Shaun Harris — Mechanical Engr.

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Education

Stanford University — **Stanford, CA**
Ph.D. Mechanical Engineering, GPA – 3.72 — *Mar 2022*
- Concentration in Fluid Mechanics [R1]

Stanford University — **Stanford, CA**
M.S. Mechanical Engineering, GPA – 3.7 — *Apr 2018*
- Depth in Fluid Mechanics

Utah State University (USU) — **Logan, UT**
B.S. Mechanical Engineering, GPA – 3.95 — *May 2016*
- Summa Cum Laude
- Emphasis: Aerospace
- Minors: Management and Mathematics

Utah State University — **Logan, UT**
A.S. General Studies, GPA – 4.0 — *Aug 2010*

Experience

Sandia National Laboratories — **Albuquerque, NM**
Post-doctoral Research — *06/22 – present*
- Performed direct numerical simulations and optimal linear studies for complex hypersonic geometries relevant to laminar-turbulent transition.[CP1, CP3]
- Maintained DOE-Q clearance

Sandia National Laboratories — **Albuquerque, NM**
Graduate Research Year-Round Intern — *06/19 – 06/22*
- Performed direct numerical simulations using massively parallel computer clusters for compressible high Reynolds number flows and compared to stability analysis for transition modeling [CP2]
- Implemented new boundary condition in massively parallel code architecture using C++
- Obtained and maintained DOE-Q clearance since Jan. 2021

Center for Turbulence Research — **Stanford, CA**
Graduate Research Student — *01/18 – 06/22*
- Developed reduced order model to study instabilities by using the Orr-Sommerfeld-Squire and the parabolized stability equations for study in laminar, transitional, and turbulent fluid flows [C2, R3, R6, CP4, C3, C5, R7]
- Applied machine learning for study and prediction of peak events in turbulent flow [R5]
- Aided in development of new wall model for LES in prediction of laminar-turbulent transition flow [R2]

Sandia National Laboratories — **Livermore, CA**
Graduate Research Summer Intern — *06/18 – 09/18*
- Simulated computational fluid dynamics of multi-component repair garage for hydrogen fuel cell vehicle failure analysis [A1, R4, C4]
- Created all simulation inputs from scratch and performed refinement/parameter studies

Flow Physics and Computation Engineering — **Stanford, CA**
Graduate Research Student — *09/16–11/17*

- Combined LES modeling with weather forecasting data assimilation techniques to enrich scales of LES models using experimental data from high-fidelity 3D PIV system [A2, C7]

Sandia National Laboratories **Albuquerque, NM**
Technical Undergraduate Year-Round Intern *05/15 – 08/16*
- Performed uncertainty quantification, verification, and validation of computation model of thermal batteries [R8, CP6]

High Performance Computational Fluid Dynamics Lab (USU) **Logan, UT**
Undergraduate Computational Fluid Dynamics (CFD) Researcher *05/14 – 04/16*
- Coded, as part of a team, parts of a CFD strand code (C++ and Fortran) [A3, CP5, CP7]

Experimental Fluid Dynamics Lab (USU) **Logan, UT**
Undergraduate Research and Creative Opportunities Grant Recipient *1/14 – 12/14*
- Led research and conducted experiment in olive oil tracer particle atomization [C8]

Experimental Fluid Dynamics Lab (USU) **Logan, UT**
Undergraduate Research Assistant *12/12 – 03/14*
- Assisted CFD validation experiments for safety analysis of nuclear reactors
- Designed and assembled various parts for particle image velocimetry (PIV) experiment

Synthetic Biomanufacturing Center (USU) **Logan, UT**
Undergraduate Research Assistant *06/10 – 12/10*
- Experimental phase of cohabitating two species in growth reactor for effective bio-diesel algae production
- Presented research finding to professors at conclusion of summer research

Awards

Fall 2016: Stanford Graduate Engineering Fellowship Award

Undergraduate Awards: Academic Excellence Senior (2016), Outstanding Undergraduate Researcher (2015), A-pin award (2014), Outstanding Pre-Professional Award (2014)

Undergraduate Scholarships: George S. & Dolores Doré Eccles Foundation University, Integrated University Program, USU Presidential, and New Century

