

Amanda V. Steckel

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I'm a postdoctoral researcher at Caltech studying ice in permanently shadowed regions of the surface of the moon. I've also studied the surface morphology and composition of ancient Mars, and the active surfaces of Icy Moons (Enceladus, Europa, and Triton). I received my PhD from the University of Colorado Boulder in Geological Sciences in 2024. Prior to this, I spent 9 years designing, building, and launching spacecraft and space payloads as a mechanical engineering lead. In the future I hope to bridge the gap between scientists and engineers in planetary exploration. Mission operations is a role I've explored recently through science uplink / downlink lead on the Mastcam-Z instrument on the Mars 2020 rover, and seems like the ideal way to blend science and engineering.

EDUCATION

University of Colorado Boulder, Boulder, CO *Aug. 2024*
Doctor of Philosophy Candidate, Geological Sciences GPA: 3.95/4.00

Cornell University, Ithaca, NY *May 2015*
Masters of Engineering, Aerospace Engineering GPA: 4.00/4.00
Bachelor of Science, Mechanical Engineering GPA: 3.31/4.00 *May 2014*

AWARDS

Henry A. Waldrop Scholarship 2024, Bruce and Marcy Benson Graduate Fellowship 2023 (**\$44,000**), Benson Travel Grant Award 2023, GPSG Travel Grant 2023, DPS Hartmann Travel Award 2023, CU Boulder Domestic Travel Grant 2023, Geology Student Travel Scholarship 2023, Graduate School International Travel Scholarship 2021, NSF Graduate Research Fellowship 2020 (**\$102,000**), Air Force Technical Initiative 2017, 2018, 2019 (**\$200,000**), Thomas J. and Joan T. Kelly Aerospace Prize 2015

SKILLS

Software: ArcGIS, Python, Matlab, C, Fortran, Tetracorder, Labview • **CAD:** Solidworks, OnShape • **FEA:** ANSYS, Fluent, Nastran
Training: XRD, Laser, Cryo, Haz Waste, Chemical Handling (H₂O₂), Micro FOD, Clean Room, ESD, Solder, Lathe, Mill, 3D Print
Professional Development: MIT Course Physical Principles of Remote Sensing (2018), MIT LL Technical Education Course Hyperspectral Imaging and Remote Sensing (2018), NSREC Radiation Short Course (2017), Small Satellite Conference (2017, 2018)

RESEARCH PROJECTS

Spectral modeling in Lunar Permanently Shadowed Regions (PSRs), Caltech- P.I. Dr. Bethany Ehlmann *Sept. 2024-Present*
Mapping Noachian terrain with Hirise and Mastcam-Z, Caltech- P.I. Dr. Bethany Ehlmann *Sept. 2024-Present*
Icy Plume Deposit UV and VNIR Spectral Characterization, LASP- P.I. Dr. Greg Holsclaw *Oct 2023- Aug. 2024*
Toolbox for Research and Exploration (TREX) Field Campaign, PSI – P.I. Dr. Amanda Hendrix *Oct 2022- Aug. 2024*
Nautilus: A Mission Concept to Triton, JPL PSSS – P.I. Amanda Steckel (Self) *Jun 2022- Aug. 2023*
Microbial Response to Radiation in High Altitude, LASP and CU Boulder – P.I. Dr. Brian Hynek *Jan 2021- Jan. 2022*
Mars Landscape Evolution Modeling, LASP and CU Boulder – P.I. Dr. Brian Hynek *Aug 2020-Present*
Atmospheric Lidar, CIRES and CU Boulder – P.I. Dr. Xinzhao Chu *Aug 2019- Jun 2020*
Integrated Propellant Storage and Feed System, MIT Lincoln Laboratory - P.I. Amanda Steckel (Self) *Oct 2017- Sep 2019*
Regolith Thruster, Cornell University – P.I. Dr. Mason Peck *Aug 2014- May 2015*
VIOLET Satellite Project Team, Cornell University, AFRL – P.I. Dr. Mason Peck *Aug 2010- Jan 2015*
High Temperature Biomass Pyrolysis Reactor, Cornell University – P.I. Dr. Elisabeth Fisher *Aug 2013- May 2014*
Ionospheric Satellite and Radar Data Analysis, Cornell University – P.I. Dr. David Hysell *Aug 2011- May 2013*

TEACHING

CU Boulder Introduction to Geology Lab Instructor *Jan 2022- May 2023*
Dynamics and Systems TA, Aerospace Vehicles TA *Jan 2020- May 2020*
MIT Lincoln Laboratory CubeSat course development with MIT Media Lab and MIT AeroAstro *Sep 2015- Sep 2019*
Cornell University Computer Vision (CURIE Academy), Mechatronics/ Mechanical Synthesis TA *Jan 2013- May 2015*

