EMIL J. GEIGER, Ph.D., P.E. EXPERT NOT RETAINED

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CURRENT POSITIONS

Founder and Principal Engineer Geiger Engineering, PLLC 2018-present

- Served as forensic engineer and expert witness for personal injury legal cases.
- Provided engineering expertise in matters related to microfluidics, experiment design, and product development.

Adjunct Professor of Mechanical Engineering University of Nevada, Reno 2016-present

- Serve on graduate student committees as needed.
- Serve on cleanroom design committee for new engineering building.
- Volunteer position

EDUCATION

Ph.D. in Mechanical Engineering – September 2008
University of California, Berkeley
Major Subject: MEMS (with emphasis on polymers)
Inside Minor: Fluid Dynamics
Outside Minor: Chemical Engineering
Advisor: Professor Albert P. Pisano
Dissertation: "A highly-integrated, polymer-based microfluidic chip for disposable applications."

M.S. in Mechanical Engineering – December 2006
University of California, Berkeley
Advisor: Professor Albert P. Pisano
Thesis: "Packaging and assembling microfluidic devices via plastic injection molding."

B.S. in Mechanical Engineering with Honors – May 2003
Louisiana State University, Baton Rouge
Advisor: Professor Kevin W. Kelly
Thesis: "Modification of an injection molding machine to mold micro parts with a LIGA mold"

POSITIONS HELD

Senior Systems Engineer Nevada Nanotech Systems Inc. 2016-2019

- Developed and validated chemometric algorithms to create customer-facing answer from raw sensor signals. Wrote scripts to pull sensor data from log files, trained physics and statistical based models, prepared algorithms for deployment in sensor system firmware.
- Led MEMS fabrication team responsible for all design work including Finite Element Analysis, CAD, vendor management, and wafer probe testing. Used statistical analysis to identify common failure modes and improve wafer yield.
- Collaborated with marketing team to develop technical sales material and manage customer specific inquiries.
- Management responsibilities included conducting annual reviews and mentorship of early to mid-career engineers.

Assistant Professor of Mechanical Engineering University of Nevada, Reno 2010-2015

- Research – Built microfluidics fabrication laboratory from ground up. Focus on dielectrophoresis for cell sorting applications.
- Publications: 8 peer-reviewed journal paper published, 13 conference publications

- Funded Competitive Grants: 1 NSF unsolicited grant, 1 ORAU Junior Faculty Award, 3 Nevada NASA Space Grant, ($412,464 total including $54,997 in matching)
- Graduate Students: 1 PhD student, 4 MS students graduated.
- Teaching: Completely redeveloped the Capstone Design Course Sequence (Senior Project). I have instructed 421 capstone students in 89 teams. Developed a senior elective course, "Introduction to Microtechnology" and contributed to other department teaching needs.
- Service: Editorial Board Member of *Algal Research*, reviewer for a variety of journals, panelist for NSF, active member of the ASME IMECE conference community, organized college-wide Innovation Day.

Post-Doctoral Researcher Lawrence Livermore National Laboratory 2008-2010

- Responsible for designing, fabricating, and testing neural prosthesis components including microfabricated polymer-based electrode array and biocompatible packaging for electronics. Applications include the Artificial Retina project (Dept. of Energy) and general purpose nervous stimulation and recording (NIH).
- Wrote proposals for using polymer-based microsystems for emerging biomedical and energy applications.
- Mentored undergraduate summer interns by identifying projects, providing necessary training, and monitoring progress.

Graduate Student Researcher Mechanical Engineering, UC Berkeley 2003-2008

- In-house expert for projects using plastic injection molding. Key projects include: plastic microfluidic chip fabrication, plastic injection molding for microfluidic packaging, plastic microneedles, and plastic wafer manufacturing.
- Developed plastic microfluidic chips with integrated electrodes and thermally actuated hydrogel valves.
- Worked closely with advisor to write research proposals to DARPA and private industry.

Student Worker Chemical Engineering Machine Shop, LSU 2002-2003

- Designed and fabricated and high-pressure compression molding machine for rapidly molding cement parts in a CO_2 environment.
- Machined various projects on mill, lathe, and CNC machine.

