

Nicholas Dorn

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Professional Summary

First year Chemical Engineering PhD candidate at Stanford University. Undergraduate research at UC San Diego focused on characterizing the immunomodulatory effects of small molecules both *in vivo* and *in vitro* as well as developing small molecule drug delivery systems. I am enthusiastic about biochemical engineering, fluid mechanics, machine learning and cell engineering.

Education

Ph.D., Chemical Engineering, Stanford University

September 2022-Present

In Progress

Relevant Coursework: Applied Mathematics in the Chemical and Biological Sciences, Machine Learning for Computational Engineering, Computational Biology: Structure and Organization of Biomolecules and Cells.

B.S., Chemical Engineering, UC San Diego

June 2022

Minor in Mathematics

GPA: 3.82

Relevant Coursework: Principles of Biomaterials Design, Nanoengineering in medicine, Chemical Engineering Thermodynamics, Biochemical Structure and Function, Introductory Fluid Mechanics, Chemical Reaction Engineering with MATLAB, Heat Transfer, Mass Transfer

High School Diploma, Saint Ignatius College Preparatory

June 2018

AP Scholar with Distinction

SAT: 1490/1600

Research

Rotation Student, Shaqfeh Lab

January 2023 - Present

Stanford University

Towards a Swimming Rheometer: Parameter Sweep for Viscoelastic Swimmers

- Utilized HPC clusters to simulate spinning swimming geometries in viscoelastic fluid according to the Oldroyd-B model for polymeric fluids.
- Observed the effect of polymer relaxation time and relative viscosity on propulsion of swimmer due to polymer hoop stresses.
- Developed theory for a second order perturbation in Deborah number for a rotating sphere in Oldroyd-B fluid.

Rotation Student, DeSimone Lab

September 2022 – December 2022

Stanford University

Coating Optimization of 3D-Printed Lattice Micro-Array Patches

- Designed and printed coating masks to facilitate optimal filling of microscale (~1 um height) lattice needle structures with aqueous solution.
- Optimized dip-coating mask parameters to further optimize filling of microneedles.
- Utilized Fusion 360 to design and fabricate a micro-channel system to fill lattice microneedles through the base of the patch.

Undergraduate Researcher, Shah Lab

September 2019-June 2022

for Nanoscale Materials and Cell Engineering

UC San Diego

Short chain fatty acid-mediated epigenetic modulation of T cell function

- Characterized SCFA-mediated epigenetic modification of T cells through *in vitro* cell culture
- Analyzed gene and protein expression by flow cytometry, ELISA and cytokine multiplex assays
- Characterized *in vivo* effects of SCFAs through clinical scoring, joint measurement and flow cytometric analysis of arthritic mice treated with SCFAs
- Optimized synthesis and quantified degradation of a fluorescently-labeled, alginate-based SCFA delivery depot *in vitro*.
- Conducted *in vivo* studies in mice to assess the ability of SCFAs to ameliorate mannan-induced arthritis
- Synthesized POPC liposomes to facilitate sustained release of SCFAs

Agent-based, cytokine-driven Python model of rheumatoid arthritis

- Modeled T cell phenotypes and synovial fibroblast cells as classes, each with different methods modeling cytokine sensing, secretion, proliferation, and cell-cell interaction.
- Computational model initiated in response to the COVID-19 lockdown halting wet lab work.

Publications

David A. McBride*, **Nicholas C. Dorn***, Mina Yao, Wade T. Johnson, Wei Wang, Nunzio Bottini & Nisarg J. Shah. "Short-chain fatty acid-mediated epigenetic modulation of inflammatory T cells *in vitro*." *Drug Delivery and Translational Research*, December 24, 2022. doi/10.1007/s13346-022-01284-6

*Authors contributed equally to the study

Wade T. Johnson, **Nicholas C. Dorn**, Dora A. Ogbonna, Nunzio Bottini, Nisarg J. Shah. "Lipid-based regulators of immunity." *Bioengineering & Translational Medicine*, December 31, 2021. doi/10.1002/btm2.10288

David A. McBride, Matthew D. Kerr, **Nicholas C. Dorn**, Dora A. Ogbonna, Evan C. Santos and Nisarg J. Shah. "Triggers, Timescales, and Treatments for Cytokine-Mediated Tissue Damage." *European Medical Journal Innovations*, December 9, 2020. DOI/10.33590/emjinnov/20-00203.

