

Karina Torres-Castro

Project Engineer at Theiss Research/Guest Researcher at NIST

Profile

I am a Project Engineer from Theiss Research working as an international guest researcher associate at the Biophysical and Biomedical Measurements Group at the National Institute of Standards and Technology (NIST). I obtained my Ph.D. at the Charles L. Brown Department of Electrical and Computer Engineering at the University of Virginia, doing research at the intersection of electronics and biological systems. My research encompassed microfabrication, biological sample manipulation, computational fluid dynamics, microfluidics, and electrokinetics. Currently, I work developing microfluidic platforms and microsystems to measure and study different biological entities and condensed matter properties using acoustics and other electrical means. My main goal is integrating technologies with sensing and actuation capabilities for studying biological entities and bio-fluids.

Education

Ph.D. in Electrical and Computer Engineering (Bio-microsystems), University of Virginia,

August 2016 — March 2022

(GPA: 3.844/4)

MS. in Electronics (MEMS), Tecnológico de Costa Rica,

January 2013 — July 2016

summa cum laude

Licenciate (BS+Thesis) in Chemical Engineering, Universidad de Costa Rica,

March 2002 — December 2008

Publications

Dielectrophoretic enrichment of live chemo-resistant circulating-like pancreatic cancer cell from media of drug-treated adherent cultures of solid tumors

Aditya Rane, Javad Jarmoshti, Abdullah Bin-Siddique, Sara Adair, **Karina Torres-Castro**, Carlos Honrado, Todd W. Bauer, Nathan S. Swami. *Lab on a Chip*, 2024, 24 (3), 561-571.

Microfluidic Blood Separation: Key Technologies and Critical Figures of Merit

Karina Torres-Castro, Katherine Acuna-Umana, Leonardo Lesser-Rojas, Darwin R. Reyes. *Micromachines*, 2023,14(11). 2117.

Multichannel Impedance Cytometry Downstream of Cell Separation by Deterministic Lateral Displacement to Quantify Macrophage Enrichment in Heterogeneous Samples

Details

Gaithersburg, MD. 20899,
United States, 4348060604
karina.torrescastro@nist.gov
v

Links

[Google Scholar](#)
[Personal webpage](#)
[LinkedIn](#)
[X](#)

Skills

Ability to Work
Independently

Critical thinking and
problem solving

Computational Fluid
Dynamics

Experimentalist

Languages

English

Spanish

Karina Torres-Castro, Javad Jarmoshti, Li Xiao, Aditya Rane, Armita Salahi, Li Jin, Xudong Li, Federica Caselli & Carlos Honrado, Nathan S. Swami.
Advanced Materials Technologies, 2023, 8, 2201463 (**Selected for inside back cover**)

Biophysical quantification of reorganization dynamics of human pancreatic islets during co-culture with adipose-derived stem cells

Karina Torres-Castro, Mohammad S. Azimi, Walter B Vahue, Carlos Honrado, Shayn M. Peirce & Nathan S. Swami.

Analyst, 2022, 147, 2731-2738

On-chip microfluidic buffer swap of biological samples in-line with downstream dielectrophoresis

XuHai Huang*, **Karina Torres-Castro***, Walter Varhue, Aditya Rane, Ahmed Rasin & Nathan S. Swami. ***Equal Contributors**

Electrophoresis 2022; 43: 1275– 1282. (**Selected for Best Student Paper award of June 2021**)

Thermal Analysis of Microfluidic cooling Processing-in-3D-Stacked Memory

Jun-Han Han, **Karina Torres-Castro**, Robert E. West, Nathan S. Swami & Mircea Stan.

22nd International Conference on Thermal, Mechanical and Multiphysics Simulation and Experiments in Microelectronics and Microsystems (EuroSimE) Proceedings

Power and Thermal Modeling of In-3D-Memory Computing

Jun-Han Han, Robert E. West, **Karina Torres-Castro**, Nathan S. Swami, Samira Khan & Mircea Stan.

2021 International Symposium on Devices, Circuits and Systems (ISDCS) Proceedings

Self-aligned sequential lateral field non-uniformities over channel depth for high throughput dielectrophoretic cell deflection.

XuHai Huang, **Karina Torres-Castro**, Walter Varhue, Armita Salahi, Ahmed Rasin, Carlos Honrado, Audrey Brown, Jennifer Guler, Nathan S. Swami.

Lab on a Chip, 2021, 21, 835-843. (**Selected for Inside Front Cover and Lab on a Chip HOT Articles 2021**)

Microfluidic Cooling for 3D-IC with 3D Printing Package

Jun-Han Han, **Karina Torres-Castro**, Robert W. West, Walter Varhue, Nathan Swami & Mircea Stan.

IEEE SOI-3D-Subthreshold Microelectronics Technology Unified Conference (S3S) Proceedings.

High-throughput dynamic analysis of dielectrophoretic frequency dispersion of single-cells based on deflected flow streamlines.,

Karina Torres-Castro, Carlos Honrado, Walter B.Varhue, Vahid Farmehini, Nathan S. Swami.