Intern Engineer Advanced Ceramics Research, Tucson, AZ Summer 2002

- Researched and produced prototype gel cast ceramic MEMS, including high performance mechanical seals and turbine blades.
- Designed and fabricated molding fixtures for cast ceramic process and other molding processes.

Intern Engineer Intralox, Harahan, LA Summer 2001

- Intern Engineer with new product development group.
- Designed and built new testing equipment for conveyor belts.
- Performed strength, fatigue and wear tests on new conveyor belt designs.

Undergraduate Researcher Microsystems Engineering Team, LSU 1999-2002

- Designed and managed fabrication of injection molding die.
- Produced prototype plastic micro heat exchanger parts and microfluidic devices with hot embossing machine.
- Assisted graduate students with various design projects such as vacuum chambers, injection molding dies, and electroplating fixtures.
- Supervised other student workers.

INDEPENDENT CONSULTING

1. Technical/Professional Consultant, Xandex Inc., Petaluma, CA, 2018-present.
2. Expert Witness, Anderson, Boutwell, and Traylor, Hammond, LA, 2018.
3. Technical/Professional Consultant, Xandex Inc., Petaluma, CA, 2012 -2013.
4. Litigation Consultant, Anderson & Boutwell, Hammond, LA, 2011.

AWARDS AND HONORS

2014 College of Engineering Nominee for Outstanding Undergraduate Research Mentor Award (UNR)
2012 Oak Ridge Associated Universities: Ralph E. Powe Jr. Faculty Enhancement Award
2009 R&D 100 Editor's Choice Award: Artificial Retina Project (R&D Magazine)
2006 Industrial Advisory Board Best Presentation Award (Berkeley Sensor and Actuator Center)
2005-06 National Science Foundation GK-12 Fellowship
2003-07 National Science Foundation Graduate Research Fellowship
2003 Most Outstanding Senior in Mechanical Engineering (LSU)

PUBLICATIONS

Journal Publications

1. H. Hadady, D. Redelman, S. R. Hiibel, **E. J. Geiger**, "Continuous-flow sorting of microalgae cells based on lipid content by high frequency dielectrophoresis," *AIMS Biophysics* Vol. 3 Iss. 3, 2016, pp. 398-414.
2. H. Hadady, C. Montiel, D. Wetta, **E. J. Geiger**, "Liposomes as a model for the study of high frequency dielectrophoresis," *ELECTROPHORESIS* Vol. 36 Iss. 13, 2015, pp. 1423-1428.
3. N. S. Baker, W. J. MacCauley, Jr., E. J. Geiger, "Use of Writing Fellows to Support an Engineering Capstone Course," *International Journal of Engineering Education*, Vol. 31 Iss. 6B, 2015, pp. 1892-1901.
4. M. Higgins, **E. J. Geiger**, "Epifluorescent direct-write photolithography for microfluidic applications," *Journal of Micro/Nanolithography, MEMS, and MOEMS,* Vol. 14 Iss. 1, 2015, pp. 013504.
5. H. Hadady, J. J. Wong, S. R. Hiibel, D. Redelman, **E. J. Geiger**, "High frequency dielectrophoretic response of microalgae over time," *ELECTROPHORESIS*, Vol. 35 Iss. 24, 2014, pp. 3533–3540.
6. K. A. Michael, S. R. Hiibel, **E. J. Geiger**, "Dependence of the dielectrophoretic upper crossover frequency on the lipid content of microalgal cells," *Algal Research*, Vol. 6 Part A., 2014, pp. 17-21.
7. J. Malinowski, **E. J. Geiger**, "Development of a Wireless Sensor Network for Algae Cultivation using ISFET pH probes," *Algal Research*, Vol. 4 No.1, 2014, pp. 19-22.
8. P. Wiley, L. Harris, S. Reinsch, S. Tozzi, T. Embaye, K. Clark, B. McKuin, Z. Kolber, R. Adams, H. Kagowa, J. Richardson, J. Malinowski, C. Beal, M. Claxton, **E. Geiger**, E. Campbell, and J. Trent, "Microalgae Cultivation using Offshore Membrane Enclosures for Growing Algae (OMEGA)," *Journal of Sustainable Bioenergy Systems,* Vol. 3 No. 1, 2013, pp. 18-32.
9. **E. J. Geiger**, D. A. Mair, F. Svec, and A. P. Pisano. "Development of an Injection Molding Tool for Complex Microfluidic Geometries," *Microsystems Technologies*, vol. 17, 2011, pp. 1537-1540.
10. **E. J. Geiger**, A. P. Pisano, and F. Svec, "A Polymer-Based Microfluidic Platform Featuring On-Chip Actuated Hydrogel Valves for Disposable Applications," *Journal of MicroElectroMechanical Systems*, vol. 19, 2010, pp. 944-950.
11. J.M. Lippmann, **E.J. Geiger**, and A.P. Pisano, "Polymer investment molding: Method for fabricating hollow, microscale parts," *Sensors & Actuators: A. Physical*, vol. 134, 2007, pp. 2-10.
12. D. A. Mair, **E. J. Geiger**, A. P. Pisano, J. M.J. Fréchet, and F. Svec, "Injection molded microfluidic chips featuring integrated interconnects," *Lab on a Chip*, vol. 6, 2006, pp. 1346-1354.
13. R. A. Turner, Y. Desta, K. W. Kelly, J. Zhang, **E. J. Geiger**, S. Cortez, and D.C. Mancini, "Tapered LIGA HARMs," *Journal of Micromechanics and Microengineering*, vol. 13, 2003, pp. 367-372.