David A. McBride, Matthew D. Kerr, Wade T. Johnson, Anders Nguyen, Martina Zoccheddu, Mina Yao, Edward B. Prideaux, **Nicholas C. Dorn**, Wei Wang, Mattias N.D. Svensson, Nunzio Bottini & Nisarg J. Shah. "Immunomodulatory microparticles epigenetically modulate T cells and systemically ameliorate autoimmune arthritis " *Advanced Science*, March 8, 2023.
doi/10.1002/adv.202202720

Presentations

Nicholas C. Dorn. "Epigenetic Modulation of T-cells in Inflammatory Disease." Oral Presentation at the UCSD Summer Research Conference. Virtual. August 12, 2021.

Nicholas C. Dorn, David A. McBride, Andrew J. Portell, Nisarg J. Shah. "Epigenetic Modulation of Inflammatory T cells in Autoimmune Disease." Oral presentation at the American Institute of Chemical Engineers Annual Meeting 2020. Virtual. November 16, 2020.

Nicholas C. Dorn, David A. McBride, Andrew J. Portell, Nisarg J. Shah. "Epigenetic Modulation of Inflammatory T cells in Autoimmune Disease." Poster presentation at the Biomedical Engineering Society Annual Meeting 2020. Virtual. October 17, 2020.

Nicholas C. Dorn. "Engineering Anti-inflammatory Biomaterials for Gut Autoimmune Disorders." Oral Presentation at the UCSD Online Undergraduate Research Symposium 2020. Virtual. May 28, 2020.

Leadership Experience

President, UCSD Sailing Team

April 2020 - Present

- Collaborates with school officials, yacht club administration and a leadership team of 10 to manage practice, competition, financial and social logistics. Oversees maintenance for a fleet of 8 competition-ready sailboats
- Organizes and runs biweekly executive and full team meetings as well as off-campus team practices.
- Organizes competition logistics and strategies for a team of 40, across 10 annual competitions.
- Worked with school and county administration to develop a plan to safely facilitate 3-4 trainings per week for up to 16 sailors each during the COVID-19 pandemic

Program Manager, AIChE Projects at UCSD

May 2019 - Present

- Oversaw the general operations of 6 student-led engineering project teams of 10 students each, managing affairs and deadlines for each team
- Works within a leadership team of 7 to organize and run 8 program-wide events per year for a minimum of 30 and a maximum of over 100 students
- Facilitates the organization of 2 fundraisers annually

Project Manager, Fuel Cell Design Team

April 2020 – Sept 2021

- Led a team of 7 undergraduates to research, develop and implement forward-thinking fuel cell solutions

- Researches the application of metal hydrides as an alternative hydrogen storage solution.
- Responded to adversity of the COVID-19 pandemic by setting up and executing a team-wide course in Fusion 360

Honors and Awards

National Science Foundation Graduate Research Fellowship Sept 2022 - Present

- Awarded to support PhD studies in Chemical Engineering at Stanford University based on a strong undergraduate research record.
- \$34,000 per year for 3 years

Summer URS Ledell Family Scholarship for Science and Engineering Jun 2021 - Aug 2021

- Awarded for summer research under Dr. Nisarg Shah at UCSD.
- \$5,000 scholarship

Tau Beta Pi, UCSD Jan 2020 - Present

- Premier national engineering honor society

Triton Research and Experiential Learning Scholar, UCSD AEP Sept 2019 - Mar 2020

- Scholarship awarded for research work under Dr. Nisarg Shah
- Awarded for Fall 2019 and Winter 2020

Academic Excellence Award, UCSD Recreation May 2019, May 2020

- Two-time recipient (2019 and 2020)
- 1 of 9 students selected among athletes from 31 club sports teams for academic success

Skills

Software

- Python
- MATLAB
- Fusion 360
- C++
- Tecplot

Research

- Cell Culture
- Flow Cytometry
- ELISA
- Data Analysis and Presentation
- Research animal (mouse) handling and analysis

Soft Skills

- Team management
- Public Speaking
- Event Organization
- Fundraising