

**Leyla Esfandiari, Ph.D.**  
Associate Professor  
Biomedical Engineering  
University of Cincinnati  
**Email:** [Leyla.esfandiari@uc.edu](mailto:Leyla.esfandiari@uc.edu)  
**Website:** [esfandiari-lab.com](http://esfandiari-lab.com)

## Education

---

<b>Ph.D.</b> , Bioengineering <i>University of California Los Angeles, Los Angeles, CA</i>	<b>2014</b>
<b>M.Sc.</b> , Biomedical Engineering <i>University of California Irvine, Irvine, CA</i>	<b>2008</b>
<b>B.Sc.</b> , Electrical Engineering <i>California State University Long Beach, Long Beach, CA</i>	<b>2006</b>

## Professional Experience

---

<b>Associate Professor (Tenured)</b> <i>Biomedical Engineering Electrical and Computer Engineering Environmental and Public Health Sciences University of Cincinnati</i>	<b>2021- Pres</b>
<b>Faculty of Medical Science Training Program</b> <i>University of Cincinnati</i>	<b>2020-Pres</b>
<b>Faculty of Stem Cell and Organoid Medicine (CuSTOM)</b> <i>Cincinnati Children's Hospital Medical Center</i>	<b>2019-Pres</b>
<b>Assistant Professor</b> <i>Electrical Engineering and Computer Science Biomedical Engineering University of Cincinnati</i>	<b>2015- 2021</b>
<b>Research Scientist</b> <i>Biohybrid Microsystems Laboratory University of California Los Angeles</i>	<b>2009- 2014</b>
<b>Research Scientist</b> <i>California Nano-Systems Institute University of California Los Angeles</i>	<b>2010- 2011</b>
<b>Visiting Fellow</b> <i>Department of Orthopedic Surgery University of California Los Angeles</i>	<b>2009- 2010</b>

**Process Engineer** 2008- 2009  
*Applied Medical Co.*  
*Rancho Santa Margarita, CA*

**Research Associate** 2006- 2008  
*Micro-biomechanics Laboratory and neuro-pathology Laboratory*  
*University of California Irvine*

## **Honors and Awards**

---

- ♣ NIH Maximizing Investigator's Research Award (MIRA) 2023
- ♣ University of Cincinnati CEAS Distinguished Research Award 2023
- ♣ 1<sup>st</sup> Place Abstract Presentation in *IEEE Micro and Nanotechnology in Medicine* 2022
- ♣ National Science Foundation CAREER Award 2021
- ♣ University of Cincinnati CEAS Distinguished Research Award 2020
- ♣ University of Cincinnati CEAS Faculty Development Award 2019
- ♣ William E. Restemeyer Teaching Excellence Award 2017
- ♣ University of Cincinnati CEAS Faculty Development Award 2016
- ♣ 2<sup>nd</sup> Place in *IEEE Micro and Nanotechnology in Medicine Paper Competition* 2016
- ♣ UCLA Graduate Division Unrestricted Fellowship 2009- 2014
- ♣ National Science Foundation Fellowship on Cell Mechanics 2007
- ♣ UC Irvine Kleist Fellowship 2006- 2007
- ♣ Final Candidate of Rhodes Scholarship 2006
- ♣ Academic Achievement Award of Professors and Scholars of Persian Heritage 2006
- ♣ Boeing Scholarship 2004- 2006

## **Grant Support**

---

### **Active Grants**

- ♣ "Nanoelectronics to study exosome circuitry and their role in neuroregeneration" National Institute of Health (NIH), NIGMS, Maximizing Investigators' Research Award (MIRA) (R35), PI: Esfandiari. L; \$2,005,468 Aug 2023-Jul 2028 [Status: **Active**].

- ♣ “CAPSTONE: Central and Peripheral Stroke Inflammation with Exosomes”, National Institute of Health (NIH), NINDS (R01)/1R01NS128425-01, PI: Walsh, K, **Co-I: Esfandiari. L; \$3,819,665** Jul 2022-Jun 2027 [Status: **Active**].
- ♣ “Label-free electrokinetic micro-devices for rapid isolation and detection of circulating small extracellular vesicles”, National Science Foundation (NSF) CAREER Award 2021, ECCS-2046037, **PI: Esfandiari. L; \$500,000** Jan 2021-Dec 2026 [Status: **Active**].
- ♣ “Next Generation Smart Scaffolds for Regenerative Peripheral Nerve Therapeutics”, Department of Defense (DoD) Defense Medical Research and Development Program (DMRDP) DM 190692, PI: Harris. G, **Co-PI: Esfandiari. L**, Co-I: Cushion, M; **\$500,000** Mar 2021-Feb 2024 [Status: **Active**].
- ♣ “Development of a Multi-Cue Biomaterial for Traumatic Tissue Injury”, National Science Foundation (NSF) DMR-2104639, PI: Harris. G, **Co-PI: Esfandiari. L; \$450,000** Jul 2021-Jun 2024 [Status: **Active**].