Conference Proceedings – Refereed Papers

1. H. Hadady, **E. J. Geiger**, "Conducting Engineering Research in a Senior Mechanical Engineering Course," *ASME International Mechanical Engineering Congress and Exposition*, 2015. (presentation)
2. H. Hadady, S. R. Hiibel, D. Redelman, **E. J. Geiger**, "Use of a Separability Parameter for the Design of a High Frequency Dielectrophoresis Cell Sorter Device," *ASME InterPACK/ICNMM,* 2015. (presentation and poster)

3. H. Hadady Gharehghieh, J. J. Wong, S. R. Hiibel, **E. J. Geiger**, "Effect of Media Conductivity on High Frequency Dielectrophoretic Response," *ASME International Mechanical Engineering Congress and Exposition*, 2014. (presentation)
4. H. Hadady Gharehghieh, K. A. Michael, **E. J. Geiger**, "Impedance Effects During High-Frequency Dielectrophoresis," *ASME International Mechanical Engineering Congress and Exposition*, 2014. (presentation)
5. J. J. Wong, **E. J. Geiger**, "Microfluidic Mems Device in the Cultivation of Microalgae with Positive Dielectrophoretic Cell Trapping for Media Exchange," *ASME International Mechanical Engineering Congress and Exposition*, 2014. (presentation)
6. **E. J. Geiger**, W. J Macauley, Jr, and N. S. Baker, "Use of Writing Fellows to Support an Engineering Capstone Course: Preliminary Results," *Capstone Design Conference,* 2014. (poster)
7. J. Malinowski, **E. J. Geiger**, "Wireless ISFET pH sensor network for offshore microalgae cultivation." *ASME International Mechanical Engineering Congress and Exposition*, 2012. (presentation and poster)
8. M. Higgins, **E. J. Geiger**, "Maskless photolithography using an epiflourescent microscope for microfluidic applications," *ASME International Mechanical Engineering Congress and Exposition*, 2011. (presentation and poster)
9. **E. J. Geiger**, D.A. Mair, A.P. Pisano, and F. Svec, "On-chip actuation of thermally sensitive hydrogel valve," *Micro Total Analysis Systems*, 2008. (poster)
10. D. A. Mair, **E. J. Geiger**, T. Schwei, T. Dinio, J. M. J. Fréchet, and F. Svec, "Use of photopaterned nanoporous polymer monoliths as passive mixers to enhance mixing efficiency for on-chip labeling reactions," *Micro Total Analysis Systems*, 2008. (poster)
11. **E. J. Geiger**, J. M. Lippmann, J. A. Frank, A. P. Pisano, "Single-step, integrated, assembly and encapsulation of microfluidic bubble generator," *ASME International Mechanical Engineering Congress and Exposition*, 2005. (poster)
12. J. M. Lippmann, **E. J. Geiger**, and A. P. Pisano, "Micro Investment Molding: Method for Creating Injection Molded Hollow Parts," *ASME International Mechanical Engineering Congress and Exposition*, 2005. (presentation)

