

James C. Liao

5/01/15

EDUCATION

- 2003-2004 Ph.D. Harvard University, Cambridge, MA.
1999-2003 M.A. Harvard University, Cambridge, MA.
1993-1996 B.A. Wesleyan University, Middletown, CT. *magna cum laude*

EMPLOYMENT RECORD

- 2015- Affiliate Professor, Clayton Pruitt Family Dept. of Biomedical Engineering, UF
2011- Research Associate, Division of Vertebrate Zoology, American Museum of Natural History
2009- Assistant Professor, Department of Biology UF, Whitney Laboratory for Marine Bioscience
2009- Affiliate Assistant Curator of Ichthyology, Florida Museum of Natural History
2007-2008 Research Associate, Department of Neurobiology, Cornell University
2004-2007 NIH NRSA Postdoctoral Fellow, Cornell University

HONORS

- 2004 Elsevier Young Investigator Award, 2nd place, Society for Experimental Biology
2003 Derek Bok Certificate of Excellence in Teaching, Harvard University (1999, 2000 and 2003)
2003 Stoye Award, American Society for Ichthyologists and Herpetologists
2003 Robert A. Chapman Memorial Scholarship, Harvard University
2000 Bermuda Biological Station Research Scholarship
1999 UC-Irvine Holcomb Scholarship for Marine Biology

RESEARCH INTERESTS

Neurobiology of sensory and motor systems
Biomechanics of aquatic locomotion
Ecology, evolution and behavior of fishes

PROFESSIONAL SOCIETIES

Association for Research in Otolaryngology
Society for Neuroscience
Society for Integrative and Comparative Biology
Society for Neuroethology
Society for Experimental Biology
American Society of Ichthyologists and Herpetologists

GRANTS

- 2013 NSF IOS- Single neuron resolution of flow sensing in the zebrafish lateral line during development (sole PI, \$516,083, 7/1/13-6/30/16)
2010 NIH RO1 NIDCD- Organization and functional of lateral line afferents (sole PI, \$1.73 million, 7/1/10 – 6/30/15)
2010 UF Office of Research- South East Neuroscience Conference (\$3000)
2004 National Institutes of Health NRSA Postdoctoral Fellowship (\$122,700, 11/1/04- 10/31/07)
2002 Sigma Xi Grants in Support of Research (\$3000)

2002 Lerner-Gray Fund, American Museum of Natural History (\$3000)
 2000 Putnam Expedition Grant, Harvard Museum of Comparative Zoology (\$2,600)
 2000 Bermuda Biological Station Grant in Aid of Research (\$1600)
 1995 Howard Hughes Undergraduate Summer Scholarship (declined)
 1993-96 Charles Ray Scholarship and Wesleyan Scholarship, Wesleyan University
 1991-15 Awards < \$1500: UF Faculty travel award, Harvard University Graduate Student Council Travel Award, SICB Grants in Aid of Research, ASIH Student Travel Award, Mote Marine Laboratory Scholarship, The School for Field Studies Scholarship

PUBLICATIONS (U NSF REU undergraduate, P postdoc, T technician, * invited submission)

1. Ristroph L, **Liao J.C.**, and Zhang J (2015) Lateral line layout correlates with the differential hydrodynamic pressure on swimming fish. **Physical Review Letters** 114: 018102
doi:10.1103/PhysRevLett.114.018102
2. Rafael Levi^P, Otar Akanyeti^P, Aleksander Ballo^T and **James C. Liao** (2015) Frequency response properties of primary afferent neurons in the posterior lateral line system of larval zebrafish. **The Journal of Neurophysiology** 113: 657-668. *doi:10.1152/jn.00414.2014*
3. Melanie Haehnel-Taguchi^P, Otar Akanyeti^P and **James C. Liao** (2014) Afferent and motoneuron activity in response to single neuromast stimulation in the posterior lateral line of larval zebrafish. **The Journal of Neurophysiology** 112:1329-1339. *doi:10.1152/jn.00274.2014*
4. ***Liao, J.C.** (2014). Functional Architecture in Lateral Line Afferent Neurons. **Flow Sensing in Air and Water: Behavioral, Neural and Engineering Principles of Operation**. Bleckman, Mogdans & Coombs (Eds.). New York: Springer.
5. Otar Akanyeti^P and **Liao, J.C.** (2013) A kinematic model of Kármán gaiting in rainbow trout. **The Journal of Experimental Biology**. 216, 4666-4677. *doi:10.1242/jeb.093245 (cover article)*.
6. Otar Akanyeti^P and **Liao, J.C.** (2013) The effect of flow speed and body size on Kármán gait kinematics in rainbow trout. **The Journal of Experimental Biology**. 216, 3442-3449
doi:10.1242/jeb.087502
7. *McHenry, M.J. & **Liao, J.C.** (2013) The Hydrodynamics of Flow Sensing. **Handbook of Auditory Research** 48: The Lateral Line. Coombs & Bleckman (Eds.). New York: Springer. DOI 10.1007/2506_2013_13.
8. ***Liao, J.C.** and Cotel, A. (2012). Effects of turbulence on fish swimming in aquaculture. **Swimming Physiology of Fish**, Chapter 5, 109-127, Springer Berlin Heidelberg, Ed. Palstra and Planas. *doi:10.1007/978-3-642-31049-2_5*
9. Olszewski, J.^U, Haehnel, M.^P, Taguchi, M.^T and **Liao J.C.** (2012) Zebrafish Larvae Exhibit Rheotaxis and Can Escape a Continuous Suction Source Using Their Lateral Line. **PLoS ONE** 7(5): e36661. *doi:10.1371/journal.pone.0036661*. PMID 22570735

