

Aaron Michael Schinder

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Asst. Research Prof. of Engineering Physics
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Professional Interests

Plasma physics, spacecraft propulsion, engineering physics simulations, machine learning.

Education

- PhD, Aerospace Engineering, Georgia Institute of Technology, Fall 2016.
PhD Dissertation: Schinder, A. Investigation of Hall Effect Thruster Channel Wall Erosion Mechanisms. Georgia Institute of Technology, Atlanta, GA, 2016.
- MS, Aeronautical Engineering, High Power Electric Propulsion Lab, Georgia Institute of Technology, Atlanta GA, 2013. GPA: 3.93.
- BS Aeronautical Engineering, Major Concentration: Propulsion, Minor Concentration: Structures, Minor in Economics, Purdue University, West Lafayette IN, 2006. GPA 3.91

Employment and Research

Assistant Research Professor of Engineering Physics, Air Force Institute of Technology

Employment: 1 April 2022 – Present

Proposed machine learning research to the NRO AS&T call in March 2023.

Performed analysis on multi-spectral and hyperspectral camera data from ERDC testing at Wright-Patterson, Alaska, and Yuma AZ.

Assisting the Center for Technical Intelligence Studies and Research (CTISR) with their satellite scene emulation tool ASSET. Studied cloud physics and produced a fast 3d, deterministic, global fractal cloud generator. Integrated the fractal cloud renderer into the latest version of ASSET. Created a model for specular high altitude ice cloud reflections.

Studied rod-pinch diode plasma physics for Naval Research Lab in 2022. Produced modified Chicago source code to study the effects of centrifugal cut-off of current to the rod-pinch anode.

Won AS&T grant to study the formation of sporadic-E ionospheric phenomenon. Developing 3d GPU accelerated models for the formation of turbulent ion cloud structures.

AI Research Engineer, Staff, Lockheed Martin CTO

Employment: part time July 2020 - Oct 2020, full time 2 Nov 2020 – 1 April 2022

Developed flexible polynomial with Gaussian uncertainty, and Kalman filtering algorithms for the prediction of trajectories from uncertain data. Added mathematics and statistics tools (quaternions, Bayesian updating) to Project Overwatch, a trajectory prediction software suite.

Aerospace Engineer Sr. Lockheed Martin Aeronautics

Employment: 9 Oct 2017 - 2 Nov 2020

- Experimenter, analyst, and HPC modeling and sim developer for RTP's Compact Fusion Reactor T4B/T5 experiment. Designed automated analysis programs for plasma diagnostics.
- Designed Langmuir probe current sense electronics, and high-density retarding field analyzer for T4B/T5 experiment, enabling point measurements of plasma properties.
- Performed HPC PIC simulations of plasma confinement. Studied aspects of LERC confinement physics for heating requirements and reactor scaling. Compiled and distributed LSP/Chicago and in-house modeling code against HPC libraries on supercomputer and windows workstations, allowing others to use our models. Developed fast-ion particle tracer, providing insight into neutral beam heating of our plasma.
- Trained neural network to invert a tomography problem, enabling a 2d cross sectional plasma profile to be developed from 1d bolometer lines-of-sight.

NASA Glenn Research Center, Chemical and Thermal Propulsion Systems Branch (GRC/LTR0)

Employment: 17 Sep 2016 - 8 Sep 2017

- Engineer and analyst for the Orion project. Performed analysis, modeling, and engineering support for the development of the propulsion subsystem of the European Service Module. Modeled prop feed-system water-hammer, pressurization system and engine performance. NASA analyst for 2017 European Service Module propulsion qualification test.

PhD Student, Georgia Institute of Technology, High Power Electric Propulsion Lab

Enrolled: 17 Aug 2011 - 17 Sep 2016

- Won ASEE NDSEG fellowship for work on my dissertation on plasma erosion of heterogeneous materials.
- Joint PhD student of Prof Mitchell Walker's High Power Electric Propulsion Lab, and Prof Julian Rimoli's Computational Solid Mechanics Lab.
- Studied the physical processes behind the erosion of channel wall materials in Hall effect thrusters (HETs). Computational and experimental basic research into plasma-material interactions with application to life limiting processes.
- Experience with electric propulsion devices, plasma device physics, space plasma physics, and modeling and simulation. Wrote parallel C++ engineering simulations to predict surface features developed during plasma erosion of a heterogeneous borosil microstructure. Other simulation experience with molecular dynamic simulation of grain boundary energy in metals.
- Coursework in fusion plasma physics, space plasma physics, spacecraft electric propulsion, laser physics, and advanced orbital mechanics.
- Assisted with data collection in testing of Hall effect thrusters. Experienced with Solidworks and 3-axis mill and lathe. Designed and machined test fixtures for research.