Spring 2010: High School Salutatorian of 453 students

Skills

Coding: Python, C++, MatLab, Fortran, batch scripts for HPC, LabVIEW, and Vim

Software: ParaView, CUBIT, tecplot, Pointwise, Solid Works, and Solid Edge

Written: Microsoft Office, LaTeX, and $\approx$ 90 WPM

Technical: hand tools, saws, mills, drill presses, and soldering

Biological: autoclave, optical density machine, centrifuge, flow hoods, and pipettes

Leadership and Volunteer

03/23 – Current: Journal of Fluid Mechanics Reviewer

01/20 – Current: Member of the American Institute of Aeronautics and Astronautics (AIAA)

01/15 – Current: Member of the Tau Beta Pi Society

01/14 – 12/17: Member of the American Nuclear Society (ANS)
- Communications Officer (ANS) USU section

01/13 – 11/13: Member of the American Society of Mechanical Engineers (ASME)

01/11 – 12/12: Full-time Service Volunteer for non-profit organization in Atlantic Canada
- Leader over fellow volunteers in door-to-door communications
- Trained and instructed fellow volunteers in presentation effectiveness

- Worked with people providing addiction recovery and life coaching

2008: Eagle Scout

Articles

[A1] B. D. Ehrhart et al. "Risk assessment and ventilation modeling for hydrogen releases in vehicle repair garages". In: *International Journal of Hydrogen Energy* 46 (23 2021), pp. 12429–12438. DOI: 10.1016/j.ijhydene.2020.09.155.

[A2] J. W. Labahn et al. "Ensemble Kalman Filter for Assimilating Experimental Data into Large-Eddy Simulations of Turbulent Flows". In: *Flow, Turbulence and Combustion* (2019). ISSN: 15731987. DOI: 10.1007/s10494-019-00093-1.

[A3] O. Tong et al. "High-Order Strand Grid Methods for Shock Turbulence Interaction". In: *International Journal of Computational Fluid Dynamics* 32.4-5 (2018), pp. 203–217. DOI: 10.1080/10618562.2018.1490411.

Reports

[R1] Shaun Harris. "Some numerical considerations for prediction of laminar-turbulent transition in boundary layers". PhD thesis. Stanford University, 2022. URL: https://purl.stanford.edu/hb041ct1379.

[R2] C. A. Gonzalez, S. R. Harris, and P. Moin. *Falkner-Skan wall model baseflow generation for the parabolized stability equations*. Center for Turbulence Research, 2021.

[R3] S. R. Harris, P. Moin, and M. J. P. Hack. *Predicting the nonlinear amplification of disturbances using the spatial perturbation equations in a viscous boundary layer*. Center for Turbulence Research, 2021.

[R4] B. D. Ehrhart et al. *Risk Assessment and Ventilation Modeling for Hydrogen Release in Vehicle Repair Garages*. English. Tech. rep. Sponsor Org.: USDOE National Nuclear Security Administration (NNSA). United States, 2020. URL: https://www.osti.gov/servlets/purl/1617120.

[R5] S. R. Harris and M. J. P. Hack. *Forecasting extreme dissipation events in wall turbulence using machine learning*. Annual Research Brief. Center for Turbulence Research, 2020. URL: http://web.stanford.edu/group/ctr/ResBriefs/2020/21_Harris.pdf.

[R6] S. R. Harris and M. J. P. Hack. *Well-posed marching of disturbances using the spatial perturbation equations*. Annual Research Brief. Center for Turbulence Research, 2020. URL: http://web.stanford.edu/group/ctr/ResBriefs/2020/24_Harris.pdf.

[R7] S. R. Harris and M. J. P. Hack. *Well-posed spatial marching of perturbations in viscous shear flows*. Annual Research Brief. Center for Turbulence Research, 2019. URL: http://web.stanford.edu/group/ctr/ResBriefs/2019/08_Harris.pdf.

[R8] S. A. Roberts et al. *Establishing the Credibility of the Thermally Activated Battery Simulator, Full-Battery Version 4: Verification, Validation, and Uncertainty Quantification*. Sandia Report SAND2017-3397. Sandia National Laboratories, 2017.