10. **Liao, J.C.** and Haehnel, M.^P (2012). Physiology of afferent neurons in larval zebrafish provides a functional framework for lateral line somatotopy. **The Journal of Neurophysiology**. *doi:10.1152/jn.01108.2011*. PMID 22338025
11. Haehnel, M.^P, Taguchi, M.^T and **Liao, J.C.** (2012). Heterogeneity and dynamics of lateral line afferent innervation during development in zebrafish (*Danio rerio*). **Journal of Comparative Neurology** 520, 1376-1386. *doi:10.1002/cne.22798*. PMID 22102005
12. *Lacey, J.R.W., Neary, V.S., **Liao, J.C.**, Enders, E.C., and Tritico, H.M. (2011) The IPOS framework: linking fish swimming performance in altered flows from laboratory experiments to rivers. **River Research and Applications**, RRA-10-0239.R2, 1-48. *doi: 10.1002/rra.1584*.
13. F-B. Tian, H. Luo, L. Zhu, **J.C. Liao** and X-Y. Lu. (2011) "An efficient immersed boundary-lattice Boltzmann method for the hydrodynamic interaction of elastic filaments" **Journal of Computational Physics** 230, 7266-7283. *doi: 10.1016/j.jcp.2011.05.028*.
14. Taguchi, M.^T and **Liao, J.C.** (2011) "Trout decrease oxygen consumption in turbulence: evidence for an energetic hierarchy across speed and behaviors" **The Journal of Experimental Biology** 214, 1428-1436. *doi:10.1242/jeb.052027*.
15. Liao, J.C. (2010). Organization and physiology of posterior lateral line afferent neurons in larval zebrafish. **Biology Letters** 6:402-405. *doi:10.1098/rsbl.2009.0995*, PMID: 20181553.
16. **Liao, J.C.** and Fetcho, J.R. (2008). Shared versus specialized glycinergic spinal interneurons in axial motor circuits of larval zebrafish. **The Journal of Neuroscience**; 28(48): 12982-92.
17. ***Liao, J.C.** (2007). A review of fish swimming mechanics and behavior in altered flows. **Philosophical Transactions of the Royal Society B**. 362 (1487):1973-93.
18. **Liao, J.C.** (2006) The role of the lateral line and vision on body kinematics and hydrodynamic preference of rainbow trout in turbulent flow. **The Journal of Experimental Biology** 209, 4077-4090.
19. D. N. Beal, F. S. Hover, M. S. Triantafyllou, **J. C. Liao** & G. V. Lauder (2006). Passive propulsion in vortex wakes. **Journal of Fluid Mechanics** 549, 385-402.
20. **Liao, J.C.** (2004). Neuromuscular control of fish swimming in a vortex street: implications for energy economy. **The Journal of Experimental Biology** 207, 3495-3506.
21. **Liao, J. C.**, Beal, D. N., Lauder, G.V., and Triantafyllou, M.S. (2003). Fish exploiting vortices use less muscle. **Science** 302, 1566-1569. (*cover article*).
22. **Liao, J. C.**, Beal, D. N., Lauder, G.V., and Triantafyllou, M.S. (2003). The Kármán gait; novel kinematics of rainbow trout swimming in a vortex street. **The Journal of Experimental Biology** 206, 1059-1073. (*cover article*).
23. **Liao, J. C.** (2002). Swimming in needlefish: anguilliform locomotion with fins. **The Journal of Experimental Biology** 205, 2875-2884.

24. **Liao, J.** and Lauder, G.V. (2000). Function of the heterocercal tail in white sturgeon: flow visualization during steady swimming and vertical maneuvering. **The Journal of Experimental Biology** 203, 3585-3594.

