

CURRICULUM VITAE (CONDENSED)

SPRUCE W. SCHOENEMANN, PHD

PROFESSOR

Environmental Sciences Department

The University of Montana Western

Dillon, MT, 59725

(360) 471-8835

spruce.schoenemann@umwestern.edu

[spruceschoenemann.com](https://www.linkedin.com/in/spruceschoenemann)

www.linkedin.com/in/spruceschoenemann

SUMMARY

I am a scientist, environmentalist, and climate specialist with a passion for tackling climate change and accelerating progress. My research investigates changes in Earth's past to better understand the long-term context of human-driven changes and future impacts on our climate system. I have a background in geology, environmental studies, and climate science, with a strong personal interest in boldly addressing the climate crisis through education & community engagement, natural climate solutions, sustainable resource management, renewable energy, decarbonization, and building resilience. I am passionate about protecting our winters and wilderness while securing a livable climate for future generations.

- Significant experience in drafting grant proposals, abstracts, and publishing peer-reviewed articles
 - Experience in project management, overseeing budgets, multi-disciplinary collaboration, and leading fieldwork
 - Excellent oral and graphical communication skills, experienced in external presentations, outreach, and engagement
 - Extensive knowledge of resource management, sustainable design, renewable energy, and climate solutions
 - Skilled in using Microsoft Office, Google Workspace, Adobe Acrobat/Illustrator, Slack, Zoom, MATLAB, QGIS, R, Structure-in-Motion, and other software
 - Detail-oriented, organized, reliable, versatile, collaborative, problem solver, and motivated self-starter
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EDUCATION

PhD Earth & Space Sciences, University of Washington

Sep 2009 – Mar 2015

- Climatology, Ice Core Paleoclimate Reconstructions, and Stable Isotope Geochemistry

Certificate: Graduate Certificate in Climate Science, UW Program on Climate Change

Sep 2010 – Jun 2014

BA in Geology and Environmental Studies, Whitman College

Sep 1999 – May 2003

Awarded Dr. Albert Ripley Leeds Prize in Geology (2003)

RESEARCH & TEACHING EXPERIENCE

Assistant/Associate/Full Professor

The University of Montana Western

Dillon, MT

Aug 2016 – present

Environmental Sciences Dept.

- Developed numerous applied science courses focused on past, current, and future climate change, including its impacts on water & air quality, forests, soils, permafrost, snowpack, and oceans, and incorporated the most current climate adaptation and resilience strategies to address the climate crisis. Select courses included: Weather & Climate, Carbon Cycle and Climate, Intro to Environmental Geology, Environmental Geochemistry, Sustainable Natural Resource Management, Water in the West: Science and Society, and PolarPASS Greenland Climate Change.
- Developed research program in paleolimnology of alpine lakes, combined with tree-ring records and regional water isotope systematics to reconstruct past winter hydroclimate in the Northern Rocky Mountains.
- Managed multiple NSF grants, including budget, timeline, personnel, field research, data analysis, interpretation, and synthesis. Deliverables included peer-reviewed publications, presentations, webinars, curriculum & websites.
- Director and coordinator of Save the Snow! Climate Summit and SnowPack Fest; community events that brought together scientists, stakeholders, and community groups to discuss strategies for climate action and resilience in rural Montana.
- Strong track record of communicating complex scientific concepts to broad audiences, including a TEDx talk titled "[What will the climate be like for our kids.](#)" where I discussed the increasing severity of climate change impacts on Montana and the Rockies, as well as regionally relevant solutions (see Selected Presentations).
- Established working relationships with external partners to address climate impacts, including the US Forest

Service, Bureau of Land Management, NRCS, MT Tech, MSU, & USGS Northern Rockies Center.

Lecturer (sabbatical appointment)

University of Vermont

Burlington, VT

Jan-May 2023

Rubenstein School of Env. & Natural Resources

Applied Polar Science & Climate Change ENSC295/395

- Designed course curriculum, assessments, and climate data/GIS analysis exercises.
- Presented and facilitated course lectures, student-led discussions, group worksheets, and activities.
- Developed 360° interactive environments and virtual field trips to immerse students in Greenland's glaciated landscapes.

