Nicole Sarna

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EDUCATION

PhD in Biomedical Engineering — Aug. 2021-Present
Vanderbilt University — *Nashville, TN*
Cumulative GPA: 4.0/4.0

BS in Biomedical Engineering, *Magna Cum Laude* — Aug. 2017-May 2021
University of Florida — *Gainesville, FL*
Cumulative GPA: 3.58/4.0 | Major GPA: 3.92/4.0

RESEARCH EXPERIENCE

Graduate Research Fellow — Aug. 2021-Present
Vanderbilt University — *Nashville, TN*
Advisor: Michael R. King, PhD, Department of Biomedical Engineering

- Evaluating the long-term behavior of T cells following exposure to fluid shear stress
- Engineering third-generation chimeric antigen receptor (CAR) T cells targeting prostate specific membrane antigen (PSMA)
- Enhancing *ex vivo* activation of CAR T cells to improve persistence and cytotoxicity at solid tumor sites following Adoptive Cell Transfer (ACT)

Undergraduate Student Researcher — Jul. 2019-Aug. 2021
University of Florida — *Gainesville, FL*
Advisor: Carlos M. Rinaldi-Ramos, PhD, Department of Chemical and Biomedical Engineering

- Characterized super-paramagnetic iron oxide nanoparticles (SPIONs) for *in vivo* imaging applications in the context of cancer immunotherapy
- Evaluated the sensitivity and resolution of in-house synthesized SPIONs using the MOMENTUM™ Magnetic Particle Imaging (MPI) system
- Performed *in vivo* experiments to monitor and track the biodistribution of T cells following Adoptive Cell Transfer (ACT) in breast cancer and glioblastoma murine models
- Developed MATLAB programs to analyze MPI and fluorescence microscopy data sets

Research & Development Intern — Sept. 2020-Mar. 2021
Lucere Laboratories — *Gainesville, FL*
Supervisor: Atticus Steinmetz, CEO

- Optimized the synthesis of D-Luciferin, a bioluminescent compound, to ensure clean, efficient, and more affordable production
- Conducted market research to validate and prioritize new product offerings
- Identified and communicated internationally with D-Luciferin users to form research collaborations

Undergraduate Student Researcher — Jan. 2020-May 2020
University of Florida — *Gainesville, FL*
Advisor: Todd E. Golde, MD, PhD, Department of Neuroscience

- Developed MATLAB program to analyze fluorescent images of 3D ex vivo brain slice cultures that exhibit aggregation of tau protein, a primary marker of Alzheimer's and other neurodegenerative diseases

Undergraduate Student Researcher — Sept. 2017-Dec. 2018
University of Florida — *Gainesville, FL*
Advisor: Norman Fitz-Coy, PhD, Department of Neuroscience

- Collaborative research project, DebriSat, between NASA, The Aerospace Corporation, and the US Air Force Space and Missile Systems Center
- Collected data to update NASA's Standard Breakup Model using Orbital Debris Modeling
- Analyzed and characterized space debris fragments generated by hypervelocity collision on a model satellite

HONORS/AWARDS

- 1st Place in Graduate Student Poster Competition – NIH/NCI Tissue Engineering Collaborative (TEC) Meeting — July 2022
- National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP) — Apr. 2022-Present
- Outstanding Undergraduate Research Award — Apr. 2021
- Bright Futures Florida Academic Scholarship — Aug. 2017-May 2021
- Valedictorian at Winter Park High School — 2017

PATENTS

- PCT International Patent Application (PCT/US2022/073015):
  "*Fluid Shear Stress for Ex Vivo Activation of Immune Effector Cells"*. Filed: June 17th, 2022.
  Inventors: King, MR, Hope, JM, Dombroski, JA, **Sarna, NS**.

PUBLICATIONS

- **Sarna, NS***, Marrero-Morales, L*, DeGroff, R*, Rivera-Rodriguez, A, Lui, S, Chiu-Lam, A, Good, H, Rinaldi-Ramos, CM. "**An anatomically correct 3D printed mouse phantom for magnetic particle imaging studies**" *Bioengineering & Translational Medicine*, 2022; https://doi.org/10.1002/btm2.10299
- Dombroski, JA*, Hope, JM*, **Sarna, NS**, King, MR. "**Channeling the Force: Piezo1 mechanotransduction in cancer metastasis**" *Cells*, 2021; 10(11):2815. https://doi.org/10.3390/cells10112815
- Rivera-Rodriguez, A, Hoang-Minh, L, Chiu-Lam, A, **Sarna, NS**, Marrero-Morales, L, Mitchell, D, Rinaldi-Ramos, CM. "**Tracking Adoptive T Cell Immunotherapy Using Magnetic Particle Imaging**" *Nanotheranostics*, 2021; 5(4):431-444. https://doi.org/10.7150/ntno.55165
- Lui, S*, Rivera-Rodriguez, A*, Chiu-Lam, A*, DeGroff, R, Savliwala, S, **Sarna, NS**, Rinaldi-Ramos, CM. "**Long Circulating Tracer Tailored for Magnetic Particle Imaging**" *Nanotheranostics*, 2021; 5(3):348-361. https://doi.org/10.7150/ntno.58548