PUBLISHED ABSTRACTS

- 2015 Akanyeti, O., Thornycroft, P.J.M., Peterson, A.N., Lauder, G.V. and Liao, J.C. Swimming performance of flexible 3-D printed fish. **Integrative and Comparative Biology** 55 (1) e1-e210, *doi:10.1093/icb/icv011*
- 2014 Akanyeti, O., Yanagitsuru, Y.R. and Liao, J.C. Head movements may reduce drag experienced by swimming rainbow trout. **Integrative and Comparative Biology** 54 (1) e1-e234, *doi:10.1093/icb/icu008*
- JC Liao, O Akanyeti, A Ballo, M Haehnel, R Levi. Sensory and Motor Responses to Deflection of Single Neuromasts in the Lateral Line System in Larval Zebrafish. **Integrative and Comparative Biology** 54, E123-E123
- YR Yanagitsuru, O Akanyeti, JC Liao. The Effects of Self Motion on the Pressure Difference Across the Head of Rainbow Trout (*Oncorhynchus mykiss*) During Locomotion. **Integrative and Comparative Biology** 54, E372-E372
- KS Ward, O Akanyeti, JC Liao. The Iridescent Catfish (*Pangasianodon hypophthalmus*) as a Hybrid Rigid-Undulatory Model for Aquatic Robotics. **Integrative and Comparative Biology** 54, E219-E219
- O Akanyeti, YR Yanagitsuru, JC Liao. Distributed pressure detectors for underwater robotic locomotion and sensing: insight from direct measurements in swimming trout. **Integrative and Comparative Biology** 54, E4-E4
- CA Smith, M Haehnel-Taguchi, JC Liao. Regional specialization of posterior lateral line efferent neurons in the hindbrain of larval zebrafish. **Integrative and Comparative Biology** 54, E351-E351
- 2013 Akanyeti, O.* and Liao, J.C. Modeling midline kinematics of fish swimming in a vortex street. **Integrative and Comparative Biology** 53(1): e1-e235, *doi:10.1093/icb/ict013*
- J Zhang, L Ristroph, J Liao. The lateral line system of fish as a hydrodynamic antenna. **Bulletin of the American Physical Society** 58
- JC Liao, AW Ballo, O Akanyeti. Signal transmission properties of the zebrafish larval lateral line in response to neuromast deflections. **Integrative and Comparative Biology** 53, E318-E318
- JC Liao, LM Chambers, O Akanyeti. Pressure across the head of a freely-swimming rainbow trout (*Onchorynchus mykiss*) in uniform flow. **Integrative and Comparative Biology** 53, E127-E127

- 2012 Liao J.C. The effect of flow speed and body length on swimming kinematics of rainbow trout in a vortex street. **Frontiers in Behavioral Neuroscience**. Conference Abstract: Tenth International Congress of Neuroethology. doi: 10.3389/conf.fnbeh.2012.27.00164
- Haehnel M.* and Liao J.C.. Motor responses to mechanical deflections of individual neuromasts of the lateral line system in larval zebrafish (*Danio rerio*). **Frontiers in Behavioral Neuroscience**. Conference Abstract: Tenth International Congress of Neuroethology. doi: 10.3389/conf.fnbeh.2012.27.00148
- JC Liao, M Taguchi. Exploring the parameter space for Karman gaiting: kinematics across speed and size. **Integrative and Comparative Biology** 52, E106-E106
- 2011 JC Liao, M Taguchi. Velocity-dependent energetics hierarchy for trout swimming in vortical flows **Integrative and Comparative Biology** 51, E81-E81
- 2010 JC Liao, JR Fetcho. Organization and function of lateral line afferent neurons in larval zebrafish **Integrative and Comparative Biology** 50, E101-E101
- 2006 JC Liao. *In vivo* activity of zebrafish inhibitory spinal interneurons across behaviours. **Integrative and Comparative Biology** 46, E84-E84
- 2005 JC Liao, JR Fetcho. Identification of sensory spinal interneurons using optical, genetic, and electrophysiological techniques in larval zebrafish. **Integrative and Comparative Biology** 45 (6) 1032.
- JC Liao, JR Fetcho. *In vivo* visualization of inhibitory interneurons involved in the spinal motor circuit of zebrafish. **Comparative Biochemistry and Physiology A-Molecular and Integrative Physiology**, 141 (3) S167.
- 2004 Liao, J. C. The mechanics, sensory biology, and physiology of fish exploiting vortices. **Comparative Biochemistry and Physiology** 137A, S94.
- 2003 JC Liao. Function of the lateral line in trout exposed to environmental vortices; the effect of a pharmacological block of the sensory neuromasts. **Integrative and Comparative Biology** 43 (6), 1017-1017
- 2002 Liao, J.C. How trout interact with Kármán vortices behind a cylinder: insights from kinematics, electromyography, and flow visualization. **Integrative and Comparative Biology** 42 (6) 1266-1267.
- Liao, J. C., Beal, D. N., and Lauder, G.V. Novel body kinematics of a trout swimming in a von Kármán trail; can fish tune to vortices? **Comparative Biochemistry and Physiology** 132A, S73.
- 2001 Liao, J. C., Beal, D. N., Lauder, G.V., and Triantafyllou, M.S. Novel body kinematics of a trout swimming in a von Kármán trail; can fish tune to vortices? **American Zoologist** 41 (6), 1505-1506.
- 2000 Liao, J. Locomotion in needlefish: anguilliform swimming with fins. **American Zoologist** 40 (6), 1103.

- 1999 Liao, J. and Lauder, G.V. Wake dynamics of the heterocercal tail in freely-swimming sturgeon *Acipenser transmontanus*. **American Zoologist** 39 (5), 324.