### **Completed Grants**

- ♣ “Exonostics: path to commercialization”, State of Ohio Seed Funding for Startups, Chief Scientific Officer: **Esfandiari. L**, Chief Executive Officer: Oscar Mayer; **\$275,000** Feb 2021-Dec 2022 [Status: **Completed**].
- ♣ “EAGER: A Novel Lab-on-a-Chip Concept for Characterization of Nanovesicles based on their Dielectric Properties”, National Science Foundation (NSF) EAGER, ECCS-2020112, **PI: Esfandiari. L; \$99,452**, May 2020- Apr 2022 [Status: **Completed**].
- ♣ “Detection and characterization of cell type specific extracellular vesicle in obesity-driven hepatocellular carcinoma”, National Institute of Health (NIH), National Cancer Institute (NCI) (R21)/ PAR-16-277, PI: Nakamura. T, **Co-PI: Esfandiari. L; \$389,905**, Jul 2019-Jun 2021 [Status: **Completed**].
- ♣ “Phase I: Detection of environmental DNA (eDNA) to determine the Hellbender distribution”, Ohio Department of Transportation/2017-04, **PI: Esfandiari. L**, Co-PI: Wendell. D; **\$98,000**, Oct 2016-Apr 2017 [Status: **Completed**].
- ♣ “Phase II: Detection of environmental DNA (eDNA) to determine the Hellbender distribution”, Ohio Department of Transportation/2018-04, **PI: Esfandiari. L**, Co-PI: Wendell. D; **\$660,000**, Feb 2018- Feb 2021 [Status: **Completed**].
- ♣ “Non-invasive biosensing through skin: Integrated reverse iontophoresis extraction and electrochemical impedence spectroscopy detection”, Strategic Collaborative Research Grant, University of Cincinnati. **PI: Esfandiari. L**, Co-PI: Kasting. G; **\$125,000**, Aug 2015-Jun 2017 [Status: **Completed**].
- ♣ “RET Site: Engineering Design Challenges and Research Experiences for Secondary and Community College Teachers”, National Science Foundation/ Award Number: 1710826, PI: Kupferle. M, **Co-PI: Esfandiari. L; \$598,705**, for summer 2019, 2020 [Status: **Completed**].

### **Pending Grants**

- ♣ “Developing multi-cue piezoelectric PVDF-TrFE biomaterials for peripheral nerve repair” National Institute of Health (NIH) R01, PI: Harris. G, **Co-I: Esfandiari. L**, Co-I: Cushion. M; **\$3,005,802** Jan 2024-Dec 2029 [Status: **Pending**].

## Peer Reviewed Journal Publications

---

*Underlined names are Esfandiari students*

*\* represents the corresponding author*

<https://scholar.google.com/citations?user=CmOs-WIAAAAJ&hl=en>

[1] H. M. Polling, A. Singh, G.W. Fisher, K. Thorner, P.Chaturvedi, M.R. Batie, T. Hausfeld, N. Brown, **L. Esfandiari**, T. Takebe, M. A. Helmra<sup>th</sup>\*, M.M. Mahe\*, “*Engineering Transplantable Large-Scale Innervated Human Gastrointestinal Organoids*”; *Nature Medicine (Under Review)*

[2] H. M. Poling, N. Sundaram, G.W. Fisher, A. Singh, J. R Shiley, V. Govindarajah, A. R. Cortez, S. Ménoret, I. Anegon, M. Kasendra, **L. Esfandiari**, J. M. Wells, C. N. Mayhew, T. Takebe, M. M. Mahe, M. A. Helmra<sup>th</sup>\*, “*Human pluripotent stem cell derived organoids regenerate damaged bowel in vivo*”; *Cell Stem Cell (Under Review)*

[3] M. Sharma, M. Sheth, H.M. Poling, D. Kuhnell, S.M. Langevin, **L. Esfandiari\***, “*Multiparametric Analysis of Small Extracellular Vesicles Purified by a Rapid and Label-free Lab on a Chip Device*”; *Scientific Reports (Under Review)*

[4] Y. Izhiman, **L. Esfandiari\***, “*The emerging role of extracellular vesicles and exogeneous stimuli on molecular mechanisms of peripheral nerve regeneration*”; *Journal of Neuroscience Research (Under Review)*

[5] J. A. Westphal, A. E. Bryan, M. Krutko, **L. Esfandiari**, S. C. Schutte, G. M. Harris\*, “*Innervation of an Ultrasound-Mediated PVDF-TrFE Scaffold for Skin Tissue Engineering*”; *Biomaterials (Under Review)*

[6] A. E. Bryan, M.Krutko, J. Westphal, M. Sheth, **L. Esfandiari\***, G.M. Harris\*, “*Ultrasound Activated Piezoelectric PVDF-TrFE Scaffolds Improve Cell Proliferation for Tissue Engineering Applications*”; *Military Medicine (In Press)*

[7] J. Pounders, E.J. Hill, D. Hooper, X. Zhang, J. Biesiada, D. Kuhnell, H. L. Greenland, **L. Esfandiari**, E. Timmerman, F. Foster, C. Wang, K. Walsh, R. Shatz, D. Woo, M. Medvedovic, S. Langevin, R. Sawyer\*, “*MicroRNA Expression within Neuronal-derived Small Extracellular Vesicles in Frontotemporal Degeneration*”; *Medicine*<sup>®</sup>, 2022, DOI: 10.1097/MD.00000000000030854

[8] L. Shi, **L. Esfandiari\***, “*A label-free and low-power microelectronic impedance spectroscopy for characterization of exosomes*”, *PLoS ONE*, 2022, DOI:10.1371/journal.pone.0270844

[9] J. A. Orkwis, A. Wolf, Z. J. Mularczyk, A. Bryan, C.S. Smith, R. Brown, M. Krutko, A. McCann, R.M. Collar, G.M Harris\*, **L. Esfandiari\***, “*Mechanical stimulation of a bioactive, functionalized PVDF-TrFE Scaffold provides electrical signaling for nerve repair applications*” *Biomaterials Advances*, 2022, DOI: 10.1016/j.bioadv.2022.213081.

