 students on the current research in the field of sensory ecology and neurophysiology. The course uses current literature for teaching trends in neuroscience and experimental sensory biology. For the Final, the students learn to write a research proposal in the NIH or NSF format, and how research proposals are reviewed.

**Biology 457 “Chemical Communication” 2011-2016**

60 student upper-division undergraduate course on the field of chemical communication and ecology. A synthetic course, comprising material from Organic Chemistry to Community Ecology.

**Biology 105 (Pima Community College, Desert Vista Campus) 2006-2007**

Student lower-division undergraduate course on Introductory Biology. The students are introduced to hypothesis testing, introductory chemistry, and evolution and ecology. An associated laboratory section (part of the course) also exposes the students to scientific design and testing.

**MENTORING**

Students mentored in Riffell Laboratory:

- 4 Postdoctorates
- 6 Graduate students
- 11 (68 total undergraduate students)
- 4 High School students