CURRICULUM VITAE

SPRUCE W. SCHOENEMANN, PH.D.
ASSISTANT PROFESSOR
Environmental Sciences Department
The University of Montana Western

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SUMMARY OF QUALIFICATIONS

- Strong personal and professional interest in Environmental Science and Climate Change solutions
- 6 years experience of scientific research; applying analytical tools and implementing research methods
- Experienced in teaching and designing inclusive and engaging curriculum for undergraduate students
- Extensive teaching experience in academic and outdoor/experiential education settings
- Skilled in organizing and facilitating field research and course field trips
- Strong commitment to developing students' critical reasoning skills and interdisciplinary approaches to problem-solving
- Detail-oriented, meticulous, motivated, reliable, collaborative, team player, and good-natured

EDUCATION

Ph.D. Earth & Space Sciences, University of Washington **2015**
- Climatology, Ice Core Paleoclimate Reconstructions, and Stable Isotope Geochemistry

***Certificate**:* Graduate Certificate in Climate Science, Program on Climate Change **Jun 2014**

Related Coursework: Paleoclimatology and Proxies, Isotope Geochemistry, The Global Carbon Cycle, Ice and Climate Climate Dynamics, Objective Statistical Analysis, Principles of Glaciology, and Energy, Science, and Technology,

B.A. in Geology and Environmental Studies, Whitman College **May 2003**
Awarded Dr. Albert Ripley Leeds Prize in Geology (2003)

Sea Education Association (SEA), Boston University **Sept – Dec 2001**
Nautical Science and Oceanography semester aboard
SSV Schooner Westward

RESEARCH INTERESTS

- Understanding the variability and dynamics of past and present climate change, thereby informing our projections of future climate change
- Paleoclimate reconstructions from proxy records including ice cores, sediment and ocean cores, and other environmental recorders
- Utilize geochemical tracers, such as water isotopes, to investigate spatial and temporal changes in the Earth's hydrological cycle, including regional precipitation, snowpack, and lakes.

TEACHING INTERESTS

- Undergraduate and graduate environmental science and climate courses, including Environmental Geochemistry, Geology, Earth's Climate System, Glaciology and Ice Sheets, Paleoclimate and Proxies, and Regional Climate Impacts
- Commitment to developing science curriculum that promotes transferable skills including: scientific inquiry, data analysis and interpretation, problem-solving, comprehend long-term implications, critical reading and effective writing
- Advising graduate and undergraduate research projects and coordinating capstone seminars

RESEARCH & FIELD EXPERIENCE

Assistant Professor
The University of Montana Western **Dillon, MT** **Aug. 2016 – present**
Environmental Sciences Dept.

- Taught Geology of the American West, Intro to Environmental Geology, and Intro to General Chemistry during Fall semester
- Courses are developed for Experience One (known as X1) where students take one course at a time for 3.5 weeks.
- Classes provide authentic practice in the discipline, including hands-on, experiential, and project-based research and transferable job skills.

Postdoctoral Research Associate
University of Washington, Earth & Space Sciences **Seattle, WA** **Feb 2015 – Aug. 2016**

- Investigation of Holocene climate of Antarctica and the Southern Hemisphere through high-resolution ice cores and sediment cores with an aim to understand the application of ^{17}O-excess as a sea ice proxy.
- Utilize back-trajectory modeling and isotope models for investigating connections between Arctic permafrost cores and moisture source regions during the Holocene period.

Graduate Research Assistant
University of Washington, Earth & Space Sciences **Seattle, WA** **2009 – 2014**

- Study past climate of Antarctica and the Southern Hemisphere through water isotopes preserved in ice cores with an aim to better understand the mechanisms responsible for the last deglacial transition.
- Implementation and inclusion of δ^{17}O isotopes into isotope-enabled General Circulation Model, and in Intermediate Complexity Isotope-Models for interpretation of $^{17}O_{excess}$ sensitivity to climate conditions.
- Developed sample preparation line and Isotope Ratio Mass Spectrometer methods for high precision measurement of δ^{17}O and δ^{18}O isotopes of O_2.

Graduate Student Representative
Program on Climate Change, University of Washington **Seattle, WA** **2011-2012**

- Represented graduate student perspectives, curricular needs, and feedback/suggestions on PCC Advisory Committee
- Provided regular feedback to graduate students on PCC state of affairs, student opportunities for fellowships, and upcoming PCC-related events

Field & Lab Technician
University of Washington **Kangerlussuaq, Greenland** **Aug – Sept 2012**

- Gathered water samples for performing a suite of geochemistry and sedimentological analysis.
- Filter waters for sediment grain size & distribution, Sulfates, Particulate Organic Carbon, and Dissolved Organic Carbon
- Utilized a spectrophotometer for measurements of Fe(II), Fe(tot), and DOC absorbance
- Responsibilities included site maintenance of data loggers, checking rain gauges, calculating stream discharge, and measuring pH, Ec, and DO

Field Technician
University of Washington **Mt Waddington, B.C** **June – July 2010**

- Assisted with assembly, set up & operation of drilling tower, winch, and core barrel
- Responsibilities included recovering the ice core, logging the core, and packing for shipment

Ice Core Handler and Science Technician
University of New Hampshire **WAIS Divide, Antarctica** **Nov 2008 – Jan 2009**
Science Coordination Office

- Responsibilities included removing the drilling fluid from the core, measuring the length, quality, and electrical properties of the core, packing the core for shipment, and assisting the drillers with quality control