USAF Officer, Air Force Research Lab, Laser Effects Research Branch (AFRL/RDLE)

Date of Service: 6 Jan 2007 - 10 Jan 2011

- Project officer and principal investigator for an exploratory study. Planned and executed a year-long multi-part test effort on coupon level samples, searching for an effect of interest to the Air Force.
- Project officer, analyst and experimenter for several tests. On the MANPADS test, a major outdoor testing program, I performed analysis on expectations for rocket thrust and nozzle ejection velocity,

and briefed the air base wing commander and senior civilian division director on safety and risk mitigation for the test, enabling the test to proceed. Produced GUI software for

- laser pointing corrections, and cut data reduction by 50% for FAST test program. For basic research into surface reflection, led 600 tests over weekends and evenings using high demand test equipment, saving \$200k in additional hardware which would have otherwise been needed.
- Worked on both individual research and on large test teams. Optics and high-energy laser experience. Experience analyzing thermal infrared (LWIR, MWIR), NIR, and UV cameras.
- Developed simulation of laser engagement and burn-through of multi-wall structures by writing a plug-in for the ABAQUS FEM suite.

Service Activities

- Sponsor of Alexander Winkler, Eagle Scout, for NASA Glenn Research Center Internship, 2016
- Chair of American Institute of Aeronautics and Astronautics, Albuquerque Chapter, 2010-2011
- Math Tutor, Highland High-school, Albuquerque NM, 2008-2011

Credentials and Awards

- Holder of current DoD security clearance, ask for details
- National Defense Science and Engineering Graduate Fellow, American Society of Engineering Education, Sep 2013 to Sep 2016.
- Engineer Intern License, ET30707657, Indiana Professional Licensing Agency
- Directed Energy Directorate, 3rd Quarter Scientist and Engineer Award, AFRL Directed Energy Directorate, Nov 2009.
- Directed Energy Directorate 4th Quarter Technical Teamwork Award, AFRL Directed Energy Directorate, Dec 2007.

Publications and Patents

- Schinder, Aaron and Ebersohn, Frans. Triple-Double Langmuir Probe. LM Disclosure SW-01177, disclosed 2/27/2020. (still in patent search)
- Schinder, A. M., Rimoli, J. J., and Walker, M. L. R., "Investigation of Plasma Material Erosion Under Mechanical Stress," Journal of Propulsion and Power, Sep. 2016, doi: 10.2514/1.B36253.
- Schinder, Aaron, Walker, M., Rimoli, J. "3D Model for Erosion of a Hall Effect Thruster Discharge Channel Wall." Journal of Propulsion and Power, 2014. doi:10.2514/1.B35098.
- Schinder, Aaron, Walker, M., Rimoli, J., "3D Model for Atomic Sputtering of Heterogeneous Ceramic Compounds." 49th AIAA/ASME/SAE/ASEE Joint Propulsion Conference. American Institute of Aeronautics and Astronautics, 2013. DOI 10.2514/6.2013-4127.
- Schinder, Aaron M., et al. "Deterministic Global 3D Fractal Cloud Model for Synthetic Scene Generation." Remote Sensing 16, no. 9 (April 30, 2024): 1622. <https://doi.org/10.3390/rs16091622>.

Skills and Interests

- Experience programming, compiling, and running simulation and HPC software in Windows, Linux, and supercomputer environments. C, C++, FORTRAN, Matlab, and Python languages. Familiarity with numerical libraries (LAPACK, PETsc). Developed engineering simulations, and designed websites: www.republicedm.com, www.amssolarempire.com, and others.
- Machining and metalworking.
- Flying lessons, anticipate private pilot's license with one more year of instruction.
- Interests: 3D printing, machining, electronics, space exploration