Derek A. Sutherland, Ph.D.

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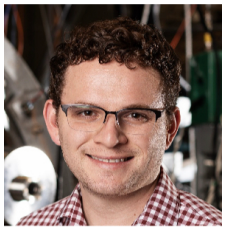

Employment History

2023 — Present **Head of Experimental Physics on FuZE-Q**, Zap Energy, Inc. — Everett, WA

2024 — Present **Fusion Energy Sciences Advisory Committee (FESAC) Member**

2019 — 2023 **Principal Investigator,** CTFusion, Inc. — Seattle, WA

ARPA-E Project: *Plasma driver technology demonstration for economical fusion power plants*, Program Manager: Dr. Scott Hsu

2015 — 2023 **Co-Founder and CEO,** CTFusion, Inc. — Seattle, WA

2016 — 2021 **Adjunct Fellow,** The American Security Project, Washington, D.C.

2012 — 2019 **Graduate Research Associate,** HIT-SI Research Group,
Department of Aeronautics and Astronautics, College of Engineering,
University of Washington — Seattle, WA

2015 **Graduate Instructor,** University of Washington
Course AA523: Tokamak Fusion Physics and Technology

2015 **Graduate Instructor,** University of Washington
Course AA523: Nuclear Reactor Physics and Technology

2012 **Controlled Fusion Plasma Physicist**, General Fusion, Inc. — Burnaby, BC, Canada

2011 **National Undergraduate Fellowship Intern**, DIII-D National Fusion Facility, General Atomics — San Diego, CA

2010 **Student Intern,** General Fusion, Inc. — Burnaby, BC, Canada

2009 **Student Intern,** FRX-L Research Group, Los Alamos National Laboratories (LANL)

Education

2012 — 2019 **Ph.D. University of Washington,** Plasma Physics and Fusion Energy
Thesis title: *Measurements of neutral particles and simulations of plasma-neutral dynamics in the HIT-SI3 experiment*
Advisor: Prof. Thomas Jarboe, Committee Members: Prof. Brian Nelson and Prof. Uri Shumlak

2008 — 2012 **B.S. Massachusetts Institute of Technology,** Nuclear Engineering and Physics
Thesis title: *A Study of Prompt Fast Ion Losses from Neutral Beam Injection in the DIII-D Tokamak*
Advisor: Prof. Dennis Whyte

Skills

Operating Systems	macOS, iOS, UNIX/Linux, Windows
Languages	English, Python, MATLAB, Mathematica, Fortran, C/C++, LaTeX
Comp. Tools	PSI-Tet (Extended-MHD), PSI-Tri (MHD Equilibria), COMSOL Multiphysics,MCNP6.2/MCNPX, HotSpot, FEMM, Solidworks, AutoCAD, Git, Microsoft Office
Technical	Experimental and computational plasma physics, plasma-material interactions (PMI), fusion neutron diagnostics, neutronics, structural engineering, thermal-hydraulics, thermal power cycles, fusion energy system design, space propulsion system design
Economics/Safety	Fusion energy system costing, energy market research, radiation protection, radioactive release analysis, safety analysis, and protocols
Business/Outreach	Fundraising (public and private), team & culture building, accounting & compliance (GAAP, DCAA), project management, corporate governance, public communication and engagement, regulatory engagement (U.S. NRC, FERC), customer engagement

Selected Works

Journal Articles and Thesis

K.D. Morgan, C.J. Hansen, A.C. Hossack, and **D.A. Sutherland**, "Effect of injected flux and current temporal phasing on self-organization in the HIT-SI3 experiment," Phys. Plasmas 29(5) (2022), https://doi.org/10.1063/5.0090665

A.C. Hossack, K.D. Morgan, C.J. Hansen, **D.A. Sutherland**, "A multi-chord, two-color interferometer using Hilbert transform phase detection for measuring electron density in spheromak plasmas," *Rev. Sci. Instrum.* **93**(9) (2022), https://doi.org/10.1063/5.0097459
K.D. Morgan, C.J. Hansen, A.C. Hossack, B.A. Nelson, and **D.A. Sutherland**, "High-speed feedback control of an oscillating magnetic helicity injector using a graphics processing unit," *Rev. Sci. Instrum.* **29**(5) (2021), https://doi.org/10.1063/5.0044805

D.A. Sutherland and C.J. Hansen, "Driven resonant current amplification in self-organized plasma configurations with uniform λ and plasma pressure confinement," *Phys. Plasmas* **28**(2) (2021), https://doi.org/10.1063/5.0025959

D.A. Sutherland, "Measurements of neutral particles and simulations of plasma-neutral dynamics in the HIT-SI3 experiment," Ph.D. Thesis, *University of Washington* (2019), https://digital.lib.washington.edu/researchworks/handle/1773/45098

A.C. Hossack, T.R. Jarboe, R.N. Chandra, K.D. Morgan, **D.A. Sutherland**, J.M. Penna, C.J. Everson, and B.A. Nelson, "Plasma response to sustainment with imposed-dynamo current drive in HIT-SI and HIT-SI3," *Phys. Plasmas* **57**(7) (2017), https://doi.org/10.1088/1741-4326/aa6ec7

A.C. Hossack, **D.A. Sutherland**, and T.R. Jarboe, "Derivation of dynamo current drive in a closed-current volume and stable current sustainment in the HIT-SI," *Phys. Plasmas* **24**(2) (2017) , https://doi.org/10.1063/1.4975663

D. Elliott, **D. Sutherland,** U. Siddiqui, E. Scime, C. Everson, K. Morgan, A. Hossack, B. Nelson and T. Jarboe, "Two-photon LIF on the HIT-SI3 experiment: Absolute density and temperature measurements of deuterium neutrals," *Rev. Sci. Instrum*. **87**(11) (2016), https://doi.org/10.1063/1.4955494