Postdoctoral Research Associate

University of Washington, Earth & Space Sciences

Seattle, WA

Jan 2015 – Aug 2016

- Investigated the Holocene climate of Antarctica and the Southern Hemisphere through high-resolution ice cores and sediment cores to understand the application of ^{17}O -excess as a potential sea ice proxy.
- Researched connections between Arctic permafrost cores and moisture source regions during the Holocene period, using air-parcel back-trajectory modeling and isotope-enabled climate models

Graduate Research Assistant

University of Washington, Earth & Space Sciences

Seattle, WA

Sep 2009 – Dec 2014

- Studied past climate of Antarctica and the Southern Hemisphere through water isotopes preserved in ice cores to better understand the mechanisms responsible for the last deglacial transition.
- Implemented rare $\delta^{17}\text{O}$ isotopes into isotope-enabled General Circulation Model, and in Intermediate Complexity Isotope-Models for improved interpretation of $^{17}\text{O}_{\text{excess}}$ sensitivity to climate conditions.
- Designed and developed sample preparation line and Isotope Ratio Mass Spectrometer methods for high-precision measurement of $\delta^{17}\text{O}$ and $\delta^{18}\text{O}$ isotopes of O_2 .
- Presented at national and international science conferences on the implications of my climate research, and to local school and community organizations in the Seattle area.

Lecturer

University of Washington, Earth & Space Sciences

Seattle, WA

Mar – June 2015

The Earth System and Climate, ESS 201

- Designed overall course syllabus and assessment design.
- Developed a “flipped classroom” structure including course videos, readings, and online quizzes
- Presented and facilitated course lectures, student-led discussions, group worksheets, and activities.
- Developed and facilitated lab experiments, data analysis, demonstrations, and field trips.

Visiting Lecturer

Environmental Studies and Science Program

Colorado College

Colorado Springs, CO

Nov – Dec 2012

- Developed science curriculum and assessments for Intro to Global Climate Change course.
- Planned and facilitated daily class lectures, discussions, and labs.
- Organized interactive field trip to the National Ice Core Lab and INSTAAR Stable Isotope Lab.

PROFESSIONAL EXPERIENCE

Climate Lecturer, Zodiac Driver, & Staff Photographer

Zegrahm Eco Expeditions

Seattle, WA

Jan – Feb 2011

Falklands, South Georgia, & Antarctic Peninsula

- Presented two lectures on Antarctic ice cores & climate change research.
- Managed passenger safety and field risk, guided eco-tours both by Zodiac boat and on foot, produced a daily photo journal/blog, and provided descriptions of flora and fauna, species identification, and local geology.

Community Outreach Coordinator

City of Boulder

Boulder, CO

Jun 2008 – Nov 2008

Office of Environmental Affairs (now Office of Sustainability, Climate Action, and Resilience)

- Spearheaded neighborhood climate action group meetings and improved public engagement.
 - Developed marketing/outreach materials for all Climate Action Plan programs (ClimateSmart, Residential Energy Audit Program, Weatherization, Home Energy Makeover contest, and Transportation)
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TECHNICAL & INTERPERSONAL SKILLS

University Teaching, Curriculum Design, Public Speaking & Presentations, Grant & Report Writing, Research Design, Data Analysis/Statistics, Modeling, Field Work, Laboratory development and design, Project Management, Digital Photography, Website Design and Graphics, FAA Drone Pilot's License
Software: Microsoft Office, Google Workspace, Adobe Acrobat/Illustrator, Slack, Zoom, MATLAB, R-Studio, QGIS, HYSPLIT-back trajectory modeling, Statistics, Agisoft Metashape DEMs/Ortho maps for planning.
Effective Communication, Organizational Skills, Teamwork, Interdisciplinary Collaboration, Community Outreach