[10] M. Sheth, **L. Esfandiari\***, “*Bioelectric Dysregulation in Cancer Initiation, Promotion, and Progression*”, *Frontiers in Oncology*, 2022, DOI: 10.3389/fonc.2022.846917

- [11] Y. Zhang, K. Murakami, V.J. Borra, M.O. Ozen, U. Demirci, T. Nakamura, **L. Esfandiari\***, "A Label-Free Electrical Impedance Spectroscopy for Detection of Clusters of Extracellular Vesicles Based on Their Unique Dielectric Properties", *Biosensors*, 2022, DOI: 10.3390/bios12020104
- [12] L. Shi, **L. Esfandiari\***, "Emerging on-chip electrokinetic based technologies for purification of circulating cancer biomarkers towards liquid biopsy – A review". *Electrophoresis*, 2021, DOI: 10.1002/elps.202100234
- [13] L. Shi, **L. Esfandiari\***, "An electrokinetically-driven microchip for rapid entrapment and detection of nanovesicles", *Micromachines*, 2021, 12(1), 11.
- [14] J. Orkwis, A. Wolf, S. M. Shahid, G. Harris\*, **L. Esfandiari\***, "Development of a Piezoelectric PVDF-TrFE Fibrous Scaffold to Guide Cell Adhesion, Proliferation, and Alignment" *Macromolecular Bioscience*, 2020, <https://doi.org/10.1002/mabi.202000197>.
- [15] L. Shi, D. Kuhnell, V. J. Borra, S. M. Langevin, T. Nakamura, **L. Esfandiari\***, "Rapid and label-free isolation of small extracellular vesicles from biofluids utilizing a novel insulator based dielectrophoretic device" *Lab on a Chip*, 2019, 19(21), pp 3726-3734.
- [16] Y. Zhang, A. Kaynak, T. Huang, **L. Esfandiari\***, "A rapid bioanalytical tool for detection of sequence-specific Circular DNA and Mitochondrial DNA point mutations" *Analytical and Bioanalytical Chemistry*, 2019, 411(10), pp 1935-1941.
- [17] Y. Zhang, A. Rana, **L. Esfandiari\***, "Advancements in microfluidic technologies for isolation and early detection of circulating cancer-related biomarkers" *Analyst*, 2018, 143 (13), pp 2971-2991.
- [18] L. Shi, A. Rana, **L. Esfandiari\***, "A low voltage nanopipette dielectrophoretic device for rapid entrapment of nanoparticles and exosomes extracted from plasma of healthy donors" *Scientific Reports*, 2018, 8 (6751).
- [19] Y. Zhang, A. Rana, Y. Stratton, M. F. Czyzyk-Krzeska, **L. Esfandiari\***, "Sequence-specific detection of microRNAs related to Clear Cell Renal cell carcinoma at fM concentration by an electroosmotically driven nanopore-based device" *Analytical Chemistry*, 2017, 89 (17), pp 9201–9208.
- [20] S. Ventura\*, J. Heikenfeld, T. Brooks, **L. Esfandiari**, S. Boyce, Y. Park, G. B. Kasting, "Cortisol extraction through human skin by reverse iontophoresis" *Bioelectrochemistry*, 2017, (114) pp 54-60.
- [21] **L. Esfandiari**, S. Wang, S. Wang, A. Banda, G. Kocharyan, M. Lorenzini, H.G. Monbouquette\*, J.J. Schmidt\*, "PCR-independent detection of bacterial species-specific 16S rRNA at 10fM by a pore-blockage sensor" *Biosensors*, 2016, 6(37) pp 1-10.
- [22] **L. Esfandiari**, M. Lorenzini, G. Kocharyan, H.G. Monbouquette\*, J.J. Schmidt\*, "Sequence-specific DNA detection at 10fM by electromechanical signal transduction" *Journal of Analytical Chemistry*, 2014, 86 (19), pp 9638-9643.
- [23] **L. Esfandiari**, H. G. Monbouquette\*, J. J. Schmidt\*, "Sequence-specific nucleic acid detection from binary pore conductance measurement" *Journal of American Chemical Society (JACS)*, 2012, 134 (38), pp 15880–15886.

[24] **L. Esfandiari**, M. Paff, W. C. Tang\*, “Initial studies of mechanical compression on neurogenesis with neonatal neural stem cells” *Nanomedicine: Nanotechnology, Biology and Medicine*, 2012, 8( 4), pp 415–418.

### **Manuscript Journals Under Preparation**

---

[1] Krutko et al., “*Quantitative analysis of biohybrid piezoelectric platform for tissue regeneration*” Under preparation (75% completed)

[2] Poling et al., “*Integration of piezoelectric nanofibers with gastrointestinal organoids for control stimulation*” Under preparation (85% completed)

[3] Sheth et al., “*Electro-mechanical Feedback Loop in Cancer Microenvironment*” Under preparation (50% completed)

### **Invention Disclosures**

---

♠ **L. Esfandiari**, “Using electrokinetic forces to manipulate suspended particles”, US Patent No: 11,559,817.

♠ **L. Esfandiari**, “Method of Characterizing Exosomes” Patent Application Serial No. 62/838,015 US patent pending, filed on 04/24/2019.

♠ **L. Esfandiari**, “An electrokinetically-driven microchip for rapid extraction and detection of nanovesicles in situ” Patent Application provisional 2020-093, filed on 03/17/2020.

♠ **L. Esfandiari**, G. Harris, “Bioactive Smart Scaffold for Regenerative Medicine” Patent Application Serial No. 62/915035 US patent pending, filed on 10/15/2019.

### **Conference Proceedings**

---

[1] M. Sheth, M. Sharma, L. Shi, Y. Zhang, **L. Esfandiari\***, “A Label-free Microelectronic Device for Purification and Characterization of Extracellular vesicles” *IEEE EMBS Micro and Nanotechnology in Medicine*, Dec 5th-9th, 2022- Kapolei, HI.

[2] L. Shi, D. Mahee, **L. Esfandiari\***, “An electrical impedance microchip for characterization of extracellular vesicles” *Miniaturized systems for chemistry and life sciences (MicroTAS)*, Oct 22<sup>nd</sup>-26<sup>th</sup>, 2021-Palm Spring California.

[3] Y. Zhang, M. F. Czyzyk-Krzeska, **L. Esfandiari\***, “Nanopore-based sensor for sequence-specific microRNA detection” *Miniaturized systems for chemistry and life sciences (MicroTAS)*, Oct 22<sup>nd</sup>-26<sup>th</sup>, 2017-Savannah Georgia.