TEACHING

- 2015 Mentor, NSF summer REU student Joy Putney
- 2015 Graduate Orientation Seminar Parade of Faculty, UF Dept of Biology (lecture)
- 2015 ZOO 6927 *Marine Biology Seminar*, (spring/fall semesters). Whitney Lab, St. Augustine
- 2014 EML 4220 *Vibrations*, UF Dept of Mechanical and Aerospace Engineering (lecture)
- 2014 ZOO 6927 *Marine Biology Seminar*, (spring/fall semesters) Whitney Lab, St. Augustine
- 2013 Mentor, NSF Summer REU student Katelyn Ward (Best Presentation Award, M.A. student, Northwestern University Feinberg School of Medicine's Prosthetics-Orthotics)
- 2013 Mentor, NSF Summer REU Yuzo Yanagitsuru (SICB travel scholarship, accepted into Ph.D. program at UF with fellowship support)
- 2013 Lecturer, Florida Master Naturalist Program, Ripple Effect Ecotours/UF IFAS
- 2013 ZOO 6927 *Marine Biology Seminar*, (spring/fall semesters) Whitney Lab, St. Augustine
- 2012 ZOO 6927 *Marine Biology Seminar*, (spring/fall semesters) Whitney Lab, St. Augustine
- 2012 BIO 135L, *Undergraduate Research: Tropical Biology on a Changing Planet*, Organization for Tropical Studies, Bocas del Toro, Panama
- 2011 ZOO 4926/6456C, *Ichthyology*, University of Florida, Gainesville
- 2011 ZOO 6927 *Marine Biology Seminar*, (spring/fall semesters) Whitney Lab, St. Augustine
- 2011 Mentor, NSF summer REU student Lena Chen
- 2011 Research lecture, NSF summer REU
- 2011 Research lecture, UF Neuroscience Club
- 2010 Mentor, NSF summer REU student Julia Olszewski (PhD student, UNC Chapel Hill)
- 2010 GMS 6074 *Comparative and Evolutionary Neurobiology*, University of Florida (lectures)
- 2010 Academy of Biotechnology and Medical Research, Ponte Vedra Highschool (lectures)
- 2010 ZOO 6927 *Marine Biology Seminar*, (spring/fall semesters). Whitney Lab, St. Augustine
- 2009 ZOO 3713, *Functional Vertebrate Anatomy*, University of Florida (lectures)
- 2009 Mentor, Luis J. Perez, Pedro Menendez High School lab volunteer
- 2009 ZOO 6927 *Marine Biology Seminar*, (fall semester). Whitney Lab, St. Augustine
- 2007 *Biology of Fishes*, Cornell University (lectures)
- 2006 *Biological Science 1*, Cornell University (lectures)
- 2006 *Biology and Filmmaking*, HPSS S505, Rhode Island School of Design (lecture)
- 2005 *Neural Development and Genetics of Zebrafish*, Marine Biological Laboratory, Woods Hole (TA)
- 2003 *Patterns and Processes in Fish Diversity*, Harvard University (TA, lecturer)
- 2002 *Vertebrate Paleontology*, Bio 139, Harvard University (lecture).
- 2002- *Graduate Tropical Field Biology*, Organization for Tropical Studies, Cabo Blanco, La Selva, Monte Verde Costa Rica (research faculty)
- 2001 *Biology of Fishes*, Bermuda Biological Station for Research (TA, lecturer)
- 2001- *Graduate Tropical Field Biology*, Organization for Tropical Studies, Cabo Blanco, Costa Rica (research faculty)
- 2000 *Patterns and Processes in Fish Diversity*, Harvard University (TA, lecturer)
- 2000 *Advanced Topics in Vertebrate Physiology and Anatomy*, Bio 121. Harvard University (TA)
- 1999 *Patterns and Processes in Fish Diversity*, Harvard University (TA, lecturer)
- 1999 *Structure and Physiology of Vertebrates*, Harvard University (TA)

1998 *Physiology*, University of California at Irvine (TA)

PRESENTATIONS (^U NSF REU undergraduate, ^P postdoc, ^T technician, *invited)

2015 *How fish save energy by swimming in unsteady flows. **Shanghai Ocean Institute**, Shanghai China.

*Electrophysiological approaches to revealing the mechanics of flow sensing at the single cell level. **Shanghai Ocean Institute**, Shanghai China.

*How Fish Swim. Daytona State College STEM Seminar Series, Daytona, FL.

*How fish swim and sense flow. Dept of Mechanical Engineering, **NYU Polytechnical University**, Brooklyn, NY.

Regional specialization of posterior lateral line efferent neurons in the hindbrain of larval zebrafish. **Association for Research in Otolaryngology**, Baltimore, Maryland.

Using 3-D printing technology to investigate the function of cranial lateral line canals in fishes during rheotaxis. **Society for Integrative and Comparative Biology**, West Palm Beach, Florida

^T The development of a rapid prototyping method for experimental studies of locomotion and flow sensing. **Society for Integrative and Comparative Biology**, West Palm Beach, Florida

^P Swimming performance of flexible 3-D printed fish. **Society for Integrative and Comparative Biology**, West Palm Beach, Florida

^P How to tickle a fish: investigating the responses of a single flow receptor to random motion. Florida Ichthyology Student Homily (FISH) Meeting, **Florida Atlantic University**.