MENTORING

High Resolution Lunar Ice Mapping Research Team (2 undergraduates, 1 graduate student) *Mar 2025-Present*

Integrated Propellant Storage and Feed System Research Team (5 undergraduates)	Oct 2017- Sep 2019
Mechanical Engineering Intern and Co-op Program (4-6 undergrads/ year, 4-5 air force cadets/ year)	Sep 2017- Sep 2019
Regolith Thruster Research Team (3 undergraduates)	Aug 2014- May 2015
Violet Satellite Team Lead (4 undergraduates)	Aug 2013- Sep 2015

PUBLICATIONS

- Steckel, A.V.**, Tucker, G.E., Rossi, M. and Hynek, B., 2025. Landscape evolution models of incision on Mars: Implications for the ancient climate. *Journal of Geophysical Research: Planets*, 130(4), p.e2024JE008637.
- Steckel, A.V.**, 2024. *Developing Techniques to Assess the Habitability Potential of Ancient Mars and Beyond* (Doctoral dissertation, University of Colorado at Boulder).
- Stern, J., Graham, H., Burcar, B., Martin, M., Noell, A., Hand, K., Bowman, J., Doran, P., Edgcomb, V., Holden, J., Howells, A., Hurford, T., Malaska, M., Radebaugh, J., Rodriguez, L., Borges, S., Diaz, M., Courville, S., Huber, J., Lawrence, J., Vick-Majors, T., Nixon, C., Spear, J., **Steckel, A.V.**, Solomonidou, A., Walker, C., Whelley, P., Wolfenbarfer, N., Vance, S., A Comprehensive Framework for Assessing Terrestrial Analogue Field Sites for Ocean Worlds. Submitted.
- Steckel, A.V.**, Conrad, J.W., Dekarske, J., Dolan, S., Downey, B., Felton, R., Giesche, A., Hanson, L.E., Horvath, T., Maxwell, R., Shumway, A.O., Siddique, A.A., Strom, C., Teece, B.L., Todd, J., Trinh, K.T., Velez, M.A., Walter, C.A., Lowes, L., Hudson, T.L., and Scully, J.E.C., 2024. The Science Case for Nautilus: A Multi-flyby Mission Concept to Triton. In Prep.
- A.V. Steckel**, H. Delecki, W. Ren, and K. Thompson. "Freeform Propellant Delivery System for Cubesats (F-PoDS)." International Astronautical Congress (IAC) (2019).
- Steckel, A.** *Integrated Propellant Storage and Feed System* FY18 Engineering Research Technical Investment Program Report TIP-89, May 2019. <https://apps.dtic.mil/sti/citations/AD1098357>.
- Steckel, A.V.** Technical Report "Novel CubeSat Propulsion Storage and Feed System" (2017) MIT Lincoln Laboratory internal.
- Steckel, A.V.**, Wilenz, D.‡, and Coon, M.‡, Masters Report "Lunar Regolith Rocket" (2015).

PRESENTATIONS (*oral presenter, †poster, ‡undergrad mentee)