GRANTS

- C. Chupik, Y. Gavillot, **S. Schoenemann (collaborator)** and others, Dec 1, 2022- Jul 1, 2024), Exploring void detection, and seismic hazards using acoustic sub-bottom profiling data, Bureau of Reclamation-Technical Service Center, \$118,854.
- T. Moon, A. Gold, A. Khan, **S. Schoenemann (co-PI)** (Aug 1, 2020-Jul 31, 2023), Collaborative Research: EHR-Polar DCL: Polar Space and Place: Using GIS and interactive environments to bring polar science to the classroom, National Science Foundation, Award# 2021275, 2021543, 2021503: \$299,963
- S. Schoenemann (PI)**, L. Corbett, P. Bierman (Sep 15, 2020-Aug 31, 2022), Collaborative Research: A place-based, student-led research project in the Pioneer Mountains, Montana: an investigation of very dry, alpine glaciation proximal to the Laurentide Ice Sheet, National Science Foundation, Award# 2018222, 2018059: \$135,046.
- S. Schoenemann (PI)**, J. Sachs, R. Sletten, (Jun 10, 2019-Jul 1, 2020), West Greenland Coastal Temperatures during the 8.2 ka Event derived from Alkenones, Quaternary Research Center-Univ of Washington, \$7,500.
- S. Schoenemann (PI)**, G. Pederson, D. McWethy, J. Martin (Jan 1, 2018-Dec 31, 2018), Precipitation Isotope Ratios and Tree-ring based Snowpack Relationships to inform Paleoclimate Reconstructions from Lake Sediment Cores, NASA Montana Space Grant Consortium, \$101,476.08.
- E. J. Steig, A. J. Schauer, **S. W. Schoenemann** (Oct 1, 2013-Jan 31, 2017), Development of a laser spectroscopy system for analysis of ¹⁷O-excess on ice cores, Grant Opportunities for Academic Liaison with Industry, Paleoclimate Program, Antarctic Instrumentation & Support, Antarctic Glaciology, Climate & Large-Scale Dynamics, \$357,627.00.
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SELECTED PEER-REVIEWED PUBLICATIONS

- [1] **Schoenemann, S.W.**, M. Wolhowe, A. Maloney, R. Sletten, K. W. Huntington, A. J. Schauer, J. P. Sachs (2024), Prominent cooling of West Greenland during the 8.2 ka event based on multiple proxies from lake sediments, *Paleoceanography and Paleoclimatology*, In revision.
- [2] **Schoenemann, S.W.**, M.M. Bryant, W.B. Larson, L. B. Corbett, P.R. Bierman (2023). A cosmogenic ¹⁰Be moraine chronology of arid, alpine Late Pleistocene glaciation in the Pioneer Mountains of Montana, USA. *Quaternary Science Reviews*, 317, 108283, 1-20. <https://doi.org/10.1016/j.quascirev.2023.108283>
- [3] Gold, A.U., E.G. Ward, C. Marsh, T. Moon, A. Khan, **S.W. Schoenemann**, M. Littrell. (2023) Measuring novice-expert sense of place for a far-away place: Implications for geoscience instruction, *PLOS One*. Manuscript# PONE-D-22-27793
- [4] **Schoenemann, S. W.**, J.T. Martin, G.T. Pederson, and D.B. McWethy (2020), 2,200-year tree-ring and lake-sediment based snowpack reconstruction for the northern Rocky Mountains highlights the historic magnitude of recent snow drought, *Quaternary Science Advances*, 2, 100013, 1-13, doi:10.1016/j.qsa.2020.100013.
- [5] Porter, T. J., **S.W. Schoenemann**, L.J. Davies, E.J. Steig, S. Bandara, D. Froese (2019), Recent summer warming in northwestern Canada exceeds the Holocene thermal maximum, *Nature Communications*, 10, 1-10, doi:10.1038/s41467-019-09622-y.
- [6] Markle, B. R., E.J. Steig, C. Buizert, **S.W. Schoenemann**, C.M. Bitz, T. Fudge. J.B. Pedro, Q. Ding, T. Jones, J.W.C. White, T. Sowers (2016), Atmospheric teleconnections between the tropics and high southern latitudes during abrupt climate change, *Nature Geoscience*, 10, 36-40. Contributed to key science concepts, editing manuscript and supplement, and reviewing figures.