^P To sprint, be an eel. Florida Ichthyology Student Homily (FISH) Meeting, **Florida Atlantic University**.

^P Towards non-visual detection of detailed fish swimming kinematics and behaviour. Florida Ichthyology Student Homily (FISH) Meeting, **Florida Atlantic University**.

^T Surf's up: swimming kinematics of a juvenile carangid in unsteady flow. Florida Ichthyology Student Homily (FISH) Meeting, **Florida Atlantic University**.

2014 ^P Influence of efferent innervation on lateral line sensing in larval zebrafish (*Danio rerio*). **The Society for Neuroscience** poster, 530.01/FF14 Washington, D.C.

Fish swimming and flow sensing. Departmental Seminar, Biomedical Engineering. **University of Florida**.

Responses of larval zebrafish to single neuromast deflections in the lateral line system. **International Conference for Neuroethology**, Hokkaido, Japan.

Effects of mechanical stimulation on the lateral line neuromasts in larval zebrafish: from afferent activity to motor response. **7th World Congress of Biomechanics**, Boston MA.

^P Fish actively control head movements during undulation to increase swimming performance. **7th World Congress of Biomechanics**, Boston MA.

^P Frequency Response Properties of the zebrafish lateral line neuromasts in larval zebrafish. **Mote Marine Lab Popper and Fay Symposium: 50 Years of Underwater Bioacoustics**.

^P Mechanical stimulation of individual lateral line neuromasts in larval zebrafish. **Mote Marine Lab Popper and Fay Symposium: 50 Years of Underwater Bioacoustics**.

*Passive vortex exploitation in a cylinder wake. Auckland Bioengineering Institute, **University of Auckland**.

*How fish swim in turbulence. Institute of Marine Science and School of Biological Sciences. **University of Auckland**.

Afferent neuron activity in response to single neuromast deflections in the posterior lateral line system of larval zebrafish. **Association for Research in Otolaryngology**, San Diego.

Sensory and motor responses to deflection of single neuromasts in the lateral line system in larval zebrafish. **Society for Integrative and Comparative Biology**, Austin, Texas.

^U The effects of self motion on the pressure difference across the head of rainbow trout (*Oncorhynchus mykiss*) during locomotion. **Society for Integrative and Comparative Biology**, Austin, Texas.

^U The iridescent catfish (*Pangasianodon hypophthalmus*) as a hybrid rigid-undulatory model for aquatic robotics. **Society for Integrative and Comparative Biology**, Austin, Texas.

Connectivity of posterior lateral line efferent neurons in the zebrafish hindbrain. **Society for Integrative and Comparative Biology**, Austin, Texas.

^P Head movements may reduce drag experienced by swimming rainbow trout. **Society for Integrative and Comparative Biology**, Austin, Texas.

2013 ^P Effects of mechanical ramp stimulation on individual lateral line neuromasts in larval zebrafish: from afferent activity to motor response. **The Society for Neuroscience** poster, 352.13/QQ19 San Diego CA.

^P Frequency response properties of the zebrafish larval lateral line. **The Society for Neuroscience** poster, 352.12/QQ18 San Diego CA.

Transmission characteristics and frequency response properties of the zebrafish larval lateral line. **7th European Conference on Comparative Neurobiology**, Budapest, Hungary.

*Biomechanics and sensory biology of fish swimming. Department of Biology, Brooklyn College.

Pressure distribution on the head of a freely-swimming rainbow trout (*Onchorynchus mykiss*) in uniform flow. **Society for Integrative and Comparative Biology**, San Francisco, California.

Signal transmission properties of the zebrafish larval lateral line in response to neuromast deflections. **Society for Integrative and Comparative Biology** poster, San Francisco, California.

^P Modeling midline kinematics of fish swimming in a vortex street. **Society for Integrative and Comparative Biology** poster, San Francisco, California.

2012 Neural reliability of afferent neurons in the posterior lateral line system of larval zebrafish (*Danio rerio*). **The Society for Neuroscience** poster, 460.01/U4 New Orleans, Louisiana.

^P Single neuromast stimulation initiates motor responses in larval zebrafish which in turn modifies afferent neuron activity. **The Society for Neuroscience** poster, 460.06/U9 New Orleans, Louisiana.

The effect of swimming speed and body size on swimming kinematics of rainbow trout in a vortex street. **The Society for Neuroethology** poster, PO244, Washington D.C.

^P Motor responses to mechanical deflections of individual neuromasts of the lateral line system in larval zebrafish (*Danio rerio*). **The Society for Neuroethology**, Washington D.C.

*Fluid-fish interactions: insights from energetics and behavior. Courant Institute of Mathematical Sciences, Applied Math Lab, **New York University**.

^P Organization and early development of the lateral line organ in the zebrafish (*Danio rerio*). **South East Nerve Conference**.

