Derek Nichols

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EDUCATION

Georgia Institute of Technology, Atlanta, GA 2024
Ph.D. Mechanical Engineering

- Thesis: Characterization and Control of Inlet Nacelle Flow in the Presence of Crosswind and Ground Effects
- Graduate Research Advisor: Professor Ari Glezer
- Minor Concentration: Teaching in Higher Education

Georgia Institute of Technology, Atlanta, GA 2021
M.S. Mechanical Engineering

- Minor Concentration: Environmental Fluid Mechanics

University of Pittsburgh, Pittsburgh, PA 2017
B.S. Mechanical Engineering, Summa Cum Laude

- Minor Degrees: Bioengineering; Mathematics

RESEARCH EXPERIENCE

Fluid Mechanics Research Laboratory, Professor Ari Glezer 2017 – Present
Georgia Institute of Technology, Atlanta, GA

- Funded by The Boeing Company, Georgia Tech, and the NSF GRFP
- Design and conduct wind tunnel experiments to study commercial aircraft nacelle performance in crosswinds close to the ground
- Characterize the flow into and around the nacelle using pressure, temperature, and velocity measurements and surface oil flow visualization
- Develop flow control techniques to negate the effects of inlet separation during takeoff and landing
- Reduce inlet flow distortion by up to 60% in 30 knot crosswind using optimized flow control
- Investigate the effect of the presence of a ground surface and the possible formation of a ground vortex
- Reconstruct ground vortex 3D flow field using slices of stereo PIV
- Delay vortex formation by over 3x that of the uncontrolled thrust value

Computational Biofluid Mechanics Laboratory, Dr. Riccardo Gottardi 2014 – 2018
University of Pittsburgh, Pittsburgh, PA

- Developed microfluidic bioreactor prototypes used to test drugs for osteoarthritis
- Simulated fluid flow and 3D printed models tested in a laboratory to compare results
- Optimized model to maximize drug exposure to the test cells achieving 2.4x delivery versus original design

JOURNAL PUBLICATIONS

Nichols, D.A., Vukasinovic, B., and Glezer, A., "Control of a Nacelle Inlet Ground Vortex in Crossflow," *AIAA Journal*, 2025.

Nichols, D.A., Vukasinovic, B., Glezer, A., and Rafferty, B., "Aerodynamic Control of an Inlet Flow in Crosswind using Peripheral Bleed Actuation," *Journal of Propulsion and Power*, Vol. 40, No. 1, 2024.

Nichols, D.A., Sondh, I., Little, S., Zunino, P., and Gottardi R., "Design and Validation of an Osteochondral Bioreactor for the Screening of Treatments for Osteoarthritis," *Biomedical Microdevices*, Vol. 20, No. 18, 2018.

PATENTS

"Adaptable Flow Control for Engine Nacelles," Rafferty, B., DeFore, M., Glezer, A., Vukasinovic, B., **Nichols, D.A.**, *US Patent 11,542,866*, January 3, 2023.

CONFERENCE PAPERS

Nichols, D.A., Vukasinovic, B., and Glezer, A., "Control of a Nacelle Inlet Ground Vortex," AIAA Paper 2024-2138, January 2024.

Nichols, D.A., Vukasinovic, B., and Glezer, A., "The Formation, Evolution, and Sustainment of Inlet Ground Vortices," AIAA Paper 2023-3891, June 2023.

Nichols, D.A., Vukasinovic, B., and Glezer, A., "Scaling Characteristics of Ground Vortices in a Nacelle Inlet Flow Field," AIAA Paper 2023-1981, January 2023.

Nichols, D.A., Vukasinovic, B., Glezer, A., and Rafferty, B., "Formation of a Nacelle Inlet Ground Vortex in Crosswind," AIAA Paper 2022-1698, January 2022.

Nichols, D.A., Vukasinovic, B., Glezer, A., DeFore, M., and Rafferty, B., "Steady and Unsteady Control of Nacelle Inlet Flow in Crosswind," AIAA Paper 2021-1556, January 2021.

Nichols, D.A., Vukasinovic, B., Glezer, A., DeFore, M., and Rafferty, B., "Fluidic Control of Nacelle Inlet Flow in Crosswind," AIAA Paper 2020-2955, June 2020.

Nichols, D.A., Vukasinovic, B., Glezer, A., DeFore, M., Rafferty, B., and Palacios, F., "Characterization and Control of a Nacelle Inlet Flow in Crosswind" AIAA Paper 2019-3685, June 2019.

CONFERENCE PRESENTATIONS

Nichols, D.A., Vukasinovic, B., and Glezer, A., "Regulated Formation of a Ground Vortex in Suction Flow Over a Surface," *77th Annual Meeting of the APS Division of Fluid Dynamics*, November 25, 2024.

