# 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 computeraided 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	Hanover, NH
Doctor of Philosophy in Physics	Since Sep. 2019
University of Calgary	Calgary, AB
Bachelor of Science (Honours), Major in Astrophysics	Sep. 2014 – June 2018
Southern Alberta Institute of Technology	Calgary, AB
Mechanical Eng. Tech. (Honours), Major in Design and Development	Sep. 2012 – June 2014

PROFESSIONAL EXPERIENCE

#### **Graduate Student**

Dartmouth College – K. A. Lynch – 603 646 9311

Hanover, NH Since Sep. 2019

- Approved thesis proposal on electric current closure in ionospheric plasmas. Defense: July 2025
- Proposed to, and selected for graduate funding from, NASA's 2022 FINESST solicitation
- Aided in developing NASA's 2022 HLCAS selected proposal: Geophysical Non-Equilibrium Ionospheric System Science (GNEISS, PI: K. A. Lynch) sounding rocket mission
- Aided in developing NASA's 2019 MIDEX proposal and through its Phase A Concept Study Report: Auroral Reconstruction CubeSwarm (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 Loss through Auroral Microburst Pulsations (LAMP, PI: A. Halford) sounding rocket mission
- Teaching Assistantship for both graduate and undergraduate classes, and mentoring of undergraduate students in the Lynch Rocket Lab

#### Instrument Design & Assembly Assistant Calgary, AB University of Calgary – J. K. Burchill – 403 220 8108 May 2018 - Aug. 2019

- 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 Cusp-Region Experiment 2 (C-REX 2, PI: M. Conde) sounding rocket mission
- Oversaw integration of rMPIs onto NASA's VISualizing Ion Outflow via Neutral atom Sensing 2 (VI-SIONS 2, PI: D. Rowland) sounding rocket mission

#### **Research Internship**

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

Calgary, AB May 2017 – Oct. 2017

 Used the European Space Agency's Swarm EFI data for 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

Washington, DC

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

#### LEADERSHIP ROLES & COMMUNITY INVOLVEMENT

Van Irsel Medical Board Member	vanirselmedical.com
Consult on product and software development, including machine learning methods	Since Feb. 2025
<b>Department Graduate Student Treasurer</b>	Dartmouth College
Propose community funding, generate/manage yearly budgets and reimbursements	Since Feb. 2024
<b>Department Building Committee Liaison</b>	Dartmouth College
Restore and refurnish community spaces, reorganizing and redesigning office spaces	Since Oct. 2024

#### Selected Publications

- van Irsel, J., Lynch, K., Mule, A., Zettergren, M., Burchill, J., (2025), Data-Driven 3D Simulations of Auroral Arc Systems, *Journal of Geophysical Research: Space Physics*. Manuscript in preparation.
- 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

<b>NASA FINESST</b> : Future Investigators in NASA Earth and Space Science and Technology	2023
<b>NSERC USRA</b> : Undergraduate Student Research Award (Declined)	2018
<b>PURE Award</b> : Program for Undergraduate Research Experience Award	2017
Courses	

Incoherent Scatter Radar Summer School	Virtual
Theory, concepts, and hands-on experiment design for incoherent scatter radars	July 2020
Machine Learning	Virtual
Coursera class on Supervised Machine Learning: Regression and Classification	Dec. 2019

Selected Conferences

2025 AGU Chapman Meeting	Melbourne, AUS
Oral: Current Continuity in Auroral System Science: Data-Driven Auroral GEMINI 3	D Simulation

#### 2024 AGU Fall Meeting

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

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, multithreading, Slurm Workload Manager, Portable Batch System

Other: Computer Aided Design, surface-mount soldering, prototyping, Geometric Dimensioning and Tolerancing, precision machining

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: I have thoroughly enjoyed building my website from the ground up while learning HTML, CSS, and JavaScript

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

#### 2024 CEDAR Workshop

## Poster: Current Continuity in Auroral System Science: Data-Driven Auroral GEMINI Simulations 2023 AGU Fall Meeting

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

## 2023 CEDAR Workshop

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

## 2022 AGU Fall Meeting

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

## 2022 CEDAR Workshop

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

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

### TECHNICAL SKILLS

San Diego, CA

San Diego, CA

San Francisco, CA

Chicago, IL

Austin, TX