

HENRY C. ZERINGUE

Assistant Professor of Bioengineering

CONTACT INFORMATION

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EDUCATION

Postdoctoral Associate in Neurobiology at the Massachusetts Institute of Technology
Advisor: Prof. Martha Constantine-Paton Sept. 2003 – Dec. 2005
Project: RNAi knockdown of PSD-95 affects NMDAR-mediated synaptic refinement
Focus: Electrophysiology, Anatomy, RNA interference, Viral vector delivery

Doctor of Philosophy in Biomedical Engineering at the University of Wisconsin – Madison
Advisors: Profs. D. J. Beebe & J. J. Rutledge Dec. 2003
Thesis: Applications of Microfluidics in *In Vitro* Production of Mammalian Embryos
Minor: Bioinformatics
Focus: Microfluidic systems, Biological MEMS, Embryology
Electives: Bioinformatics, Cellular and molecular biology, Molecular biology techniques, Cellular signal transduction mechanisms

Master of Science in Electrical Engineering at the University of Illinois, Urbana-Champaign
Advisors: Profs. D. J. Beebe & M. B. Wheeler Oct. 2000
Thesis: Mammalian Embryos in Microchannels: porting embryology to microfluidics
Electives: Electromagnetics, Automated microwave measurements

Bachelor of Science in Biomedical Engineering at Louisiana Tech University Aug. 1997
Sr Design: An eye driven GUI pointer for personal computing
Electives: VLSI design (2 quarters), C++, Bioinstrumentation

RESEARCH AND PROFESSIONAL EXPERIENCE

- 2006 – Assistant Professor of Bioengineering, University of Pittsburgh, PA
- 2005–2006 Postdoctoral Fellow, NIH-NRSA, Dept. of Biology, MIT, Cambridge, MA
- PI: Martha Constantine-Paton
- 2003–2005 Postdoctoral Associate, Dept. of Biology, MIT, Cambridge, MA
- PI: Martha Constantine-Paton
- 2002–2003 CIBM Predoctoral Trainee, Biomedical Engineering, UW–Madison, Madison, WI
- PIs: David Beebe and Nicole Parna
- 2000–2002 Research Assistant, Biomedical Engineering, UW–Madison, Madison, WI
- PI: David Beebe
- Fall 2001 Set up a mammalian embryology lab
- 6/01–8/01 Internship at Cytometry Services Inc., Urbana, IL, PI: Gary Durak
- researched and authored sections of a research proposal
- 1997–1999 Research Assistant, Electrical Engineering, UIUC, PI: David Beebe
- designed and fabricated microfluidic devices for embryo culture
- 1995–1996 Senior Research Project, Louisiana Tech University, Ruston, LA
- Electroocular-driven device for graphical computer control
- 1995–1996 Undergraduate researcher, Louisiana Tech University, Ruston, LA
- helped develop protocols for anodic bonding of Si/glass

- Fall 1994 Engineering Internship, Monroe VA Hospital, Monroe, LA
- performed preventive maintenance and repair on hospital equipment
- held workshops to teach nurses to use a new blood gas analyzer

RESEARCH AREAS

General research interests

- application of microelectromechanical systems (MEMS), microfluidics and computational informatics to biology
- cellular interactions with physical and chemical environment, including cell-to-cell, electrochemical, hormonal and metabolic interactions
- developing MEMS for exploration of single synaptic event stimulation and detection
- develop microfluidics for exploration of neuronal network communications
- the effects of NMDA receptor subunits and scaffolding proteins on neuronal potentiation
- the biology of the superior colliculus related to saccadic eye movement

Current projects

- functions of NMDA receptor related proteins in the visual system of the developing rat
- effects of NMDA receptor subunit knockdown on cortical cultures using RNAi
- establish lentivirus based RNAi system for use in intact rat brain

Proficiencies

- biological: mammalian developmental biology, neurobiology
- engineering: MEMS, microfluidics, BioMEMS, computational bioinformatics
- animal models: bovine, rodent, *Xenopus laevis*

SUCCESSFUL PROPOSALS

- NRSA Postdoctoral Fellowship: NIH Ruth L. Kirschstein National Research Service Award
siRNA Knockdown of PSD-95 in the Developing Rat, NIH Grant # NS49747
- CIBM Training Grant: competitive campus-wide grant from the National Library of Medicine
SNPChip Development and Design, NLM Grant # LM007359
- IEDR Grant: competitive campus-wide grant from University-Industry Relations
Advanced Manipulation for Assisted reproduction