Toth, B., Vukasinovic, B., **Nichols, D.A.**, Glezer, A., DeFore, M.C., and Harris, C.A., "Evolution of Streamwise Vortices Formed by an Inclined, Yawed Round Surface Jet within a Turbulent Boundary Layer," *77th Annual Meeting of the APS Division of Fluid Dynamics*, November 24, 2024.

Yraguen, B.F., Arkhurst, B.K., Montgomery, S., **Nichols, D.A.**, and Molnar, J., "Promotion of Student Well-being via Successful Navigation Through Conflict Resolution Pathways," *CoNECD 2024*, February 27, 2024.

Nichols, D.A., Vukasinovic, B., and Glezer, A., "Formation of Ground Vortices in the Cross Flow over an Axisymmetric Inlet Above a Plane," *76th Annual Meeting of the APS Division of Fluid Dynamics*, November 19, 2023.

Nichols, D.A., Vukasinovic, B., and Glezer, A., "Formation and Stability of a Ground Vortex in the Cross Flow over an Axisymmetric Inlet," *75th Annual Meeting of the APS Division of Fluid Dynamics*, November 21, 2022.

Nichols, D.A., Vukasinovic, B., and Glezer, A., "Vortex Dynamics in Axisymmetric Inlet Over a Plane in a Cross Flow," *74th Annual Meeting of the APS Division of Fluid Dynamics*, November 21, 2021.

Nichols, D.A., Vukasinovic, B., Glezer, A., DeFore, M., and Rafferty, B., "Adaptable Fluidic Control of Round Inlet Flow in Cross Flow," *73rd Annual Meeting of the APS Division of Fluid Dynamics*, November 22, 2020.

Nichols, D.A., Vukasinovic, B., Glezer, A., DeFore, M., and Rafferty, B., "Fluidic Control of Round Inlet Flow in a Crosswind," *72nd Annual Meeting of the APS Division of Fluid Dynamics*, November 25, 2019.

Gottardi, R., Riccardis, G., Avolio, M., **Nichols, D.A.**, et al., "A 3D Printed Microfluidic Bioreactor to Engineer Biphasic Construct," *2018 AlChE*, November 1, 2018.

Gottardi, R., Riccardis, G., Avolio, M., **Nichols, D.A.**, et al., "A 3D Printed Microfluidic Bioreactor to Engineering Biphasic Musculoskeletal Construct," *Tissue Engineering and Regenerative Medicine International Society – World Annual Meeting*, September 6, 2018.

POSTERS

Donnaloja, F., Riccardis, G., **Nichols, D.A.**, et al., "Biphasic Bioreactor for Osteochondral Drug Screening and Toxicity Assessments," *6th TERMIS World Congress*, November 15, 2021.

Donnaloja, F., Riccardis, G., **Nichols, D.A.**, et al., "Osteochondral Bioreactor for Drug Screening and Toxicity Assessments," *26th Congress of the European Society of Biomechanics*, July 13, 2021.

Gottardi, R., Riccardis, G., Avolio, M., **Nichols, D.A.**, et al., "A 3D Printed Microfluidic Bioreactor to Engineering Biphasic Musculoskeletal Construct," *Biomedical Engineering Society Annual Meeting*, Atlanta, GA, October 18, 2018.

Gottardi, R., Riccardis, G., **Nichols, D.A.**, et al., "A 3D Printed Microfluidic Bioreactor to Engineering Biphasic Musculoskeletal Construct," *Orthopedic Research Society Annual Meeting*, New Orleans, LA, March 2018.

Nichols, D.A., Sondh, I., Zunino, P., and Gottardi, R., "Optimizing an Osteochondral Bioreactor for the Screening of Treatments for Osteoarthritis," *Science 2016*, Pittsburgh, PA, October 2016.

Sondh, I., **Nichols, D.A.**, Bayer, E., Gottardi, R., and Little, S.R., "Development of a Bioreactor Aimed at Designing Spatial and Temporal Drug Delivery Profiles for Bone Regeneration Protocols," *Biomedical Engineering Society Annual Meeting*, Minneapolis, MN, October 2016.