Conference Proceedings – Abstract only

1. **E. J. Geiger**, "High Frequency Dielectrophoresis with Applications to Microalgae," *SciX*, 2014. (invited presentation)
2. H. Hadady Gharehghieh, J.J. Wong, S.R. Hiibel, D.R. Redelman, **E.J. Geiger**, "Time Course Monitoring of *Chlamydomonas reinhardtii* via Dielectrophoretic Upper Crossover Frequency," *4th International Conference on Algal Biomass, Biofuels and Bioproducts*, 2014. (presentation)
3. J.J. Wong, H. Hadady Gharehghieh, **E.J. Geiger**, "Towards Microfluidic Cultivation of Microalgae via Dielectrophoretic Cell Trapping," *4th International Conference on Algal Biomass, Biofuels and Bioproducts*, 2014. (presentation)
4. K. Kingery, M. Higgins, A. Sandoval, Jorge Nolasco, and **E. J. Geiger**, "Atmospheric Plasma for Polydimethylsiloxane, (PDMS) Bonding," *ASME International Mechanical Engineering Congress and Exposition*, 2013. (poster)
5. K. Eiriksson, **E. Geiger**, "Dielectrophoresis as a method for sorting cells based on intrinsic properties," *ASME International Mechanical Engineering Congress and Exposition*, 2012. (poster)
6. K. G. Shah, W. J. Bennett, T. L. DeLima, **E. Geiger**, M. Shusteff, P. J. Tabada, A. Tooker, S. S. Pannu, "Advanced Neural Interfaces, *Neural Interfaces Conference*, Long Beach, CA, 2010. (presentation)
7. S. S. Pannu, **E. J. Geiger**, M. Shusteff, T. L. Delima, W. J. Benett and P. J. Tabada, "Advanced neural interfaces," *Conference on Implantable Auditory Prostheses,* 2009. (poster)
8. D. A. Mair, **E. J. Geiger**, A. P. Pisano, F. Svec , J. M. J. Fréchet, "Injection molded microfluidic chips featuring integrated interconnects," *High Pressure Liquid Chromatography,* 2006. (poster)

GRANTS AND CONTRACTS

Principal Investigator

1. Nevada NASA Space Grant Consortium, "Flipping a Capstone Design Course," **E. J. Geiger**, $19,998 (including 1:1 match), 2014 - 2016.
2. NSF CBET - Chemical and Biological Separations, "Cell Sorting and Separation via High Frequency Dielectrophoresis," **E. J. Geiger**, $276,722, 2013 - 2016.
   - NSF REU Supplement, $12,000, 2015.
   - NSF REU Supplement, $11,500, 2014.
3. Nevada NASA Space Grant Consortium, "Combinatorial Growth Studies of Microalgae on a Microfluidic Platform," **E. J. Geiger**, $39,998 (including 1:1 match), 2012 - 2013.
4. Nevada NASA Epscor Travel Award, **E. J. Geiger**, $2,248, 2011-2013
5. Oak Ridge Associated Universities, "Separation of Microalgae on the Basis of Lipid Content via High Frequency Dielectrophoresis," **E. J. Geiger**, $10,000 (including 1:1 match), 2012 - 2013.
6. Nevada NASA Space Grant Consortium, "Microfluidic Based Diagnostics for Microalgae Technology", **E. J. Geiger**, $39,998 (including 1:1 match), 2011 - 2012.

Other

1. Senior Personnel on: NSF, "GK-12 Toward Energy-Aware STEM Leaders for the 21st Century," K. Leang (PI), K. Kim (Co-PI), E. Wang (Co-PI), J. LaCombe (Co-PI), Michael Robinson (Co-PI), $1,212,182, 2011.