Locomotion in oscillating flows: insights from experimental kinematics and modeling. **UF Department of Neuroscience** retreat, Whitney Lab.

Exploring the parameter space for Kármán gaiting: kinematics across speed and size. **Society for Integrative and Comparative Biology**, Charleston, South Carolina.

2011 Functional architecture of zebrafish lateral line afferent neurons. **The Society for Neuroscience** poster, 477.11/U9 Washington DC.

Lateral line architecture and function in larval zebrafish. **International Congress of Flow Sensing in Air and Water**, Bonn, Germany.

*Understanding the mechanics and control of fish swimming using optical, genetic and electrophysiological techniques. Department of Biology, **University of Miami**.

Velocity-dependent energetic hierarchy for trout swimming in vortical flows. **Society for Integrative and Comparative Biology**, Salt Lake City, Utah.

Velocity-dependent energetic hierarchy for trout swimming in vortical flows. **UF Marine Biology Symposium**, The Whitney Lab for Marine Bioscience.

2010 Organization and heterogeneity in lateral line afferent neurons. **International Congress for Neuroethology**, Salamanca Spain.

*Trout use less oxygen in turbulent flows: evidence for an energetics hierarchy. **International Leverhulme Workshop for Fish Passage**, Winnipeg, Canada.

*Metabolic cost of trout swimming in vortical flows. **American Society for Ichthyologists and Herpetologists**, Providence R.I.

Structure and architecture of lateral line afferent neurons in larval zebrafish. **UF Marine Biology Symposium**.

Organismal and physiological approaches to understanding vertebrate locomotion. **South East Nerve Conference**.

In vivo approaches to understanding vertebrate hair cell circuits. **UF Department of Neuroscience**.

Organization and function of lateral line afferent neurons in larval zebrafish. **Society for Integrative and Comparative Biology**, Seattle, WA.

2009 *Understanding how fish sense and exploit flows using optical, genetic and electrophysiological techniques. Department of Theoretical Biology, **University of Groningen**, Netherlands.

*How To Catch More Fish: Insights from Biomechanics. **Evenings at the Whitney Lecture Series**.

*Links between marine science and human health. **Whitney Docent Training Program**.

*How fish swim. **Whitney Public Open House Lecture**.

*Understanding underwater locomotion. **Valdosta State University**.

2008 Insight into the neural encoding of flow; morphological and functional heterogeneity in the lateral line neurons of larval zebrafish. **Society for Integrative and Comparative Biology**, San Antonio, Texas.

*Neuromechanics of fish locomotion. Department of Engineering Science and Mechanics, **Virginia Polytechnic Institute and State University**.

*Organismal and cellular approaches to understanding vertebrate behavior. Dept. of Biology, **University of New Orleans**.

*The mechanics and sensory biology of fish swimming. Dept. of Biology, **University of Wyoming**.

2007 Optical and electrophysiological techniques reveal functional diversity in posterior lateral line ganglion neurons in larval zebrafish. **The Society for Neuroscience** poster, San Diego, CA.

*How fish encode and exploit flows in a Karman vortex street. Courant Institute of Mathematical Sciences, **New York University**.

2007 *Physiology of flow exploitation; implications for hydraulics and ecological habitat modeling **U.S. Army Engineer Research and Development Center**, Vicksburg, MS.

* Biomechanics and neural control of adaptive behavior in fishes. Dept. of Integrative Biology, **University of Guelph**, Canada.

* Optical, genetic, and electrophysiological approaches to understanding neural circuits in larval zebrafish. Dept. of Biology, **University of Las Vegas**.

- 2006 Optical, genetic, and electrophysiological techniques in larval zebrafish support a role for a commissural, glycinergic spinal interneuron type in switching motor behaviors. **Society for Neuroscience**, poster 252.5/U22, Atlanta GA
- *Wu wei: the Tao of environmental vortex capture by fish. Sibley School of Mechanical and Aerospace Engineering, **Cornell University**.
- *Using larval zebrafish as a model system to understand vertebrate sensorimotor systems. Dept of Biology Seminar. **Hawaii Institute of Marine Biology**.
- *Fluid dynamics, physiology and sensory ecology of fishes swimming in perturbed environments. Dept. of Biology , **Scripps Institute of Oceanography/ University of California at San Diego**.
- * Optical, genetic and electrophysiological approaches to understanding vertebrate sensorimotor systems. Dept. of Biology, **Indiana University**.
- 2005 *Mechanics and control of fish swimming in turbulent flows. Dept of Biology, **UNC Chapel Hill**.
- *Vortex exploitation in fishes. Dept. Neurobiology and Behavior, **Cornell University**.
- 2004 *Mechanics and control of vortex capture in swimming fishes. Machines and Organisms Group (IGERT), **Cornell University**
- 2004 The effect of lateral line and vision on the Kármán gait. **Society for Integrative and Comparative Biology**, New Orleans, LA.
- How fish negotiate turbulent flow: function of the lateral line neuromasts. **Society for Experimental Biology**, Heriot-Watt University, Edinburgh, Scotland.
- 2003 *The Kármán gait: implications for passive thrust generation in a vortex street. Dept. of Integrative Biology, **University of California at Berkeley**
- Passive energy extraction in the wake of bluff objects by fish. **13th International Symposium on Unmanned, Untethered Submersible Technology**, NH.
- The Kármán gait: insights from kinematics, electromyography and flow visualization. **Society for Integrative and Comparative Biology**, Toronto, Canada.
- *To surf or swim? How fish hold station via vortex exploitation. Dept. of Biology, **University of Massachusetts**.
- 2002 How trout swim in a von Kármán vortex street. **Society of Experimental Biology**, University of Swansea, Wales. (Elsevier Young Investigator Award)
- The Kármán gait. Division of Vertebrate Morphology, Regional Meeting, **Harvard University**.