Analytical and Bioanalytical Chemistry (2020) 412:3847–3857 (*Selected in Forefront Cover*)

Combined electrokinetic manipulations of pathogenic bacterial samples in low-cost fabricated dielectrophoretic devices.,

Alejandro Martínez-Brenes, Karina Torres-Castro, Richard Marín-Benavides, Katherine Acuña-Umaña, Christopher Espinoza-Araya, et al.

AIP Advances 9, 115303 (2019)

▣ Conferences/Workshops

Invited speaker at the 1st Advanced Materials Workshop-

From Bioinspiration to Technological Innovation, Costa Rica-Taiwan-ONRG/AFOSR: Microfluidic and Biophysical measurements for Lab/Organ-on-a-Chip Applications.

December 2023

Oral Presentation at Early Career session at SciX 2023 meeting: On-chip multichannel impedance cytometry for phenotypic monitoring of microfluidic separations.

October 2023

AES Electrophoresis Society annual meeting at SciX

Oral Presentation: Leveraging multiple surface acoustic waves (SAW) interrogation points for precise flow measurements.

June 2023

Gordon Research Seminar (GRS): Leveraging Microscale Fluidic Phenomena for Novel Analyte Measurements (Physics and Chemistry of Microfluidics Seminar)

Poster: Leveraging multiple surface acoustic waves (SAW) interrogation points for precise flow measurements

June 2023

Gordon Research Conference (GRC): Microscale Systems: From Physical Phenomena to Biological Applications (Physics and Chemistry of Microfluidics)

Poster: Sidewall electrodes in a microchannel for high-throughput dielectrophoretic separations, virtual

July 2021

Dielectrophoresis Conference (DEP 2021)

Poster: Biomechanical markers for monitoring heterogeneity in islet reorganization dynamics with Adipose Stem Cells,

October 2022

Miniaturized Systems for Chemistry and Life Sciences (μ TAS) Conference

Poster: Microfluidic Dielectrophoretic Cytometry for Single-Cell Analysis to Quantify Phenotypic Heterogeneity,

October 2018

AES Electrophoresis Society annual meeting at SciX

Oral presentation: Sensing human performance factors on-chip,

September 2017

Air Force Office of Scientific Research (AFOSR) Mid-Atlantic student research meeting

Poster: Low-cost fabrication of dielectrophoretic devices for electrokinetic characterization of tropical infectious bacterial samples,

July 2016

Dielectrophoresis Conference (DEP 2016)

Awards/Memberships

- **Best Student Paper Award, ELECTROPHORESIS Journal -Wiley VCH-**
- **Sture G. Olsson Fellowship in Engineering, UVA's School of Medicine**
- **iRedefine grant award for professional development workshop, National Science Foundation (NSF)**
- **Outstanding Graduate Teaching Award, UVA's School of Engineering and Applied Science**

Member of American Association of Advancement of Science (AAAS) and Society of Women Engineers (SWE)

Patent

On-chip Microfluidic Buffer Swap of Biological Samples In-line with Downstream Dielectrophoresis and Related Method thereof

February 2022

Nathan Swami, Xuhai Huang, Karina Torres Castro, and Walter Varhue

U.S. Provisional Patent Application Serial No. 63/308,717

Extra-curricular activities

President at University of Virginia's Electrical and Computer Eng. (ECE) Graduate Student Council, Charlottesville

2020 — 2021

Organizing ECE graduate student events, acting as a proxy for students and faculty. Promoting discussions on students' concerns and ideas.

Vice President at ECE Graduate Council

2019 — 2020

Co-Chaired the Fundamentals of Electrokinetics session at 2019 AES Electrophoresis Society meeting.

October 2019

Employment History

Project Engineer at Theiss Research

April 2023 — Present

International Guest Researcher at National Institute of Standards and Technology (NIST),

April 2022 — Present

Solar energy consultant at IguanaSolar (Start-up)

March 2013 — June 2016

Founded a start-up company for the commercialization of solar energy and worked on the first national policy for distributed generation in Costa Rica with the Costa Rican Association of Solar Energy.

R&D Engineer at CELEQ (Universidad de Costa Rica)

March 2011 — February 2015

Applied research on dye-sensitized solar cells, worked with a US Department of Energy (ECPA) grant for developing a sustainable energy model for Central American coffee milling sector and wrote a technical manual of renewable energy for agricultural industry (ISBN: 978-9968-919-14-2)

Process Engineer at Firestone Industrial Products

June 2009 — February 2011

In charge of continuous improvement of vulcanization processes, raw materials, and technical support of the manufacturing plant. Lean six-sigma methods (Green Belt). Startup and stabilization of plant rubber calender.

RF and Materials Research Intern at Ad Astra Rocket Company

January 2009 — May 2009

Designed and performed statistical experiments to test ceramics for rapid cooling and electrical isolation from a rocket propulsion plasma reactor. Designed and fabricated an impedance matchbox for dielectrics prototype.