ADVISING

Doctoral

Hanie Hadady, 2016

Master's

Nicholas Baker, 2016
Johnson Wong, 2014
Kelsey Eiriksson (now Kelsey Nelson), 2013
John Malinowski, 2012

Undergraduate

MacCallister Higgins, Alexandria Hill, Kyle Kingery, Caroline Montiel (McNair Scholar), Patrick Nipay (McNair Scholar), Graham Leese, Don Jordan, Jacob Hurd (REU summer student from Humboldt State University), Martin Cornejo Maldonado, Marcello Carvalho, Ean Edwards, Jamie Fry

INVITED PRESENTATIONS

1. SciX 2014: Bioanalytical Dielectrophoresis session, "High Frequency Dielectrophoresis with Applications to Microalgae," Reno, NV, September 29, 2014
2. Humboldt State University, "Application of Dielectrophoresis to Microalgae", Arcata, CA, April 3, 2014
3. University of Nevada, Reno, Department of Mechanical Engineering, Reno, NV, February 2, 2010
4. Lawrence Livermore National Lab, Lab Directed Research and Development Committee, "Single Cell Studies of Lipid Accumulation in Microalgae," Livermore, CA, July 8, 2009
5. Vanderbilt University, Department of Mechanical Engineering, Nashville, TN, April 22, 2009
6. Lawrence Livermore National Laboratory, Center for Meso, Micro, and Nano Technology, Livermore, CA, May 12, 2008
7. University of California, Berkeley Sensor and Actuator Center, "Micro Plastic Injection Molded Fluidic Chip with Thermally Actuated Hydrogel Valves," Berkeley, CA, March 13, 2008
8. FormFactor Inc., Livermore, CA, March 28, 2008
9. University of Texas at Arlington, Automation and Robotics Research Institute, Ft. Worth, TX, March 11, 2008
10. Therafuse Inc., Carlsbad, CA, February, 18, 2008

11. University of California, Berkeley Sensor and Actuator Center, "Packaging and Assembly of Microfluidic Devices via Plastic Injection Molding," Berkeley, CA, September 19, 2006

PANELS AND WORKSHOPS

1. Capstone Conference, "Communication in Capstone Design", Columbus, OH, June 3, 2014 (Panel Member)
2. Capstone Conference, "Flipping a Capstone Course – Dealing with Large Capstone Classes", Columbus, OH, June 3, 2014 (Informal Discussion Facilitator)
3. Capstone Conference, "Nifty Ideas and Surprising Flops – Class Website", Columbus, OH, June 4, 2014 (Panel Member)

INSTRUCTION AND COURSE DEVELOPMENT

Instructor Mechanical Engineering, UNR 2010-2015

- Intermediate Dynamics and Lab (ME 444/644/444L)
  - Lagrangian Dynamics for ME Seniors and MS students
  - Laboratory was revitalized with the introduction of MEMS-based accelerometers and gyros
  - Fall 2010 (26 students), Fall 2011 (31 students)
- Senior Capstone Sequence (ME 451/452)
  - Initiated and championed a curriculum change to offer the ME senior capstone courses a sequence whereby students could work on a single project for two semesters
  - ME 451 focuses on design methodology with an emphasis on written communication leading to the development of a proof-of-concept for each of the projects
  - ME 452 provides time for students to build working prototypes of their design using knowledge gained from the proof-of-concept build. Students learn about a wide variety of topics including: intellectual property, business topics, ethics, sustainability, supply chain management, and globalization.
  - Implemented Writing Fellow to support student written and oral reports.
  - OLD ME 452 Spring 2011 (35 students in 9 teams), NEW ME 451/2 AY 2012-13 (89 students in 18 teams), AY 2013-14 (69 students in 14 teams), AY 2014-15 (101 students in 21 teams), AY 2015-16 (127 students in 27 teams)
- Special Topics – Introduction to Microtechnology (ME 493)
  - Survey of microtechnology focusing on microfabrication technologies, material selection and properties, design considerations, and scaling of physical laws. Included a hands-on microfluidic laboratory.
  - Upper division and MS elective course based on my expertise
  - Spring 2012 (17 UG, 1 Grad), Spring 2015 (35 UG, 2 Grad)

Guest Lecturer Mechanical Engineering, UC Berkeley Fall 2009

- Invited to give two lectures for the graduate level ME polymers class (MEC223).
  - Lecture 1: Polymer fabrication processes.
  - Lecture 2: Polymer Microfluidics – a design case study

Graduate Student Instructor Mechanical Engineering, UC Berkeley Spring 2007

- Instructed injection molding laboratory for senior ME lab (ME107B).
- Developed 4-5 week curriculum designed to teach students basic theory about injection molding and design of experiments.
- Diagnosed and repaired existing infrastructure to improve laboratory experience.