*How fish use vortices. **University of Guelph**, Ontario, Canada.

Novel kinematics of a trout swimming in a vortex street. **Society for Integrative and Comparative Biology**, Anaheim, CA.

2001 The Kármán gait: novel body kinematics of trout swimming in a vortex street. **American Society of Ichthyologists and Herpetologists**, Manaus, Brazil. (Stoye Award)

Locomotion in needlefish: anguilliform swimming with fins. **Society for Integrative and Comparative Biology**, Chicago, IL.

2000 Function of the heterocercal tail in sturgeon, *Acipenser transmontanus*. **American Society of Ichthyologists and Herpetologists**, La Paz, Mexico.

Wake dynamics of the heterocercal tail in freely-swimming sturgeon, *Acipenser transmontanus*. **Society for Integrative and Comparative Biology**, Atlanta GA.

1999 Wake dynamics of the heterocercal tail in freely-swimming sturgeon, *Acipenser transmontanus*. Division of Vertebrate Morphology, Regional Meeting, **Brown University**.

SERVICE

- 2015 Faculty Judge, Faculty Judge, The Ocean 180 Video Challenge, sponsored by the Florida Center for Ocean Sciences Education Excellence (COSEE)
- 2014 NSF Panel Reviewer, IOS Neural Cluster (Washington, D.C.)
- 2014 Chair, Director Search, UF Seahorse Key Marine Lab
- 2014 Best Student Presentation Judge Division of Comparative Biology (DCB), SICB
- 2013 Invited moderator, "Closing the Loop" Neuroethology Gordon Research Seminar, VT
- 2013-16 UF Biology Graduate Awards Committee
- 2013 Whitney Lab Research Seminar Series Coordinator
- 2013 Whitney Lab Seawater Lab Planning and Development
- 2013 NSF Pre-proposal Grant Committee, IOS Neural Cluster
- 2013 Chair and Judge for Best Student Presentation, Division of Vertebrate Morphology (DVM) and Division of Comparative Biology (DCB), SICB
- 2013- Whitney Website/Outreach Committee
- 2013 Underwater Fish Pond Webcam development, Ocean Classrooms™ marine education partnership with Whitney Lab
- 2012- Harvard College Undergraduate Admissions NE Florida Recruiter and Interviewer
- 2012 Director Search Committee, Whitney Lab
- 2011-13 IACUC officer, Whitney Lab
- 2011 Judge for Best Student Presentation, Division of Vertebrate Morphology (DVM) and Division of Neurobiology (DNB), SICB
- 2011 Co-organizer for 2011 Southeast Nerve Net Conference
- 2011 Judge, Best Student Presentation, Southeast Nerve Net Conference
- 2011 Judge, Best Student Presentation, UF Marine Biology Symposium
- 2010 Bioinformatics Faculty Search Committee, Whitney Lab
- 2010 Faculty Panel Discussion Member, UF Department of Neuroscience Retreat
- 2010 NSF IOS ad-hoc reviewer
- 2010 Judge, Best Student Presentation, UF Marine Biology Symposium
- 2010 Judge, Best Student Presentation, Southeast Nerve Net Conference
- 2009 Anatomy and Physiology Lecturer search committee, UF Biology Department

2005 Judge for Best Student Presentation SICB, Division of Vertebrate Morphology (DVM)
2002-03 Graduate Student Representative, Dept of Organismic and Evolutionary Biology, Harvard University
2000-03 Undergraduate Tutor in Biology (non-resident), Dunster House, Harvard University
2000-02 Foreign Student Representative, graduate School of Arts and Sciences, Harvard University

REVIEWER FOR

The Biological Bulletin

Bioinspiration & Biomimetics

Canadian Journal of Fisheries and Aquatic Sciences

Coral Reefs

Ecology

Environmental Biology of Fishes

IEEE Journal of Ocean Engineering

Integrative and Comparative Biology

Journal of Comparative Physiology A

Journal of Experimental Biology

Journal of Neuroscience

Journal of Theoretical Biology

Journal of Zoology

Marine Biology

Naturwissenschaften

Proceedings of the National Academy of Sciences

Transactions of the American Fisheries Society

Zoology

NSF Integrative and Organismal Systems Division

Neural Systems: Preproposal and Panel

Organism-Environment Interactions: ad-hoc

MacArthur Foundation Fellowship

Singapore-MIT Alliance for Research and Technology Grant (SMART) 8th Innovation Grant Science Review Report