SELECTED PRESENTATIONS

- TEDx University of Montana Western **Dillon, MT** **Mar 23, 2024**
Spruce W. Schoenemann & 10-yr old daughter (Madrona Schoenemann)
[What will the future climate be like for our kids?](#)
- National Association of Geoscience Teachers- Webinar **Online** **Nov 17, 2023**
Spruce W. Schoenemann, E. Ward.
Hands-on with PolarPASS: Teaching with 360° Interactive Environments
- Montana Bureau of Mines & Geology **Butte, MT** **Nov 2, 2023**
Invited: Speaker Series: Quaternary Processes
Spruce W. Schoenemann, W. Larson, M. Bryant, L. Corbett, P. Bierman
Glacier chronologies of the Pioneer Mountains, MT derived from cosmogenic exposure dating
- American Geophysical Union – Fall Meeting **Chicago, IL** **Dec 12-16, 2022**
Spruce W. Schoenemann, Kori L. Mooney
4,400-year Reconstruction of Southwest Montana Hydroclimate using Tree-ring Snowpack Chronologies and Morrison Lake Sediment $\delta^{18}O$: Indications of past Snow Megadrought in the Northern Rockies. Poster # PP42B-06
- Alia L. Khan, **Spruce W. Schoenemann**, Twila A. Moon, Anne U. Gold, Emily Ward, Daniela Pennycook and Sophie Lei. *Engaging students in Polar Science: New undergraduate-level curriculum combines polar field data, 360-degree virtual experiences and GIS to transport students to Greenland.* Virtual Poster #ED55D-0187
- GSA Joint Rocky Mountain/Cordillera Section Meeting **Las Vegas, NV** **Mar 14-17, 2022**
Mana M. Bryant, Will B. Larson, **Spruce W. Schoenemann**, Lee B. Corbett, Paul R. Bierman
Investigating arid alpine Pleistocene glaciation in the Pioneer Mountains of Montana using cosmogenic 10-Beryllium.
- MT American Water Resources Assoc – Fall Meeting **Butte, MT (virtual)** **Oct 5-9, 2020**
Schoenemann, S. and L. Von Oesen
Lake Reconnaissance for Determining Potential Lake Cores with Carbonate for Retrieving Climate Records. Oral.
- American Geophysical Union – Fall Meeting **San Francisco, CA** **Dec 9-13, 2019**
Schoenemann, S. J. Nusbaumer, A. LeGrande, T. Porter
Ice Sheet-Moderated Changes in the Precipitation Isotope Climatology of NW Canada during the Late Deglacial. Poster #C21E-1494
- MT American Water Resources Assoc – Fall Meeting **Red Lodge, MT** **Oct 9-10, 2019**
Schoenemann, S. J. Martin, G. Pederson, D. McWethy
Precipitation Isotope Ratios and Tree-ring based Snowpack Relationships to inform Paleoclimate Reconstructions from Lake Sediment Cores. Poster.