[4] M. Ghobadi, Y. Zhang, A. Rana, E.T. Esfahani, **L. Esfandiari\***, “Quantitative estimation of electro-osmosis force on charged particles inside a borosilicate nanopore-based sensor” *IEEE EMBS*, Aug 16<sup>th</sup>-20<sup>th</sup>, 2016-Orlando Florida.

[5] Y. Zhang, **L. Esfandiari\***, “Simultaneous detection of multiple charged particles using a borosilicate nanopore-based sensor”, *IEEE Nano*, Aug 22<sup>nd</sup>-25<sup>th</sup>, 2016-Sendai, Japan.

- [6] Y. Zhang, **L. Esfandiari\***, “Sequence-specific MicroRNA detection by induced electroosmosis flow inside a borosilicate pore”, *IEEE EMBS Micro and Nanotechnology in Medicine*, 2016-Waikoloa, HI.
- [7] A. M. Yorita, B. Koo, **L. Esfandiari**, J.J. Schmidt\*, H.G. Monbouquette\*, “Sequence-specific nucleic acid detection based on blockade of a nanopore in a thin glass membrane” *American Institute of Chemical Engineers (AIChE)*, Nov 8<sup>th</sup>-13<sup>th</sup>, 2015-Salt Lake City, UT.
- [8] **L. Esfandiari** , J.J. Schmidt\*, H. G. Monbouquette\*, “PCR-Independent, reagent-Free, binary-mode nucleic acid detection” 2012 *American Institute of Chemical Engineers (AIChE)*, Oct 28<sup>th</sup>-Nov 3<sup>rd</sup>, 2012-Pittsburgh, PA.
- [9] **L. Esfandiari**, W.C. Tang\*, “PDMS stretchable platforms for studies of mechanical compression on neurogenesis” *2010 IEEE International Conference of Nano/Molecular Medicine & Engineering*, Dec 5<sup>th</sup>-9<sup>th</sup>, 2010-Hong Kong, China.

## Abstracts

---

- [1] M. Sheth, M. Sharma, H.M. Poling, D. Kuhnell, S.M. Langevin, L. Esfandiari, “Multiparametric Analysis of Small Extracellular Vesicles Purified by a Rapid and Label-free Lab on a Chip Device”, *2023 Biomedical Engineering Society, Seattle, Washington*.
- [2] M. Sheth, M. Sharma, H.M. Poling, L. Esfandiari, “Multiparametric Analysis of Small Extracellular Vesicles Purified by a Rapid and Label-free Lab on a Chip Device”, *2023 Society for Laboratory Automation and Screening, San Diego, California*.
- [3] H. M. Polling, A. Singh, G.W. Fisher, K. Thorner, P.Chaturvedi, M.R. Batie, T. Hausfeld, N. Brown, L. Esfandiari, T. Takebe, M. A. Helmrath, M.M. Mahe, “Engineering Transplantable Large-Scale Innervated Human Gut for Transplantation”, *2023 Biomedical Engineering Society, Seattle Washington*.
- [4] A. Bryan, M. Krutko, C. Smith, L. David, L. Esfandiari, G. M. Harris, “Remote Stimulation of PVDF-TrFE Scaffold directs Fibroblast and Schwann Cell Phenotype”, *2023 Biomedical Engineering Society, Seattle Washington*.
- [5] J. A. Westphal, J. Klug, S. Davidson, L. Esfandiari, S. Shutte, G. M. Harris, “Ultrasound Stimulation Promotes Innervation of a PVDF-TrFE Scaffold for Skin Tissue Engineering”, *2023 Biomedical Engineering Society, Seattle Washington*.
- [6] M. Krutko, A. Bryan, M. Sheth, Y. Izhiman, H.M. Polling, G. Harris, L. Esfandiari, “Remote shockwaves to externally activate piezoelectric PVDF-TrFE nanofibers for peripheral nervous system regeneration” *2023, 67<sup>th</sup> Biophysical Society Meeting, San Diego California*.
- [7] M. Sheth, M. Krutko, M. Lehn, V. Takiar, T. Wise-Draper, L. Esfandiari, “Alternation of membrane potential of head and neck cancer cells using a piezoelectric nanofiber interface” *2023, 67<sup>th</sup> Biophysical Society Meeting, San Diego California*.
- [8] A. Bryan, J. Orkwis, A. Wolf, Z. Mularczyk, M. Krutko, L. Esfandiari, G. M. Harris, “Functionalization of PVDF-TrFE with decellularized ECM directs Schwann Cell Phenotype” *2022 Biomedical Engineering Society, San Antonio Texas*.