PROFESSIONAL EXPERIENCE

2013 Student, Upright Citizen's Brigade, Improvisation I, NYC

2008 Screen Actors Guild (SAG) eligible

2006 Student, Meisner Technique (2 years), Ithaca Actor's Workshop

2004 Student, Neural Systems and Behavior, Marine Biological Laboratory, Woods Hole MA.

2003 Consultant, M.I.T. Leg Lab

2001 Scientific Diver, Bermuda Biological Station for Research

2001 Top student, Biology of Fishes, Bermuda Biological Station for Research

2000 Top 5/60 students, Human Gross Anatomy, Harvard Medical School

2000 Student, Phylogenetics Workshop, Bodega Marine Lab, UC Davis.

1997 Fisheries Technician, Mote Marine Laboratory

1997 Field Ecologist Intern, USGS Biological Resources Division, Hawai'i

1996 Marine Ecologist Intern, The School for Field Studies, British Columbia

- 1995 Semester abroad, James Cook University, Townsville Australia
- 1993 Student, Shoals Marine Laboratory FMS I, Cornell University
- 1991 Student, Humpback Whale Ecology, The School for Field Studies

REVIEW EDITORIAL BOARD

Frontiers in Aquatic Physiology

PRESS/OUTREACH

- 2015 How fish feel. The New Yorker magazine, March 18th.
Inside Science, video interview (American institute for Physics)
 Centers for Ocean Sciences Educational Excellence (COSEE) Faculty Finalist Judge
 Interview for NYU on PRL paper
 Interview for Northern Woodlands Magazine for PRL article 2/3/15
 Interview, Laura Escobar, University of Florida 2016, B.S. Public Relations
- 2014 Fish Code Studios, founder, science-based videos (<https://www.youtube.com/watch?v=aRWgqDi-ihs>)
 Interview, *Shaping the Future*, Gator Magazine, Florida Alumni Association
 Keynote Speaker, *Resolution in Science*, Pecha Kucha 20 x 20 St. Augustine, FL
 Keynote Speaker, Marine Science and the Public, Flagler Sportfishing Club
 Ocean Classrooms, underwater web camera installation for international marine education initiative
 Featured, Wesleyan University Alumni News
- 2013 Actor, *Scientist for a Day*, Whitney Lab K-12 educational video
 Consultant, Science Daily, Canadian TV Program
 Presentations to the FL division of the American Water Resources Association (AWRA), Ripple Effect
 EcoTours Fish Lecture (2/7/13), Master Naturalist (IFAS)
 Featured Institute, UF homepage for application of Particle Imaging System to biology
 Interview, Palm Coast Observer.com
- 2011 Research lecture, **Ponta Vedra High School**, Academy of Biotechnology and Medical Research
 “Links between Marine Science and Human Health” presentation to the **Whitney Lab Docents**.
- 2010 Interview, “Matanzas Inlet, Ponce redfish and Marine Biology” **Fish Daytona Webisode 9**.
- 2012 Author, *The Tao of Fishing Currents*, **In Fisherman Magazine** (national publication)
 Invited audition for Animal Planet/Discovery TV show
- 2010 Actor, *Reel Science*, host for pilot reel, **National Geographic Television**
- 2009 Invited speaker, How to Catch More Fish, **Evenings at the Whitney** Public Lecture Series
- 2007 Actor, It Depends on the Lens (training video), Gender Equality in Faculty Hiring, **NSF ADVANCE and Cornell University Interactive Theatre Ensemble (CITE)**
 (<http://www.news.cornell.edu/stories/2012/02/cu-advance-celebrates-major-accomplishments>)
- 2006 Invited speaker, Trout Unlimited national conservation group.
 Invited speaker, The Hook: Life Lessons Learned from Fish, **Science Cabaret**, Boyce Thompson Institute, Ithaca NY
- 2004 Interview, Physics of fish, **All Things Considered, NPR**
 Author, I Believe in Turbulence, **This I Believe, NPR**
 Author, This I Believe II (book): More Personal Philosophies of Remarkable Men and Women
 Harvard Magazine (March/April). “The Way of Trout”
 “Different Stroke,” **Natural History Magazine**
- 2003 Interview, “Physics of fish.” **National Public Radio, Morning Edition** with Chris Joyce,
<http://www.npr.org/features/feature.php?wfId=1524674>

MSNBC.com “The Tao of Fish Swimming” (<http://msnbc.msn.com/id/3607002/>)

New Scientist, Fish hitch a ride upstream on eddies,

(<http://www.newscientist.com/news/news.jsp?id=ns99994432>)

Harvard University Gazette, “Scientists show how fish save energy by swimming in schools.”

2001 Aqua Kinema (film), Dr. Hanna Rose Shell **Science, Technology and Society Program at M.I.T.**
Consultant, Hall of Ocean Life exhibit, **American Museum of Natural History.**