NSF GK-12 Graduate Fellow College of Engineering, UC Berkeley 2005-2006

- Worked in a 9th grade geometry classroom developing hands-on engineering modules to supplement regular course work. These modules were designed to expose students to engineering and highlight the utility math education.
  - Module 1: Students built solar ovens as they learned about the geometry of mirrors and reflection.

- Module 2: Students learned about the geometry of engines by building a working stirling engine with a test tube, marbles, and a balloon.
- Tutored struggling students one-on-one and in small groups in geometry and algebra.
- Taught 5 week summer course on high school chemistry with emphasis on material science. Developed both curriculum and hands-on experiments. Organized student science fair for elementary students as a final team project.

OUTREACH ACTIVITIES

Guest Speaker UNR Upward Bound 2012-14

- Taught "What does an engineer do?" to local high school students as part of Career Day with hands-on activity.

Guest Lecturer UC Berkeley Outreach 2005, 2006, 2008

- Taught "Engineering 101" to local fifth grade students as part of the "I'm Going to College" outreach program at UC Berkeley.
  - 2005-06: How engines work with model demonstration.
  - 2008: Why boats float with hands-on activity.

Mentor for High School Laboratory Interns

Washoe County School District, Gifted and Talented Program
Doug Yan (2011), Anthony Sandoval (2013), Jorge Nolasco (2013), Martin Cornejo Maldonado (2014)
UNR Upward Bound
Jessica Estrada (2011), Diego Gonzales (2012), Salena Padilla (2012), Genmer Heponia (2013)

Laboratory Tours and Demonstrations

UNR Engineering Day (2011-2015)
UNR Engineering Summer Camp (2011-2015)
Jr. Science and Humanities Symposium (2014)

PROFESSIONAL SERVICE

Editorial

Algal Research - Editorial Board Member (2014-2015)

Membership

Licensed Professional Engineer in State of Nevada (Mechanical #22884)
American Society of Mechanical Engineers
American Society of Engineering Educators

Proposal Review Panels

NSF - 4 panels, 1 adhoc
Nevada Space Grant Consortium - 1 panel

Technical Review

Algal Research
American Society of Engineering Education
American Society of Mechanical Engineers
Biomass and Bioenergy
ELECTROPHORESIS
Experimental Thermal and Fluid Science
International Journal of Engineering Education
Journal of Micromechanics and Microengineering
Journal of Micro and Nano-Manufacturing
Measurement
Microsystem Technologies

Smart Materials and Structures

Technical Conference Organizer

ASME International Mechanical Engineering Conference and Expo

2015, Houston, TX – 2 topic organizer

2014, Montreal, QC, Canada – 1 topic organizer

2013, San Diego, CA – 1 session

2012, Houston, TX – 2 sessions

UNIVERSITY SERVICE

University

Capstone Core Curriculum – Member (2014-2015)

Undergraduate General Research Award – Reviewer (2012)

College of Engineering

Differential Fee Committee – Member (2011-2013)

Innovation Day – Co-organizer (2014-2015)

Department of Mechanical Engineering

Search Committee – Member (2015)

Differential Fee Committee – Chair (2011-2013), Member (2014-2015)

Instructor Search Committee – Chair (2011)

Curriculum Committee – Member (2011)

Graduate Committee – Member (2012)

Laboratory Committee – Member (2013-2015)

COMMUNITY SERVICE ACTIVITIES

1. Member of Board of Directors for Edgewater HOA, 2016-present.
2. Member of Board of Directors for Regeneration, a community non-profit, 2009.
3. Monthly speaking engagements with community youth group, 2000.

SKILLS

Computer Languages: Matlab, Git, Python, JMP scripting

Software: Solidworks, Autocad, Pro/Engineer, L-Edit, Mastercam, Comsol, Moldflow, Labview, Microsoft Office, Coreldraw, Latex.

Microfabrication: Lithography, furnaces, plasma etching, thermal evaporators, PVD sputterers, wafer bonder, injection molding, hot embossing.

Machine Shop: Mill, lathe, CNC equipment, sheet metal design and fabrication, printed circuit board design.