- [9] M. Sheth, M. Krutko, M. Lehn, A. Bryan, G. M. Harris, V. Takiar, T. Wise-Draper, L. Esfandiari, "Electrical stimulation of head and neck cancer cells using a piezoelectric nanofiber interface" *2022 Biomedical Engineering Society, San Antonio Texas.*
- [10] Z.J. Mularczyk, M. Krutko, A. Bryan, J. Orkwis, G.M. Harris, L. Esfandiari, "Development and Characterization of a piezoelectric nanofiber conduit for nerve regeneration" *2022 Biomedical Engineering Society, San Antonio Texas.*
- [11] J. A. Westphal, J. Klug, Z.J. Mularczyk, L. Esfandiari, S. Schutte, G. M. Harris, "Development of an innervated, PVDF-TrFE scaffold for skin tissue engineering" *2022 Biomedical Engineering Society, San Antonio Texas.*
- [12] J. Orkwis, A. Wolf, Z. Mularczyk, C. Smith, L. Esfandiari, G.M. Harris, "Functionalization of a bioactive, piezoelectric fibrous scaffold for nerve repair" *2021 Biomedical Engineering Society, Orlando Florida.*
- [13] Y. Zhang, L. Shi, L. Esfandiari, "Biophysical Characterization of Exosomes based on their unique Dielectric Properties" *2020 Biophysical Society, San Diego CA*
- [14] Y. Zhang, L. Shi, L. Esfandiari, "A rapid and label-free micro-electronic device for purification and characterization of extracellular vesicles from biofluids" *2020 Microfluidics for Hematology Workshop Chicago IL.*
- [15] J. A. Orkwis, A. Wolf, S. M. Shahid, L. Esfandiari, G.M. Harris, "Development of a bioactive, PVDF-TrFE fibrous scaffold for peripheral nerve regeneration" *2020 Biomedical Engineering Society Meeting, Virtual meeting.*
- [16] L. Shi, L. Esfandiari, "Rapid and label-free isolation of exosomes from biofluids utilizing a novel insulator based dielectrophoretic (iDEP) device" *2020 International Society of Extracellular Vesicles (ISEV) Philadelphia PA.*
- [17] Y. Zhang, L. Shi, L. Esfandiari, "Biophysical characterization of exosomes based on their unique dielectric properties" *2020 Biophysical Society 64th Annual Meeting, San Diego, CA.*
- [18] J. A. Orkwis, A. Wolf, A. Kabra, L. Esfandiari, G.M. Harris, "Development of a bioactive, piezoelectric biomaterial for use in nerve regeneration" *2019 Biomedical Engineering Society Meeting, Philadelphia, PA.*
- [19] Y. Zhang, L. Shi, L. Esfandiari, "Characterization of exosomes based on their unique dielectric properties by a novel electrical impedance measurement system" *2019 Biomedical Engineering Society Meeting, Philadelphia, PA.*
- [20] Y. Zhang, E.S.B. Salem, T. Nakamura, L. Esfandiari, "Characterization of exosomes based on their unique dielectric properties by a novel electrical impedance measurement system" *2019 International Society of Extracellular Vesicles (ISEV) Kyoto, Japan.*
- [21] Y. Zhang, A. Rana, M.F. Czyzyk-krzeska, L. Esfandiari, "Sequence-specific detection of microRNA at fM concentration with nanopore-based sensor", *2018 Biophysical Society 62nd Annual Meeting San Francisco, CA.*



[22] L. Shi, A. Rana, L. Esfandiari, “Particle entrapment by an integrative insulator based dielectrophoresis (iDEP) and nanopore device”, *2017 Biomedical Engineering Society Annual Meeting, Phoenix, AZ*.

[23] L. Shi, A. Rana, L. Esfandiari, “A new low-voltage insulator-based dielectrophoresis (iDEP) device for nanoparticles entrapment”, *2017 2nd Microfluidic Congress, Philadelphia, PA*.

[24] L. Shi, A. Rana, L. Esfandiari, “A dielectrophoretic nanopore device with spatiotemporal resolution for microvesicles entrapment and quantification near living cells”, *2017 International Society of Extracellular Vesicles, Toronto, Canada*.

[25] Y. Zhang, **L. Esfandiari\***, “Sequence-specific MicroRNA detection by induced electroosmosis flow inside a borosilicate pore”, *2016 Micro and Nano-technology in Medicine workshop, Boston, MA*.

### **Invited Talks/ Seminars**

---

- ♣ May 19<sup>th</sup>, 2023, **Panelist** “Single EV characterization (molecular and biophysical)” International Society of Extracellular Vesicles (ISEV 2023).
- ♣ March 25<sup>th</sup>, 2022, “Nano-biosensors for continuous monitoring of cellular activities in 3D Organoids” Frontiers in Stem Cell & Organoid Medicine Symposium.
- ♣ July 27<sup>th</sup>, 2021, “*Micropipette Dielectrophoretic Device for Rapid Purification of Circulating Small Extracellular Vesicles*” **Keynote Speaker**, Dielectrophoresis DEP Conference.
- ♣ May 3<sup>rd</sup>, 2021, “*Nanobiosensors and actuators for early cancer diagnosis and regenerative medicine*” Department of Biomedical Engineering, Pennsylvania State University.
- ♣ March 5<sup>th</sup>, 2021, “*Electrokinetically Driven Micro-devices for Early, Minimally-invasive Cancer Diagnosis*” Department of Biomedical Engineering, University of Southern California.
- ♣ March 3<sup>th</sup>, 2021, “*Nanoelectronics for precise sensing and actuating with application in early cancer diagnosis and regenerative medicine*” Department of Biomedical Engineering, University of Buffalo.
- ♣ November 4<sup>th</sup>, 2020, “*Electrokinetically driven micro-pores for minimally-invasive cancer diagnosis*”, Department of Bioengineering, Northeastern University, Virtual Presentation.
- ♣ September 23<sup>rd</sup>, 2020, “*Lab-on-a-Chip device for extraction of small extracellular vesicles from biofluids*”, Extracellular Vesicles Research Forum, Virtual Presentation.
- ♣ July 8<sup>th</sup>, 2020, “*On-chip electrokinetically driven devices for minimally-invasive cancer diagnosis*”, Microsystems and Nanoengineering Young Scientist Forum, Virtual Presentation.
- ♣ February 18<sup>th</sup>, 2020, “*On-chip electrokinetically driven devices for minimally-invasive cancer diagnosis*” Department of Electrical Engineering, UC San Diego, San Diego, CA, USA.
- ♣ February 17<sup>th</sup>, 2020, “*Biophysical Characterization of Exosomes Based on Their Unique Dielectric Properties*”, Biophysical Society Meeting, San Diego, CA, USA.