CONFERENCES & PRESENTATIONS

NIH National Cancer Institute (NCI) Cancer Tissue Engineering Collaborative (TEC) Annual Meeting July 2022
Madison, WI

- Presented poster titled, "Enhanced T Cell Activation via Fluid Shear Stress" and awarded 1st place in the Graduate Student Poster Competition

University of Florida Undergraduate Research Symposium Mar. 2021
Gainesville, FL

- Orally defended undergraduate thesis project titled, "Advancing the Principles of Replacement, Reduction, and Refinement by Evaluating an Anatomically Correct Mouse Phantom for a Brain Tumor Model in Magnetic Particle Imaging"

American Institute of Chemical Engineers (AIChE) Nov. 2019

- Presented poster titled, "Evaluating the Sensitivity of the Momentum™ Magnetic Particle Imaging System for Ferucarbotran Iron Oxide Nanoparticles" in the Undergraduate Student Poster Competition

IEEE Engineering in Medicine and Biology Conference (EMBC) Aug. 2016

- Participated in a healthcare design challenge to improve sleep apnea machine

TEACHING EXPERIENCE

Graduate Student Research Mentor Jan. 2022-Present
Vanderbilt University *Nashville, TN*

- Mentor and train freshman undergraduate student on research techniques in Dr. Michael King's lab
- Conceptualize undergraduate student research project which aims to circumvent chemotherapy resistant glioblastoma cancer cells through combined treatment regimens
- Design, plan, and oversee experiments performed by undergraduate student

SyBBURE Searle Undergraduate Research Program Jan. 2022-Present
Vanderbilt University *Nashville, TN*

- SyBBURE Searle Graduate Fellow
  - Lead weekly subgroup meetings with undergraduate students to provide guidance and direction in their research topics
  - Advise and mentor a group of undergraduate students through a semester long, team-based STEM project
  - Organize and teach personal and professional skill workshops for undergraduate students, including Computer Aided Design (CAD), computer programming, circuit board design, CV/resume building, and time and stress management

Biomedical Engineering Lab (BME2900/3900/4901) Teaching Assistant Jan. 2022-May 2022
Vanderbilt University *Nashville, TN*

- Aided sophomore (3 sections), junior (1 section), and senior (1 section) undergraduate BME students with experimental design, data collection in lab, and scientific writing
- Provided detailed feedback, edits, and grades to student drafts and final lab reports

Introduction to Engineering (ES1041) Teaching Assistant Aug. 2021-Dec. 2021
Vanderbilt University *Nashville, TN*

- Assisted freshman undergraduate students with their coursework and final projects that involve BME wearable device design conceptualization and prototyping
- Planned and led lectures on microcontroller programming and Computer Aided Design (CAD) for project prototyping

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UNIVERSITY INVOLVEMENT

BME Graduate Student Association (GSA) Aug. 2021-Present
Vanderbilt University *Nashville, TN*
- Co-chair, Elementary Education Outreach (Aug. 2021-Dec. 2021)
- Chair, Elementary Education Outreach (Jan. 2022-Present)

Biomedical Engineering Society Aug. 2017-May 2021
University of Florida *Gainesville, FL*
- Member

Society of Women in Engineering (SWE) Aug. 2017-May 2021
University of Florida *Gainesville, FL*
- Member

Philharmonic Orchestra Aug. 2017-Dec. 2017
University of Florida *Gainesville, FL*
- Violinist

SKILLS

- **Research Techniques:** Cell culture, animal handling/experiments, flow cytometry, light/fluorescence microscopy, histological staining, rotary microtome, western blot, IVIS SpectrumCT, Magnetic Particle Imaging, Dynamic Light Scattering (DLS), Dynamic Magnetic Susceptibility (DMS)
- **Data Analysis:** ImageJ, GraphPad Prism, JMP, FlowJo, Excel
- **Programming:** MATLAB, HTML, CSS, Git, Python
- **Computer Aided Design:** Solidworks, OnShape, Autodesk Inventor, Autodesk Fusion