PUBLICATION RECORD

Research Papers

- Zeringue, H.C., M.B. Wheeler and D.J. Beebe (2005) "A Microfluidic Method for Removal of the Zona Pellucida from Mammalian Embryos", *Lab. Chip.* **5**:1 108-110 (Advance Article).
• Included in *RSC Chemical Biology Virtual Journal*.
- Zeringue, H.C., J.J. Rutledge and D.J. Beebe (2004) "Early Mammalian Embryo Development Depends on Cumulus Removal Technique", *Lab on a Chip* **5**:1 86-90 (Advance Article).
- Raty, S., E. Walters, J.A. Davis, H.C. Zeringue, D.J. Beebe, S.L. Rodriguez-Zas and M.B. Wheeler (2004) "Embryonic development in the mouse is enhanced *via* microchannel culture", *Lab on a Chip*, **4**(3):186-190.
- Beebe, D.J., M. Wheeler, H.Zeringue, E. Walters and S. Raty, (2002) "Microfluidic technology for assisted reproduction," *Theriogenology*, **57**(1): 125-135.
- Zeringue, H.C., D.J. Beebe and M.B. Wheeler (2001) "Removal of cumulus from mammalian zygotes using micro fluidic techniques," *Biomedical Microdevices*, **3**(3): 219-224.

Glasgow, I., H.C. Zeringue, D.J. Beebe, S-J. Choi, J. Lyman, N.G. Chan and M. Wheeler (2001) "Handling individual mammalian embryos using microfluidics," *IEEE Trans Biomed Eng* **48**(5): 570-578.

Review articles

Zeringue, H.C. (*accepted*) "Microfluidics for Assisted Reproduction" in D.R. Heldman, A. Bridges, D. Hoover and M.B. Wheeler (Eds.), *Encyclopedia of Biotechnology in Food and Agriculture*. New York, NY: Taylor and Francis Group

Zeringue, H.C. and M. Constantine-Paton (2004) "Post Transcriptional Gene Silencing in Neurons," *Current Opinion in Neurobiology*, **14**(5): 654-659.

Walker, G.M., H.C. Zeringue and D.J. Beebe (2004) "Microenvironment design considerations for cellular scale studies," *Lab on a Chip*, **4**(2): 91-97 (**issue cover image**).

Book Chapter

Zeringue, H.C. and D.J. Beebe (2004) "Microfluidic removal of cumulus cells from mammalian zygotes," in *Germ Cell Protocols, Volume 2*, edited by Heide Schatten, series *Methods in Molecular Biology*, Humana Press, New Jersey ISBN 1-59259-741-6.

Conference papers (presenting author underlined)

Zeringue, H.C. (2009) "Microtechnologies for Neural Connectivity", 2009 Annual Biomedical Engineering Society Conference, Pittsburgh, Pa.

Stoner, R.M. and H.C. Zeringue (2009) "High resolution spatiotemporal cell stimulation using dynamic targeting in a microfluidic device", 2009 Annual Biomedical Engineering Society Conference, Pittsburgh, Pa.

Cirinelli, L.A. and H.C. Zeringue (2009) " μ Tarps: 3D covered microstructures from single-step lithography", 2009 Annual Biomedical Engineering Society Conference, Pittsburgh, Pa.

Vishwanathan, A., S.D. Burton and H.C. Zeringue (2009) "A study of heterologous synapses through microfluidic devices", 2009 Annual Biomedical Engineering Society Conference, Pittsburgh, Pa.

Krishnamurthy, K., A. Smith-Parker, S.D. Burton and H.C. Zeringue (2009) "*SCN1a* point mutations on neuron connectivity," 35th Annual Northeast Bioengineering Conference, Cambridge, MA

Vishwanathan, A., and H.C. Zeringue (2009) "Long-term maintenance of immortal cell-lines in a microfluidic platform," Microtechnologies in Medicine and Biology (IEEE-MMB) 2009 Annual Meeting, Quebec, Quebec

Stoner, R., C. Withers, A. Vishwanathan and H.C. Zeringue (2009) "In silico and in vitro characterization of recurrent activity in patterned neuronal networks," Microtechnologies in Medicine and Biology (IEEE-MMB) 2009 Annual Meeting, Quebec, Quebec

Withers, C., R. Stoner, A. Vishwanathan and H. Zeringue (2008) "In silico and in vitro characterization of recurrent activity in patterned neuronal networks," 2008 Biomedical Engineering Annual Meeting, St. Louis, MO

Vishwanathan, A., and H.C. Zeringue (2008) "Long-term maintenance of immortal cell-lines in a microfluidic platform," 2008 Biomedical Engineering Society Annual Meeting, St. Louis, MO

Stoner, R.M., A. Vishwanathan and H.C. Zeringue (2008) "In silico and in vitro characterization of recurrent activity in patterned neural networks," Neuroscience 2008 (Society for Neuroscience), Washington D.C.

Zeringue, H.C. and M. Constantine-Paton (2005) "RNAi suppression of PSD-95 in developing cortical visual neurons," Neuroscience 2005 (Society for Neuroscience), Washington D.C.