- ♣ July 9<sup>th</sup>, 2019, “*An Electrokinetically Driven Micro-Device for Rapid Purification and Characterization of Exosomes from Body fluids*”, Micro-and Nanotechnologies for Medicine Workshop: Emerging Frontiers and Applications, UCLA, Los Angeles, CA, USA.
- ♣ April 26<sup>th</sup>, 2019, “*Characterization of Exosomes based on their unique dielectric properties by a novel electrical impedance measurement system*”, International Society of Extracellular Vesicles, ISEV meeting, Kyoto, Japan.
- ♣ September 13<sup>th</sup>, 2018, “*An electrokinetic nanofluidic device for rapid and label-free isolation of exosomes from biofluids*”, 3<sup>rd</sup> Microfluidic Congress, San Francisco, California, USA.
- ♣ September 5<sup>th</sup>, 2018, “*3D smart scaffolds for stem-cell based regenerative medicine*”, Center for Stem Cell & Organoid Medicine (CuSTOM) Seminar, Cincinnati Children’s Hospital, Cincinnati, OH.
- ♣ May 4<sup>th</sup>, 2018, “*Rapid isolation of artificial liposomes and exosomes extracted from plasma of healthy donors utilizing a novel insulator-based dielectrophoretic device*”, International Society of Extracellular Vesicles, 2018 ISEV meeting, Barcelona, Spain.
- ♣ December 11<sup>th</sup>, 2017, “*Electrokinetic micro-devices for rapid, label-free, and highly sensitive detection of circulating cancer biomarkers*”, Auckland Bioengineering Institute, University of Auckland, Auckland, New Zealand.
- ♣ December 14<sup>th</sup>, 2017, “*Electrokinetic micro-devices for rapid, label-free, and highly sensitive detection of circulating cancer biomarkers*”, Victoria University of Wellington, Callaghan Institute, Wellington, New Zealand.
- ♣ September 18<sup>th</sup>, 2017, “*Electrokinetic nano/micro-devices for rapid, label-free, and highly sensitive detection of circulating cancer biomarkers*”, Department of Electrical Engineering, University of British Columbia (UBC), Vancouver, Canada.
- ♣ June 22<sup>nd</sup>, 2017, “*Nanopore-based diagnostics for high-throughput isolation and sensitive detection of cancer-related circulating biomarkers*”, Department of Micro and Nanotechnology, Technical University of Denmark (DTU), Copenhagen, Denmark.
- ♣ May 4<sup>th</sup>, 2017, “*Micro/nano-scaled electroanalytical tools with spatiotemporal resolution for entrapment and quantification of circulating biomarkers*”, New Technologies for Molecular Epidemiology Workshop, Department of Environmental Health, University of Cincinnati, Cincinnati, OH.
- ♣ February 7<sup>th</sup>, 2017, “*Nano-bioanalytical tools for isolation and detection of minimally invasive cancer biomarkers*”, Molgen Seminar Series, Department of Molecular Genetics, Biochemistry, and Microbiology, University of Cincinnati. Cincinnati, OH.
- ♣ January 5<sup>th</sup> 2017, “*Nanopore sensors: From cancer biomarkers screening to environmental DNA monitoring*”, 2<sup>nd</sup> Annual UC Sensor Community Retreat: Innovation, Technology and Workforce, Cincinnati, OH.
- ♣ November 11<sup>th</sup> 2016, “*Nanopore devices: From sequence-specific nucleic acid detection to subcellular structures entrapment*”, Department of Bioengineering, University of Illinois at Chicago, Chicago, IL.

- ♣ August 23<sup>rd</sup> 2016, “*Simultaneous detection of multiple charged particles using a borosilicate nanopore-based sensor*”, 16<sup>th</sup> International Conference on Nanotechnology (IEEE-Nano), Sendai, Japan.
- ♣ September 22<sup>nd</sup> 2014, “*Biomedical Micro-devices: effects of mechanical compression on neurogenesis; sequence-specific nucleic acids detection with high sensitivity, specificity and simplicity*”, European Molecular Biology Laboratory (EMBL), Heidelberg, Germany.
- ♣ September 18<sup>th</sup> 2014, “*Label-free, PCR independent and rapid nanopore-based biosensors toward point-of-care molecular diagnostics*”, School of engineering and applied science, University of Cincinnati, Cincinnati, OH.
- ♣ March 28<sup>th</sup> 2014, “*Nanopore based biosensors for rapid, point-of-care and PCR independent sequence-specific nucleic acid detection*”, Illumina Inc., San Diego, CA.
- ♣ March 25<sup>th</sup> 2014, “*PCR-free detection of sequence-specific nucleic acids using a nanopore based biosensor*”, Bioengineering and Soft Matter Seminar Series, Department of Bioengineering, UCLA, Los Angeles, CA.
- ♣ March 3<sup>rd</sup> 2014, “*Biomolecular lab-on-a-chip devices: High throughput, hand-held sensors for low-cost, point of care diagnostics*”, Department of Life Sciences, University of Warwick, Warwick, UK.
- ♣ Jan 30<sup>th</sup> 2014, “*Nanopore based biosensors, a novel approach for Nucleic Acid Detection*”, Department of Mechanical and Aerospace Engineering, University at Buffalo, State University of New York, New York, NY.

## Teaching Experience

---

### **University of Cincinnati (2015- 2023):**

Functional Tissue Engineering (BME 5130/6030), 3 credits, Lecture-based.

*Dual undergraduate and graduate elective course; this course describes the goals and rationale for tissue engineering. Principles of cells and cell-matrix interactions, cell-derived products (proteins) and cell regulation. Bioreactors and scaffolds are discussed in depth based on the targeted tissue.*

Engineering Electromagnetics (EECS 3080), 4 credits, Lecture-based.

*Undergraduate core course; Definition of field vectors. Coulomb's law: Fields and potentials; Magnetostatics: Biot-Savart law, Ampere's law. Electric and magnetic properties of materials. Dynamical fields: Faraday's and Lenz' laws, displacement current.*

Biomicrofluidic Systems (EECS 5178/6078C), 4 credits, Laboratory-based.