- Steckel, A.V.** †, Ehlmann, B., 2025. Color Parameterization of HiRISE and Mastcam-Z Observations to Map Noachian Terrain Geologic Units Identified from Orbit on the Ground with the Mars 2020 Rover. *LPI Contributions*, p.2822.
- Steckel, A.V.** *, Clark, R.N., Pearson, N.C., Buxner, S., Prettyman, T.H., Kumari, N., Meier, M.L., Ahrens, C.J., Martin, A.C., Patterson, R.V., Lane, M., Vilas, F., Knightly, P., Wettergreen, D., Banks, M.E., Bell, E., Wright, S.P., Noe Dobrea, E.Z., and Hendrix, A., 2024. Mineral Identification using Tetracorder during the TREX Field Campaign. *LPI Contributions*, p.2793.
- Steckel, A.V.** †, Conrad, J.W., Dekarske, J., Dolan, S., Downey, B., Felton, R., Giesche, A., Hanson, L.E., Horvath, T., Maxwell, R., Shumway, A.O., Siddique, A.A., Strom, C., Teece, B.L., Todd, J., Trinh, K.T., Velez, M.A., Walter, C.A., Lowes, L., Hudson, T.L., and Scully, J.E.C., 2024. The Science Case for Nautilus: A Multi-flyby Mission to Triton. *LPI Contributions*, p.1173.
- Steckel, A.V.** †, Conrad, J.W., Dekarske, J., Dolan, S., Downey, B.G., Felton, R., Hanson, L.E., Giesche, A., Horvath, T., Maxwell, R. and Shumway, A.O., 2023. The Science Case for Nautilus: A Multi-Flyby Mission Concept to Triton. AGU23.
- Steckel, A.V.***, Clark, R., Pearson, N.C., Buxner, S., Prettyman, T., Kumari, N., Meier, M., Ahrens, C., Martin, A.C., Patterson, R.V. and Lane, M., 2023, October. Hyperspectral Imaging Spectrometer for Geologic Unit Mapping in Planetary Analog Setting. In AAS/Division for Planetary Sciences Meeting Abstracts (Vol. 55, No. 8, pp. 317-07).
- Prettyman, T.H., Buxner, S., **Steckel, A.V.**, Knightly, J.P., Hendrix, A., Noe Dobrea, E., Clark, R.N., Wettergreen, D.S., Ahrens, C., Kumari, N., Martin, A.C., Meier, M.L., Patterson, R.V., and Vilas, F., 2023. Radioelement Geochemistry: Rover Analog Study at Yellow Cat. *LPI Contributions*, 2806, p.1389.
- Noe Dobrea, E.Z., Ahrens, C., Banks, M.E., Bell, E., Breifeld, A., Bristow, T., Candela, A., Clark, R.N., Hansen, M., Hendrix, A., Holsclaw, G., Knightly, P., Lane, M.D., Martin, A.C., Meier, M.L., Patterson, R.V., Pearson, N.C., Prettyman, T.H., **Steckel, A.V.**, Vijayarangan, S., Vilas, F., Wettergreen, D., and Wright, S.P., 2023. Autonomous Rover Science in the Field: Yellow Cat. *LPI Contributions*, 2806, p.2366.
- Steckel, A.V.** †, Clark, R.N., Pearson, N.C., Buxner, S., Prettyman, T.H., Kumari, N., Meier, M.L., Ahrens, C.J., Martin, A.C., Patterson, R.V., Lane, M., Vilas, F., Knightly, P., Wettergreen, D., Banks, M.E., Bell, E., Wright, S.P., Noe

Dobrea, E.Z, and Hendrix, A., 2023. Utilizing a Hyperspectral Camera for Field Surveys During the TREX Field Mission. *LPI Contributions*, 2806, p.2720.

Steckel, A.V.†, Tucker, G., Rossi, M., and Hynek, B. "Landscape Evolution Modeling of Martian River Valley Networks." AGU Fall Meeting Abstracts. Vol. 2021. 2021.

A.V. Steckel*, Jackson Jandreaux, Xianxin Li, Cissi Lin "Chu Lidar Group Arrival Heights Campaign," Scott Base, Antarctica. January 28 (2020).

A.V. Steckel and Adam Shabshalowitz* "Integrated Propellant Storage and Feed System," Tampa, FL. December 9-13 (2019).

A.V. Steckel*, H. Delecki‡, W. Ren‡, and K. Thompson. "Freeform Propellant Delivery System for Cubesats (F-PODs)" International Astronautical Congress, Washington, D.C. October 21-25 (2019).

A.V. Steckel†, A. Shabshalowitz. "Integrated Propellant Storage and Feed System." NASA In-Space Propulsion TIM (2019)

A.V. Steckel†, A. Shabshalowitz. "Integrated Propellant Storage and Feed System." JANNAF 13th MSS / 11th LPS / 10th SPS Joint Subcommittee Meeting and PIB Meeting (2019)

A.V. Steckel* "Novel Cubesat Propulsion Storage and Feed System." MIT Lincoln Laboratory, Advanced Prototype Engineering Technology Symposium, Lexington, MA, (2017).

MEDIA OUTREACH (*invited panelist)

SETI Live, Red Planet, Blue Past	<i>May 2025</i>
The Last Show with David Cooper, May 1, 2025	<i>May 2025</i>
CU Today, Did it rain or snow on ancient Mars? New study suggests it did	<i>April 2025</i>
Denver Fan Expo, Mars and the Moon: On-Going Exploration*	<i>Jul 2024</i>
PSI Blog, TREX Team Tests Rover-Based Science Automation in Utah Desert	<i>Oct 2022</i>
Denver Fan Expo, Mars: Fact vs. Fiction Panel*	<i>Jul 2022</i>
9 News, Earth's highest active volcano may hold secrets to Mars, scientists say	<i>Dec 2021</i>
CIRES Blog, Life on Earth's Highest Volcano	<i>Nov 2021</i>
Mines Space Robotics Challenge, AIAA Diversity in Aerospace Panel*	<i>Sep 2021</i>
Colorado Space Business Roundtable, AIAA Panel Young Professional*	<i>Jun 2021</i>
CIRES Blog, Lidar Exploration at the Bottom of the World	<i>Dec 2019</i>
Cary Memorial Library, Women in Leadership Forum*	<i>Mar 2018</i>
American Industries Association, Team America Rocketry Challenge Star Spotlight	<i>May 2015</i>
Cornell University Blog, Regolith Thruster	<i>Feb 2015</i>