CLIMATE AND ENVIRONMENTAL SCIENCE COURSES

- NR-ENSC295/395 Applied Polar Science & Climate Change (UVM) **Spr. 2023**
- ENSC 394B Polar Places and Spaces/NSF Greenland **Spr. 2022**
- ENSC 394 Glacial Geology of Montana **Spr. 2020, 22, 24**
- HONR 193F Iceland & Climate Change: Geological, Ecological, & Sustainability Investigations **Spr. 2019, 24**
- GEO 374 Carbon Cycle and Climate **Fall 2018, Spr. 20, 21, 24**
- HONR 194 Water in the West: Science & Society **Fall 2018**
- GEO 210 Weather and Climate **Fall 17, Spr. 19, Fall 19, 20, 21, 23, 24**
- NRSM 441 Sustainable Natural Resource Management **Spr. 2018**
- GEO 103 Intro to Environmental Geology **Fall 2016, 17, 19, Spr. 21, 22**
- CHMY 121 Intro to General Chemistry **Fall 2016, 17, 18, 20, 21, 23 & Spr. 17, 20**
- GEO 431 Environmental Geochemistry **Spr. 2017, 18, 19, 20, 21**
- ESS 201 The Earth System and Climate (Univ. of Washington) **Spr. 2015**
- EV 128 Introduction to Global Climate Change (Colorado College) **Fall 2011**

PROFESSIONAL/DEPARTMENTAL SERVICE

Member-American Geophysical Union (AGU)	2009–PRESENT
Member-National Association of Geoscience Teachers (NAGT)	2016–PRESENT
Member-Geological Society of America (GSA)	2020–PRESENT
Member-Western US Paleoglacier Working Group (WUSPG)	2022–PRESENT
Paper Reviewer – <i>Journal of Quaternary Science, Climate Dynamics, EPSL The Cryosphere, The Holocene, PNAS, JGR Atmosphere, Geophysical Research Letters</i>	2013–PRESENT

UMWestern Environmental Sciences Department:

Faculty Development Fund Committee	Fall 2023
Environmental Geophysics Search Committee Member	Spring 2020
Strategic Enrollment Management Committee	Fall 2019–2022
Chemistry Search Committee Member	Fall 2018–Spring 2019
Honors Committee	Fall 2018–Present
Env. Sustainability Search Committee Member	Spring 2018
Environmental Sciences Department, Department Chair	Fall 2017–Fall 2018
Budget Committee	Fall 2017–Fall 2018
Collective Bargaining Committee	Fall 2017–present
University Court Committee	Fall 2016–2022

PUBLIC OUTREACH & SERVICE

Coordinator – <i>Snowpack Fest</i>	Dillon, MT	Jan 30-Feb 1, 2020
Coordinator/Presenter – <i>Save the Snow! Climate Summit Precipitation Isotope Ratios and Tree-Ring Based Snowpack Relationships to Inform Paleoclimate Reconstruction from Lake Sediment Cores</i>	Dillon, MT	Mar 15, 2019
Presenter – <i>Patagonia Outlet Store Antarctica to Iceland – Secrets of the Ice: Climate Research in Antarctica</i>	Dillon, MT	Dec 7, 2018
Presenter – <i>Washington Science Teachers Association Next Generation Science Standards and Climate Change in the High School Classroom</i>	Shorecrest, WA	Oct 24, 2015
Research Presenter – <i>Science Inside Out College of the Environment</i>	Seattle, WA	Nov, 2013
Program on Climate Change, UW in High School <i>Curriculum design and development for UW Atmos211</i>	Seattle, WA	2010–2015
Pacific Science Center <i>Polar Science Weekend (annual event)</i>	Seattle, WA	2010–2012, 2015
H.M. Jackson High School <i>Climate Expeditions: Adventures in Polar Research Developed in concert with the Ice Drilling Program Office – Dartmouth, NH</i>	Mill Creek, WA	Apr 11, 2012
UW in High School, University of Washington <i>Orbital Forcing of Climate, Interpreting Temperature Variations recorded in Ice Cores</i>	Seattle, WA	Mar 10, 2012
Bremerton High School <i>Climate Expeditions: Adventures in Polar Research</i>	Bremerton, WA	Feb 22, 2012
Ingraham High School <i>Antarctic Climate Evidence from Ice Cores</i>	Northgate, WA	Jan 5, Feb 2, 2012
National Science Teachers Association–Regional Meeting <i>Climate Expeditions: Adventures in Polar Research</i>	Seattle, WA	Dec 9, 2011