*Dual undergraduate and graduate elective course; Principles of microfluidic systems design and fabrication is described. The labs are focused on development of a passive microfluidic mixer and active microfluidic sorting systems.*

Biomedical Microsystems (EECS 5107/6007), 3 credits, Lecture-based.

*Dual undergraduate and graduate core course; Principles of biomedical microsystems including medical instrumentation, microsurgical tools, nucleic acid structure and analysis, cell structure and culture, biosensors, point-of-care systems, and microfluidic lab-on-a-chip.*

Biochips and Lab-on-a-chip (EECS 7026), 3 credits, Lecture-based.

*Advanced graduate course; Fundamentals of micro and nano fabrication of biochips and lab-on-a-chips, on-chip biochemical detection methods, micro/nano fluidics, basic components of lab-on-a-chips, integration of lab-on-a-chips, and micro total analysis systems ( $\mu$ TAS).*

Engineering Foundations (ENG 2010), 2 credits, Project-based.

*Undergraduate course; Introduction to engineering and engineering technology as disciplines and occupations. Through this course, students utilize their math, science, and technology skills to solve engineering problems.*

### **Teaching Associate, University of California Los Angeles (2011- 2014):**

Nanopore Sensing, BioE (C131/231), 3 credits, Lecture-based.

*Dual undergraduate and graduate course; Principles and physics of Nanopore sensing technique for the next generation DNA sequencing.*

Biophysics, Channels and Membranes, BioE (C106/206), 3 credits, Lecture-based.

*Dual undergraduate and graduate core course; Principles of cell membrane biophysics, Ion channels, and Action Potentials.*

Cell and Molecular Biology Laboratory, BioE (C167), 3 credits, Laboratory-based.

*Undergraduate core course; Principles of mammalian cell culturing, cell passaging, cell counting and microscopy.*

### **Teaching Assistant, University of California Irvine (2007- 2008):**

Design Biomaterials, (BME-111), 3 credits, Lecture-based.

*Undergraduate core course; design of new biocompatible materials and smart materials for tissue engineering and implantable devices.*

Cell and Molecular Biology, (BME-50A), 4 credits, Lecture-based.

*Undergraduate core course; Introduction to cell and molecular biology for engineers.*

Biomedical Signal and Systems, (BME-130), 3 credits, Lecture-based.

*Undergraduate core course; Introduction to signal and systems in biomedical applications.*

Computer Aided Design, (MAE-52), 3 credits, Laboratory-based.

*Undergraduate core course in Mechanical Engineering; Introduction CAD and SolidWorks.*

## **Professional Service**

---

### **University**

♣ Committee member: *University Research Safety Council*

**2022-23**

- ♣ Search Committee member: *Faculty hiring in Biomedical Engineering* **2022**
- ♣ Biomedical Electronics & Computing minor Advisor **2022-23**
- ♣ Biomedical Engineering Graduate Students Committee member **2022-23**
- ♣ Search Committee member: *Faculty hiring in Biomedical Engineering* **2020**
- ♣ College of Engineering and Applied Science: *Academic Standards Committee* **2020-21**
- ♣ College of Engineering and Applied Science: *Faculty Development Committee* **2017- 18**
- ♣ Member of: *Engineering Research Center (ERC) Clean Room Facility* **2017- 23**
- ♣ Search Committee member: *Faculty Hiring in Bioelectronics, Electronic Circuits, Application System Integrated Circuits* **2017**
- ♣ Search Committee member: *Ohio Eminent Scholar in NanoBio-Devices* **2016**

**Academic Community**

- ♣ Editorial Board Member: *Scientific Reports* **2023**
- ♣ Guest Editor of Clinical Potential of Extracellular Vesicles: *Scientific Reports* **2023**
- ♣ National Science Foundation Panelist: *Engineering of Biomedical Systems* **2022**
- ♣ Organizer Committee member: *International Society for Stem Cell Research* **2021**
- ♣ Editorial Board: *Micromachines Journal* **2020**
- ♣ Reviewer: *IEEE International Conference on Bioinformatics and Bioengineering* **2020**
- ♣ Biosensors Session Chair: *64<sup>th</sup> Biophysical Annual Meeting* **2020**
- ♣ Faculty Mentor for NSF RET Research Experience for High School Teachers **2019- 20**
- ♣ National Science Foundation Panelist: *Electronics, Photonics and Magnetic Devices* **2018**
- ♣ National Institute of Health Panelist: *Cancer Biomarkers Study Section* **2017**
- ♣ Session Chair: *2nd Microfluidic Congress, Philadelphia, USA* **2017**
- ♣ National Science Foundation Panelist: *Nano-Biosensing* **2017**
- ♣ Symposium Chair: *9th Frontier in Biomedical Devices conference* **2016**
- ♣ Session Chair: *47th American Chemical Society Regional Meeting CERM* **2016**
- ♣ Organizer Committee member: *International Conference IEEE Nanotechnology* **2016**

- ♣ Reviewer: *Sensors, Analytical and Bioanalytical Chemistry, Nanoscale, Electrophoresis, Biomaterial Science, Chemical Engineering Science, ACS Nano* 2016- 23

## **Professional Affiliations**

---

- ♣ Faculty of Medical Scientist Training Program, UC College of Medicine
- ♣ Member of *Center for Stem Cell and Organoid Medicine (CuSTOM)* Cincinnati Children's Hospital
- ♣ Associate Member of *Cincinnati Cancer Center (CCC)*
- ♣ Active Member of *UC Undergraduate Women in Science and Engineering (WISE)*
- ♣ Member of *IEEE-Engineering in Medicine and Biology Society (IEEE-EMBS)*
- ♣ Member of *American Chemical Society (ACS)*
- ♣ Member of *Biomedical Engineering Society (BMES)*
- ♣ Member of *Biophysical Society*
- ♣ Member of *International Society of Extracellular Vesicles (ISEV)*
- ♣ Member of *IEEE Women in Science and Engineering*