SERVICE

Graduate and Professional Student Government	<i>2023-2024</i>
Cornell Alumni Admissions Ambassador	<i>2017-2022</i>
Rural Science Outreach, Waltham, CO	<i>Nov 2021- Apr 2022</i>
American Institute for Aeronautics and Astronautics	
• Rocky Mountain Council member	<i>Mar 2021-Dec 2022</i>
• Colorado Aerospace Days	<i>Mar 2022</i>
• Annual Technical Symposium (ATS) Volunteer	<i>Sep 2019, Sep 2021, Sep 2022</i>
• Congressional Visit Days	<i>Mar 2019, Mar 2021</i>
• Regional (WPI) Student Conference Judge	<i>Apr 2016</i>
• New England Council member	<i>Aug 2015- Sep 2019</i>
Science Fair Judge	
• Colorado Science and Engineering Fair	<i>Apr 2021</i>
• Colorado Wyoming Junior Academy of Science	<i>Apr 2021</i>
Citizens for Space Exploration	
• Congressional Visit Days	<i>Jun 2021</i>
Boys and Girls Club, Pueblo, CO	<i>Apr 2021</i>
Mountains for Moms	<i>Jan 2012- May 2014</i>

PROFESSIONAL & RESEARCH EXPERIENCE

California Institute of Technology, Pasadena, CA	<i>Sep 2024-Present</i>
Postdoctoral Scholar Research Associate in Planetary Science	
• Mastcam-Z instrument team on Mars 2020 rover. Operations roles: science downlink and uplink lead, multispectral research.	

- Lead research on water ice abundance in permanently shadowed regions (PSRs) for the Lunar Trailblazer (LTB) science team.
- Lead external hackathons to analyze radar and optical photometry observations post launch, and assisting with LTB recovery effort.

Laboratory of Atmospheric and Space Physics (LASP), Boulder, CO *Jun 2020-Aug 2024*
Graduate Researcher, National Science Foundation (NSF) GRFP Fellow

- Principal Investigator (PI) for Nautilus mission concept to Triton, with JPL's Team X at planetary science summer school (PSSS).
- Led hyperspectral spectroscopy for lunar exploration simulation (TREX, a NASA SSERVI node). Semi-autonomous mineral ID.
- Modeled landscape evolution on Mars; Europa penitente growth in Python.
- Microbial/geologic/solar radiation study evaluating Ojos del Salado: 22,600' as analog.
- Instructor for Intro to Field Geology.
- Designed icy moon plume experiment.

Maybell Quantum Industries (MQI), Denver, CO *Jun 2021- Sep 2021*
Contractor (8th hire)

- Lead Engineer for venture backed startup. Design / analysis / manufacturing. • Personnel hiring and set initial development goals.

Cooperative Institute for Research in Environmental Sciences (CIRES), Boulder, CO *Aug 2019- Jun 2020*
Graduate Researcher

- Upgrade and operate Fe Boltzmann, Na Fluorescence, and Fe Doppler lidar (McMurdo, Antarctica). Analyze stratospheric warming.

MIT Lincoln Laboratory (MIT LL), Lexington, MA *Sep 2015- Sep 2019*
Associate Staff, Mechanical Engineering (Group 71). Security Clearance: Top Secret / SCI

- PI for technical initiative (~\$200k of internal funding) Freeform Propellant Delivery System FY '17, '18, '19
- Mechanical Lead for Optical Payload Programs
 - Initial concept, CDR presentation, to sponsor delivery
 - Lead assembly & delivery in clean room
 - Lead design of custom sensor camera package
 - Lead detailed design and validation of mechanical parts, opto-mechanical and electromechanical assemblies
 - Integrate thermal, structural, electrical, optical engineering
 - Cyberscan, CMM, digital microscope inspections
 - Environmental, functional, and performance testing
- Mechanical design for ESPA-class spacecraft research programs, leading propulsion, attitude control, and SWaP trade studies
- CubeSat and Small Satellite working groups, proposal and program support
- Manage summer intern / co-op program

Space Exploration Technologies (SpaceX), McGregor, TX *Jun 2014- Aug 2014*
Ground Support Equipment Engineer

Space Systems Loral (SSL), Palo Alto, CA *Jan 2013- Aug 2013*
Structural Analyst & Mainbody Design

NASA Goddard Space Flight Center, Greenbelt, MD *Jun 2012- Aug 2012*
Magnetospheric Multiscale Mission (MMS) Propulsion Integration and Testing