

Jules van Irsel

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PROFESSIONAL SUMMARY

I possess a solid foundation in the core branches of physics, with specialized expertise in plasma physics, multilingual computational physics, and data management. I am adept in mechanical and electrical computer-aided design, engineering, manufacturing, and space plasma instrument testing. With an interdisciplinary skill set, I approach challenges with curiosity, conscientiousness, and a spirit of collaboration.

EDUCATION

Dartmouth College <i>Doctor of Philosophy in Physics</i>	Hanover, NH <i>July 2025</i>
University of Calgary <i>Bachelor of Science (Honours), Major in Astrophysics</i>	Calgary, AB <i>June 2018</i>
Southern Alberta Institute of Technology <i>Mechanical Eng. Tech. (Honours), Major in Design and Development</i>	Calgary, AB <i>June 2014</i>

PROFESSIONAL EXPERIENCE

Graduate Student <i>Dartmouth College – K. A. Lynch – 603 646 9311</i>	Hanover, NH <i>Sep. 2019 – July 2025</i>
<ul style="list-style-type: none">– Defended thesis on electric current closure in ionospheric plasmas on July 8, 2025– Selected for two years of graduate funding from NASA’s 2022 FINESST solicitation– Contributed to the development of NASA’s 2022 HLCAS selected proposal: <i>Geophysical Non-Equilibrium Ionospheric System Science</i> (GNEISS, PI: K. A. Lynch) sounding rocket mission– Contributed to the development of NASA’s 2019 MDEX proposal through its Phase A Concept Study Report: <i>Auroral Reconstruction CubeSwarm</i> (ARCS, PI: K. A. Lynch)– Produced a catalog of multi-fluid ionospheric 3D plasma simulations using the Geospace Environment Model of Ion-Neutral Interactions (GEMINI, github.com/gemini3d)– Developed tools for driving GEMINI from multi-sourced, heterogeneous data products, as well as tools to visualize the resulting rich output data volumes (github.com/317Lab/aurora_gemini)– Implemented methods for advanced impact ionization to the GEMINI source code– Vacuum/plasma tested, and wrote GSE software for, Petite Ion Probes and oversaw their integration onto NASA’s <i>Loss through Auroral Microburst Pulsations</i> (LAMP, PI: A. Halford) sounding rocket mission– Instructed courses for both graduate and undergraduate classes while mentoring undergraduate students in the <i>Lynch Rocket Lab</i>	
Instrument Design & Assembly Assistant <i>University of Calgary – J. K. Burchill – 403 220 8108</i>	Calgary, AB <i>May 2018 – Aug. 2019</i>
<ul style="list-style-type: none">– Mechanically and electrically redesigned the rocket Miniature Plasma Imager (rMPI) lowering its power consumption and introducing ion baffling– Assisted in rMPI environment testing (vacuum, vibration, plasma) and oversaw its integration onto NASA’s <i>Cusp-Region EXperiment 2</i> (C-REX 2, PI: M. Conde) sounding rocket mission– Oversaw integration of rMPIs onto NASA’s <i>VISualizing Ion Outflow via Neutral atom Sensing 2</i> (VISIONS 2, PI: D. Rowland) sounding rocket mission	

Research Internship

University of Calgary – J. K. Burchill – 403 220 8108

Calgary, AB

May 2017 – Oct. 2017

- Analyzed the European Space Agency’s Swarm EFI data using a superposed epoch analysis comparing electron temperature enhancements and ion vertical flow to study ion outflow in the cusp region ionosphere

Mechanical Design Engineer & MWD Technician

QCD Technologies – T. Russell – 403 235 0720

Calgary, AB

May 2014 – Oct. 2014

- Designed vertical shock absorber servicing tools used in Measurements While Drilling (MWD) technology using CAD