Conference Papers

[CP1] **S. R. Harris** and R. Wagnild. "Numerical considerations of slow acoustic mode in high-velocity boundary layers". In: *AIAA SciTech 2023 Forum*. DOI: 10.2514/6.2023-1236.

[CP2] **S. R. Harris** and R. Wagnild. "Second mode growth in a high-velocity boundary layer using stability theory and DNS". In: *AIAA Aviation 2021 Forum*. DOI: 10.2514/6.2021-2845.

[CP3] **R. Wagnild** et al. "DNS of a Mach 14 Flow Over a Sharp Cone in AEDC Tunnel 9". In: *AIAA SciTech 2023 Forum*. DOI: 10.2514/6.2023-0866.

[CP4] **S. R. Harris** and M. J. P. Hack. "Well-posed spatial marching of high-amplitude perturbations in viscous shear flows". In: *AIAA SciTech 2020 Forum*. Jan. 2020. DOI: 10.2514/6.2020-0829.

[CP5] **O. Tong** et al. "Asymptotic Geometry Representation for Complex Configurations on Strand Grids". In: *AIAA SciTech*. Jan. 2016. DOI: 10.2514/6.2016-1584.

[CP6] **B. Trembacki** et al. "Uncertainty Quantification, Verification, and Validation of a Thermal Simulation Tool for Molten Salt Batteries". In: *47th Power Sources Conference, Orlando FL*. 2016. URL: https://www.osti.gov/servlets/purl/1365182.

[CP7] **O. Tong** et al. "High-Order Strand Grid Methods for Shock Turbulence Interaction". In: *22nd AIAA Computational Fluid Dynamics Conference*. 2015. DOI: 10.2514/6.2015-2283.

Conferences

[C1] **C. A. Gonzalez** et al. "Reduced-order Modeling of Laminar Boundary Layers". In: *74th Annual Meeting of the APS Division of Fluid Dynamics*. Nov. 2021. URL: https://meetings.aps.org/Meeting/DFD21/Session/M08.6.

[C2] **S. R. Harris**, M. J. P. Hack, and P. Moin. "Predicting the nonlinear amplification of disturbances using the Spatial Perturbation Equations in a viscous boundary layer". In: *74th Annual Meeting of the APS Division of Fluid Dynamics*. Nov. 2021. URL: https://meetings.aps.org/Meeting/DFD21/Session/T03.2.

[C3] **S. R. Harris**, M. J. P. Hack, and P. Moin. "Modeling the amplification of disturbances using the Spatial Perturbation Equations". In: *73rd Annual Meeting of the APS Division of Fluid Dynamics*. Nov. 2020. URL: https://meetings.aps.org/Meeting/DFD20/Session/H05.8.

[C4] **B. D. Ehrhart** et al. "Risk assessment and ventilation modeling for hydrogen vehicle repair garages". In: *International Conference on Hydrogen Safety*. 2019. URL: https://hysafe.info/myfiles/ichs2019/ICHS_2019_Program.pdf.

[C5] **S. R. Harris** and M. J. P. Hack. "Nonlinear spatial marching of high-amplitude perturbations". In: *72nd Annual Meeting of the APS Division of Fluid Dynamics*. 2019. URL: http://meetings.aps.org/Meeting/DFD19/Session/P33.6.

[C6] **J. Labahn** et al. "The application of data assimilation to combine experimental data and LES for improved state-estimation". In: *71st Annual Meeting of the APS Division of Fluid Dynamics*. 2018. URL: https://meetings.aps.org/Meeting/DFD18/Session/D31.10.

[C7] **S. R. Harris**, J. Labahn, and M. Ihme. "The coupling of high-speed high resolution experimental data and LES through data assimilation techniques". In: *70th Annual Meeting of the APS Division of Fluid Dynamics*. 2017. URL: http://meetings.aps.org/Meeting/DFD17/Session/L28.11.

[C8] **S. R. Harris** and B. Smith. "Olive Oil Tracer Particle Size Analysis for Optical Flow Investigations in a Gas Medium". In: *67th Annual Meeting of the APS Division of Fluid Dynamics*. 2014. URL: http://meetings.aps.org/link/BAPS.2014.DFD.R29.9.