Zeringue, H.C., M.B. Wheeler and D.J. Beebe (2002) "Development of bovine in vitro produced embryos after cumulus cell removal with a microfluidic microchannel device," 2001 Annual Meeting of the International Embryo Transfer Society, Foz de Iguassu, Brazil, in *Theriogenology* **56**(1):

- Zeringue, H.C., I.K. Glasgow, S. Raty, K.R. King, M.B. Wheeler and D.J. Beebe (2000) "Embryo manipulation and zona pellucida removal in a polydimethylsiloxane microfluidic system," *World Congress on Med Phys and Biomed Engr*, Chicago, IL.
- Zeringue, H.C., M.B. Wheeler and D.J. Beebe (2000) "Removal of cumulus cells from mammalian oocytes in a microfluidic system," *Solid-State Sensor and Actuator Workshop*, Hilton Head, SC.
- Zeringue, H.C., K.R. King, I.K. Glasgow, S. Raty, M.B. Wheeler and D.J. Beebe (2000) "Zona pellucida removal of mammalian embryos in a microfluidic system," *micro Total Analysis Systems 2000*, Enschede, the Netherlands (accepted for poster presentation, acceptance rate of 60%).
- Davis, J.A., S. Raty, D.T. Eddington, I.K. Glasgow, H.C. Zeringue, M.B. Wheeler, and D.J. Beebe (2000) "Development of Microfluidic Channels for the Culture of Mammalian Embryos," *IEEE-EMBS Special Topics Conference on Microtechnologies in Medicine and Biology*, Lyon, France
- Balberg, M., M. Mau, D. Frigon, K. Hristova, H.C. Zeringue, D. Brady, D. Beebe and L. Raskin (2000) "Multi-color fluorescence detection of ribosomal RNA in micro-channels," *Proceedings of SPIE - The International Society for Optical Engineering*, **3912**: 35-40.
- Zeringue, H.C., I.K. Glasgow, J.T. Lyman, M.B. Wheeler and D.J. Beebe (1999) "Micro fluidic single embryo culture systems in PDMS," *21st Ann Int'l Conf of the IEEE Eng in Med and Bio Soc and the 1999 Ann Fall Meeting of the Biomed Eng Soc*, Atlanta, GA.
- Chan, N.G., J.T. Lyman, S.-J. Choi, H.C. Zeringue, I.K. Glasgow, D.J. Beebe and M. B. Wheeler (1999) "Development of an embryo transport and analysis system: material biocompatibility," *Therriogenology*, **51**(1): 234.
- Glasgow, I.K., H.C. Zeringue, D.J. Beebe, S.J. Choi, J.T. Lyman and M.B. Wheeler (1998) "Individual embryo transport on a chip for a total analysis system," *Third Conference on Micro Total Analysis Systems*, Banff, CA.
- Zeringue, H.C., I.K. Glasgow, S.-J. Choi, J.T. Lyman, M.B. Wheeler and D.J. Beebe (1998) "Impedance-based detection of individual embryos," *Biomedical Engineering Society Meeting*, Cleveland, OH.
- Choi, S.-J., I. Glasgow, H.C. Zeringue, D.J. Beebe and M.B. Wheeler (1998) "Development of microelectromechanical systems to analyze individual mammalian embryos: embryo biocompatibility," *Biol Reprod* (Suppl. 1).

INVITED LECTURE (OFF CAMPUS)

- April 2007 Bioengineering seminar, University of Illinois- Chicago, Chicago, IL
Topic: Microtechnologies in Neurobiology and Medicine
- June 2002 Bioengineering seminar, University of Utah, Salt Lake City, UT
Topic: Microfluidics in *In Vitro* Embryo Production

TEACHING EXPERIENCE

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| Linear Signals and Systems, Pitt-BioE
- theory-based with MatLab component | Junior level |
| Cellular and Molecular Biology I and II, Pitt-BioE
- one of four instructors, focus on neurobiology material | Sophomore level |
| Bioengineering Methods, Pitt-BioE
- "Molecular Cloning" module – 3 years
- "Microfabrication" module – 2 years | Junior level |
| Substitute lecturer for Bioinstrumentation at UW-Madison and UIUC
- composed and graded exam questions for material covered | Senior/Grad level |
| Teaching Assistant, University of Illinois at Urbana-Champaign | – 3 semesters |

Biomedical Instrumentation Lab (ECE 315) – Senior/Grad level
- interfacing transducers and electronics with the body to obtain medically relevant signals
- practical design and fabrication of representative biomedical circuitry

PROFESSIONAL ACTIVITIES

- Review Panels: NSF-Integrated, Hybrid and Complex Systems (6/06)
NSF- Chemical and Biological Separations (10/06, 6/07)
- Panel member: *MIT Seminar on Research Practices and Ethics*, January 2005
- Ad hoc reviewer *Analytical Chemistry*, 2004-2005
- Society for Neuroscience member (since 2005)
- International Embryo Transfer Society (2001-04)
- Institute of Electrical and Electronic Engineers (1998-04)

PATENT

US 6,695,765 *Microfluidic Channel Embryo and/or Oocyte Handling, Analysis and Biological Evaluation*

last updated May 8, 2009, Cambridge, MA