TEACHING EXPERIENCE

Thermodynamics Instructor of Record Spring 2023
Georgia Institute of Technology, Atlanta, GA

- Developed and delivered all course material with ASME Graduate Teaching Fellowship
- Heavy emphasis on in class demonstrations to make abstract concepts more tangible
- Class size of 52 students
- Average CIOS score of 4.7/5 measuring overall teaching effectiveness

Fluid Mechanics Teaching Associate Fall 2019-2021, 2023
Georgia Institute of Technology, Atlanta, GA

- Average CIOS score of 4.9/5 measuring overall teaching effectiveness

Georgia Tech's Tech to Teaching Certificate Fall 2020
Georgia Institute of Technology, Atlanta, GA

- Completed three graduate-level courses to prepare future faculty in teaching pedagogy and course design

CIRTL Certificate Spring 2020
Georgia Institute of Technology, Atlanta, GA

- Center for the Integration of Research, Teaching, and Learning associate level certificate

MEMS Senior Design Undergraduate Teaching Assistant Spring 2017
University of Pittsburgh, Pittsburgh, PA

MEMS Fundamentals of Engineering Projects Undergraduate Teaching Assistant Spring 2017
University of Pittsburgh, Pittsburgh, PA

SKILLS

Programming Languages

- Advanced: Matlab, HTML, CSS
- Proficient: Python, LaTeX
- Beginner: C/C++, Assembly, UNIX, Mathematica

Software

- ANSYS, AutoDesk, EES, Excel, Git, LabVIEW, LaVision DaVis, Power Automate, Siemens NX, SolidWorks, Tecplot

Laboratory

- Particle image velocimetry (stereo and planar), experimental flow visualization, experimental design, thermal and fluid sensors, laser and camera optics

LEADERSHIP AND SERVICE

FMRL Lab Manager 2021 – Present
Georgia Institute of Technology, Atlanta, GA

- Manage lab operations, oversee lab/laser inspections, and schedule preventative maintenance on equipment
- Redesigned and maintain lab website (https://fmrl.gatech.edu)

Woodruff School Graduate Mental Health and Wellness Committee Member 2021 – Present
Georgia Institute of Technology, Atlanta, GA

- Advocate for graduate student rights and protective policies within the department
- Redesigned and maintain group website (https://memhc.me.gatech.edu/)
- Project/hiring manager for tool aimed at providing graduate students with resources for conflict resolution

APS DFD 2023 Session Chair November 19, 2023
Georgia Institute of Technology, Atlanta, GA

- Vortex Dynamics and Vortex Flows: Boundary Interactions

ME Rising Stars Workshop October 2023
University of California, Berkeley, CA

Georgia Tech President's Undergraduate Research Award (PURA) Reviewer 2019 – 2023
Georgia Institute of Technology, Atlanta, GA

Georgia Tech Muay Thai Senior Member - Officer 2017 – 2020
Georgia Institute of Technology, Atlanta, GA

Georgia Tech NASA Robotic Mining Team - Mechanical Engineering Lead 2018
Georgia Institute of Technology, Atlanta, GA

Pitt MEMS Senior Design Project Sponsor Spring 2017
University of Pittsburgh, Pittsburgh, PA

Pitt Makerspace Volunteer 2015 – 2017
University of Pittsburgh, Pittsburgh, PA

Altoona Public Access Channel Cameraman and Editor 2010 – 2013
Altoona Public Access Channel, Altoona, PA

AWARDS AND HONORS

Woodruff School Award - Best Graduate Instructor Spring 2024
Georgia Institute of Technology, Atlanta, GA

Webb-Donnell Graduate Quick Talk Finalist - 3rd Place Spring 2024
Georgia Institute of Technology, Atlanta, GA

Student Recognition of Excellence in Teaching: CIOS Honor Roll Spring 2023
Georgia Institute of Technology, Atlanta, GA

ASME Graduate Teaching Fellowship 2022
Georgia Institute of Technology, Atlanta, GA

Best Paper, Fluid Dynamics, AIAA SciTech 2022 2022
Georgia Institute of Technology, Atlanta, GA

National Science Foundation Graduate Research Fellow 2019 – 2022
Georgia Institute of Technology, Atlanta, GA

Georgia Tech President's Fellowship 2017 – 2020
Georgia Institute of Technology, Atlanta, GA

AIAA Orville and Wilbur Wright Graduate Award 2019
Georgia Institute of Technology, Atlanta, GA

Pitt Mobile App Challenge - Finalist 2017
University of Pittsburgh, Pittsburgh, PA

MEMS Senior Design - Best Presentation 2016
University of Pittsburgh, Pittsburgh, PA

Pitt SSOE Design Expo - 2nd Overall MEMS Design 2016
University of Pittsburgh, Pittsburgh, PA

Pitt SSOE Design Expo - 2nd Overall ECE Design 2016
University of Pittsburgh, Pittsburgh, PA

SSOE Summer Research Fellowship 2016
University of Pittsburgh, Pittsburgh, PA

Freshman Engineering Conference Best Poster 2014
University of Pittsburgh, Pittsburgh, PA

OTHER INTERESTS

Athletics: kickboxing, cycling

Other hobbies: cooking, hiking, reading, watching my cat Sonny exist

Unrelated skills: Photoshop, videography and video editing, podcasting, trained in CPR and QPR