T.R. Jarboe, B.A. Nelson, **D.A. Sutherland**, "A mechanism for the dynamo terms to sustained closed-flux current, including helicity balance, by driving the current which crosses the magnetic field, *Phys. Plasmas* **22** (2015), https://doi.org/10.1063/1.4926522

T.R. Jarboe, C.J. Hansen, A.C. Hossack, G.J. Marklin, K.D. Morgan, B.A. Nelson, **D.A. Sutherland**, and B.S. Victor, "A Proof of Principle of Imposed Dynamo Current Drive: Demonstration of Sufficient Confinement," *Fus. Sci. Tech.* **66**(3) (2014), https://doi.org/10.13182/FST14-782

B.N. Sorbom, J. Ball, T.R. Palmer, F.J. Mangiarotti, J.M. Sierchio, P. Bonoli, C. Kasten, **D.A. Sutherland**, H.S. Barnard, C.B. Haakonsen, J. Goh, Choongki Sung, D.G. Whyte, "ARC: A compact, high-field, fusion nuclear science facility and demonstration power plant with demountable magnets," *Fus. Eng. Design* **100**, 378 - 405 (2015), https://doi.org/10.1016/j.fusengdes.2015.07.008

D.A. Sutherland, T.R. Jarboe, K.D. Morgan, M. Pfaff, E.S. Lavine, Y. Kamikawa, M. Hughes, P. Andrist, G. Marklin, B.A. Nelson, "The dynomak: An advanced spheromak reactor concept with imposed-dynamo current drive and next-generation nuclear power technologies," *Fus. Eng. Design* **89**(4) (2014), https://doi.org/10.1016/j.fusengdes.2014.03.072

Recent Conference Proceedings

D.A. Sutherland, C.J. Hansen, A.C. Hossack, K.D. Morgan**, "**Projections of spheromak configurations sustained with steady, inductive magnetic helicity injection (SIHI) towards high Lundquist number," *APS-DPP Conference (2022)*, Poster TP11.00037, https://meetings.aps.org/Meeting/DPP22/Session/TP11.37

D.A. Sutherland, A.C. Hossack, K.D. Morgan, and C.J. Hansen, "Overview of the HIT-SI3 and HIT-SIU Experiments: Spheromaks Sustained with Steady, Inductive Helicity Injection (SIHI)," *ANS TOFE Conference (2022)*, Invited Talk, https://www.ans.org/meetings/am2022/session/view-1255/

D.A. Sutherland, C.J. Hansen, A.C. Hossack, and K.D. Morgan, "High-β, large current amplification sustained spheromak equilibria with Mercier stable pressure profiles and plasma shaping," *APS-DPP Conference (2021)*, Poster TP11.077, https://ui.adsabs.harvard.edu/abs/2021APS..DPPTP1077S/abstract

D.A. Sutherland, T.R. Jarboe, and C.J. Hansen, "Driven resonant current amplification in sustained spheromak configurations with plasma pressure gradients," *APS-DPP Conference (2020)*, Poster PO07.002, https://ui.adsabs.harvard.edu/abs/2020APS..DPPP07002S/abstract

Patents

T.R. Jarboe and **D.A. Sutherland**, "Plasma confinement system and methods for use," U.S. Patent 9,754,686 B2 (2017), https://patents.google.com/patent/US9754686B2/en

Other Works

D.A. Sutherland, "The Prospect of Fusion Energy," *The American Security Project*, Jan. 27, 2017, https://www.americansecurityproject.org/prospect-of-fusion-energy/

D.A. Sutherland, "Fusion: The need for clean energy sources beyond renewables," *The American Security Project*, Jun. 27, 2017, https://www.americansecurityproject.org/fusion-the-need-for-clean-energy-sources-beyond-renewables/

D.A. Sutherland, "Why is fusion so challenging to achieve?," *The American Security Project*, Mar. 2, 2018, https://www.americansecurityproject.org/why-fusion-is-difficult/

Invitations, Awards, and Recognition

Selected Invited Presentations

2022	**EPRI-Sponsored Workshop on Fusion Prototypic Neutron Sources (FPNS)** Executive Committee Member and Invited Speaker
2022	**U.S. Nuclear Regulatory Commission (NRC) Public Meeting** Developing Options for a Regulatory Framework for Fusion Energy Systems
2021	**U.S. Nuclear Regulatory Commission (NRC) Public Meeting** Developing the Regulatory Framework for Fusion Energy Systems

2021	U.S. Congressional Fusion Caucus Kick-Off Event
2020-2022	Annual Meeting of the Fusion Power Associates
2018 & 2022	American Nuclear Society (ANS) Technology of Fusion Energy (TOFE)
2017	US Magnetic Fusion Research Strategic Directions Workshop
2016	American Nuclear Society (ANS) Fusion and Plasma Technology Panel
2014	Exploratory Plasma Research (EPR) Conference
2012	American Nuclear Society (ANS) Winter Conference

Awards and Recognition

2015	**CoMotion Innovation Fund Award,** University of Washington — Seattle, WA
2015	**CoMotion Graduate Innovators Award,** University of Washington — Seattle, WA
2015	**Forbes' 30 under 30 in Energy,** Forbes Magazine
2012	**William E. Boeing Endowed Graduate Fellowship,** University of Washington, Seattle, WA
2012	**American Nuclear Society (ANS) Design Competition Finalist,** ANS
2011	**Irving Kaplan Award,** Department of Nuclear Science and Engineering, MIT