## **Academic Advising and Mentoring**

---

### **Current Postdoctoral and Graduate Students**

- ♣ Manju Sharma, Postdoctoral Scholar since 2021
- ♣ Maksym Krutko, Ph.D. Candidate in Biomedical Engineering. Expected Graduation: 2024
- ♣ Maulee Sheth, Ph.D. Candidate in Biomedical Engineering. Expected Graduation: 2025
- ♣ Holly Poling, Ph.D. Student in Biomedical Engineering. Expected Graduation: 2026
- ♣ Yara Izhiman, Ph.D. Student in Biomedical Engineering, Expected Graduation: 2026
- ♣ Gregory Macke, M.Sc. Student in Biomedical Engineering, Expected Graduation: 2025

### **Former Graduate Students**

- ♣ Leilei Shi, Ph.D. in Electrical Engineering 2021. Current Position: *Assistant Professor (Tenure Track) College of Charleston.*
- ♣ Yuqian Zhang, Ph.D. in Electrical Engineering 2020. Current Position: *Research Fellow at Mayo Clinic.*

- ♣ Ankit Rana, M.Sc. in Electrical Engineering 2019. Current Position: *Associate Scientist II, Illumina Inc.*
- ♣ Ann Wolf, M.Sc. in Electrical Engineering 2022. Current Position: *Engineer at Genetesis Inc.*
- ♣ Zachary Mularczyk, M.Sc. in Biomedical Engineering 2022. Current Position: *Doctoral Student with US Department of Defense (DOD), U.S. Navy Naval Medical Research Unit-Dayton.*
- ♣ Juntao Dong, M.Sc. in Electrical Engineering, Current position: *Data Scientist at Foxconn Industrial Internet.*
- ♣ Ahmet Kaynak, M.Sc. in Biomedical Engineering, Current position: *Ph.D. Candidate in Medicine at UC.*

### **Former Undergraduate and High School Students**

- ♣ Ming Zeng, research assistant in EECS Co-Op program, July 2020- Dec 2020.
- ♣ August Kohls, research assistant in EECS Senior Design, Aug 2019- Aug 2020.
- ♣ Seyed Minhaj Shahid, research assistant in EECS Co-Op program, May 2019- Aug 2020.
- ♣ Nikki Ferneding, research assistant in EECS Co-Op program, Aug 2018- Jun 2019.
- ♣ Lindsey Lanzillotta, research assistant in BME, Senior Design, Aug 2018- Jun 2019.
- ♣ Avani Kabra, research assistant, Medical Student, Aug 2018- May 2020.
- ♣ Jacob Long, research assistant in EECS, Senior Design, Aug 2019- May 2020.
- ♣ Yuchen Zhang, research assistant in EECS, Senior Design, Aug 2019- May 2020.
- ♣ Lujing Xiong, research assistant in EECS, Senior Design, Aug 2019- May 2020.
- ♣ Sudarshan Pillai, research assistant in EECS Co-Op program, May 2016- Dec 2017.
- ♣ Kathryn Suttling, research assistant in BME, Sep- Dec 2015.
- ♣ Alexia Gaines, research assistant from WISE program, May- Aug 2015.
- ♣ Tiffany Brooks, research assistant from WISE program, May 2015- July 2016.
- ♣ Hai Nguyen, research assistant in EECS Co-Op program, May- Dec 2015.
- ♣ Benjamin Warstler, high school student from Indian Hills High School, Jun- Aug 2016.

### **Graduate Students Thesis Committee Member**

---

- ♣ Andrew Bryan (PhD in Chemical Engineering), Thesis Advisor: Prof. Greg Harris
- ♣ Jennifer Westphal (PhD in BME), Thesis Advisor: Prof. Greg Harris

- ♣ Adam Mchenry (PhD student in BME), Thesis Advisor: Prof. Jason Heikenfeld
- ♣ Zach Watkins (MD/PhD student), Thesis Advisor: Prof. Jason Heikenfeld
- ♣ Lauren Delong (PhD student in Chemistry), Thesis Adviser: Prof. Ashley Ross
- ♣ Jacob Orkwis (PhD in Chemical Engineering), Thesis Advisor: Prof. Greg Harris
- ♣ Jun Sunghyun (PhD student in BME), Thesis Advisor: Prof. Jason Shearn
- ♣ Yuchan Yuan (PhD in EECS), Thesis Advisor: Prof. Jason Heikenfeld
- ♣ Vinitha Thiyagarajan Upaassana (PhD in EECS), Thesis Advisor: Prof. Chong Ahn
- ♣ Eric Frantz (PhD in EECS), Thesis Advisor: Prof. Andrew Steckl
- ♣ Shima Dalirirad (PhD in EECS), Thesis Advisor: Prof. Andrew Steckl
- ♣ Vishak Venkatraman (PhD in EECS), Thesis Advisor: Prof. Andrew Steckl
- ♣ Zhizhen Wu (PhD in EECS), Thesis Advisor: Prof. Chong Ahn
- ♣ Sthitodhi Ghosh (PhD in EECS), Thesis Advisor: Prof. Chong Ahn
- ♣ Hua Gao (MSc in EECS), Thesis Advisor: Prof. Ian Papautsky
- ♣ Adam Hauke (PhD in EECS), Thesis Advisor: Prof. Jason Heikenfeld
- ♣ Alva Webster (MSc in EECS), Thesis Advisor: Prof. Jason Heikenfeld
- ♣ Kiana Pickle (PhD student in Chemistry), Thesis Advisor: Prof. Ryan White
- ♣ Amy Drexelius (PhD in BME), Thesis Advisor: Prof. Jason Heikenfeld
- ♣ Desai Darshini (PhD student in Cardiology), Thesis Advisor: Prof. Sadayappan