LEADERSHIP ROLES & COMMUNITY INVOLVEMENT

Van Irsel Medical Board Member

Consult on product and software development, including machine learning methods

vanirselmedical.com

Since Feb. 2025

Department Graduate Student Treasurer

Propose community funding and manage yearly budgets and reimbursements

Dartmouth College

Feb. 2024 – July 2025

Department Building Committee Liaison

Restore/refurnish community spaces, reorganizing and redesigning office spaces

Dartmouth College

Oct. 2024 – July 2025

SELECTED PUBLICATIONS

- van Irsel, J., Lynch, K., Mule, A., Zettergren, M., et al., (2025), Current closure and Joule heating in data-driven 3-D auroral arc simulations, *Journal of Geophysical Research: Space Physics*. Manuscript in review.
- van Irsel, J., Lynch, K., Mule, A., Zettergren, M., (2024), Generation of top boundary conditions for 3D ionospheric models constrained by auroral imagery and plasma flow data, *Journal of Geophysical Research: Space Physics*.
- Lynch, K., Erlandson, R., van Irsel, J. et al., (2024), *Auroral Reconstruction CubeSwarm: A 2019 Heliophysics Medium-Class Explorer Phase A Concept Study Section D*.
- Erlandson, R., Lynch, K., van Irsel, J. et al., (2024), *Auroral Reconstruction CubeSwarm: A 2019 Heliophysics Medium-Class Explorer Phase A Concept Study Section E*.

AWARDS & SCHOLARSHIPS

Physics & Astronomy Chair’s Service Award: For community services to the department	2025
NASA FINESST: Future Investigators in NASA Earth and Space Science and Technology	2023
NSERC USRA: Undergraduate Student Research Award (Declined)	2018
PURE Award: Program for Undergraduate Research Experience Award	2017

TECHNICAL SKILLS

Software: Autodesk Inventor and Showcase, Solidworks, Solidworks Visualize, Paraview, VisIt, Dipstrace**Programming Languages:** Python, MATLAB, Mathematica, FORTRAN, HTML/CSS/JavaScript, C**Developer Tools:** Git, VS Code, Windows Subsystem for Linux, high performance computing, multi-threading, Slurm Workload Manager, Portable Batch System**Other:** Computer Aided Design, surface-mount soldering, prototyping, Geometric Dimensioning and Tolerancing, precision machining

COURSES

Incoherent Scatter Radar Summer School

Theory, concepts, and hands-on experiment design for incoherent scatter radars

Virtual
July 2020

Machine Learning

Coursera class on *Supervised Machine Learning: Regression and Classification*

Virtual
Dec. 2019

SELECTED CONFERENCES

2025 AGU Chapman Meeting

Melbourne, AUS

Oral: *Current Continuity in Auroral System Science: Data-Driven Auroral GEMINI 3D Simulation*

2024 AGU Fall Meeting

Washington, DC

Oral: *Current Continuity in Auroral System Science: 3D Data-Driven Auroral GEMINI Simulation*

2024 CEDAR Workshop

San Diego, CA

Poster: *Current Continuity in Auroral System Science: Data-Driven Auroral GEMINI Simulations*

2023 AGU Fall Meeting

San Francisco, CA

Poster: *Current Continuity in Auroral System Science: Defining a Catalog of Auroral GEMINI Simulations*

2023 CEDAR Workshop

San Diego, CA

Poster: *Current Continuity in Auroral System Science: Defining Electron Precipitation*

2022 AGU Fall Meeting

Chicago, IL

Poster: *Auroral System Science: Determining Geophysical Boundary Conditions for Multi-fluid Volumetric Simulations of Auroral Arcs*

2022 CEDAR Workshop

Austin, TX

Oral: *Two Threads for 3D Auroral Modeling: How to Drive and How to See*

Poster: *Auroral System Science: Multi-fluid 3D GEMINI Simulations of Auroral Arc Ionospheric Current Closure*

2021 AGU Fall Meeting

Virtual

Oral: *The Effect of Hall Conductance Gradients on Field-Aligned Currents in Non-Sheet-Like Auroral Arcs*

PERSONAL INTERESTS

Analog Photography: Experimenting with film photography, including developing negative film

Coding projects: E.g. personal finance tool for organizing transactions and generating reports, PyTorch based convolutional, sequential neural network model for denoising

Website design: Developed my personal website to display my personal and professional endeavors and to add HTML, CSS, and JavaScript to my repertoire of coding languages

Traveling: I am always happy to travel and explore; from Melbourne, Australia to Ny-Ålesund, Svalbard

REFERENCES

Kristina A. Lynch:

Dartmouth College – kristina.a.lynch@dartmouth.edu

Matthew D. Zettergren:

Embry-Riddle Aeronautical University – zettergm@erau.edu