TEACHING EXPERIENCE: ACADEMIC

Lecturer
The Earth System and Climate, ESS201
Univ. of Washington, Earth & Space Sciences **Seattle, WA** **Spring Qtr. 2015**

- 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 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 field trip to National Ice Core Lab and INSTAAR Stable Isotope Lab

Teaching Assistant
The Earth System and Climate, ESS201
Univ. of Washington, Earth & Space Sciences **Seattle, WA** **Winter Qtr. 2011, 2013**

- Assisted in the overall course planning and assessment design
- Presented course material during faculty absence
- Facilitated lab sections and discussions, and labs

Science Fellow
Eagle Rock School and Professional Development Center **Estes Park, CO** **Sept 2006 –Aug 2007**

- One-year residential teaching fellowship position at the Eagle Rock School and Professional Development Center
- Developed interdisciplinary science curriculum and assessments for diverse learning styles
- Instructed or co-instructed courses on geology, region specific environmental and social studies, river ecology, climate change, and physics
- Provided positive role modeling and developed mentoring relationships with students to help them foster their academic and personal growth

TEACHING EXPERIENCE: EXPERIENTIAL

Instructor
Outward Bound Wilderness, HIOBS **Wheeler Bay, ME** **May – Aug 2006**

- Led 22 & 16-day Ocean Bound Expeditions to Bermuda and Nova Scotia respectively and one 8-day Pulling Boat course
- Responsibilities included pre-program preparation, program coordination and planning
- Taught core values, seamanship, nautical and maritime science, all in an expeditionary-based learning model
- Encouraged and developed teamwork, compassion, service, and physical fitness

Crew Leader
Student Conservation Association **Naches, WA & Seward, AK** **June 2004, July 2005**

- Led 4-week backcountry trail crew of high school age volunteers in conservation service projects for US Park Service
- Duties included pre-program preparation, backcountry living instruction, group facilitation, risk management, environmental and experiential education, and trail maintenance project completion

Program Coordinator & Instructor Deckhand
Guided Discoveries CIMI Tall Ship Expeditions **Long Beach, CA** **Feb – May 2005**

- Organized and implemented 2, 3, and 5-day overnight trips
- Taught marine science, oceanography, marlinspike seamanship, navigation, and ship operations
- Rotated between program coordinator, instructor, and deckhand

Naturalist
Naturalists At Large **Ventura, CA** **Sept – Oct 2004**

- Planned, organized, and facilitated daily environmental programs, and climbing/ropes course programs with 7-9th graders for 3-5 day long trips throughout various locations in CA
- Directed discussions, activities, and other educational-based programming for groups of 8-12 high school students
- Responsibilities included pre-program staff days, natural history of each region, experiential education, backcountry living instruction, group initiatives, and risk management

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
- Responsibilities included passenger safety and risk management, eco tours both by Zodiac boat and on foot, daily photo journal, descriptions of flora and fauna, species identification, and local geology

Community Outreach Coordinator
City of Boulder **Boulder, CO** **June 2008 – Nov 2008**
Office of Environmental Affairs

- Facilitated neighborhood climate action group meetings and coordinate among groups
- Assisted with marketing/outreach of all Climate Action Plan programs (ClimateSmart, Residential Energy Audit Program, Weatherization, Home Energy Makeover contest, and Transportation)

PEER-REVIEWED PUBLICATIONS

[1] **Schoenemann, S. W**. and E.J. Steig (2016), Seasonal and spatial variation of $^{17}O_{excess}$ and d_{excess} in Antarctic precipitation: insights from an intermediate complexity isotope model, *J. Geophys. Res. Atmos.* 121, doi:10.1002/2016JD025117.

[2] 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, Atmospheric teleconnections between the tropics and high southern latitudes during abrupt climate change, *Nature Geoscience*, Vol 10, pp. 36-40. *Contributed to key science concepts, editing manuscript and supplement, and reviewing figures.*

[3] Jones, T. R. et al., (2016), Improved Methodologies for Continuous Flow Analysis of Stable Water Isotopes in Ice Cores, *Atmospheric Measurement Techniques Discussions*, ***In Review***, doi:10.5194/amt-2016-118.

[4] Schauer, A. J., **S. W. Schoenemann**, and E. J. Steig (2016), Routine high-precision analysis of triple water-isotope ratios using cavity ring-down spectroscopy, *Rapid Communications in Mass Spectrometry*, 30, 2059-2069, doi:10.1002/rcm.7682.

[5] **WAIS Divide Project Members** (2015), Precise interpolar phasing of abrupt climate change during the last ice age, *Nature*, 520, 661−665, doi:10.1038/nature14401. *Contributed to editing manuscript and interpretation of isotope/CH_4 records.*

[6] **Schoenemann, S. W.**, E. J. Steig, Q. Ding, B. R. Markle, and A. J. Schauer (2014), Triple water-isotopologue record from WAIS Divide, Antarctica: controls on glacial-interglacial changes in ^{17}O-excess of precipitation, *J. Geophys. Res. Atmos.,* 119, 8741–8763.

[7] Steig, E. J., V. Gkinis, A. J. Schauer, **S. W. Schoenemann**, K. Samek, J. Hoffnagle, K. J. Dennis, and S. M. Tan (2014), Calibrated high-precision $^{17}O_{excess}$ measurements using laser-current tuned cavity ring-down spectroscopy, *Atmospheric Measurement Techniques*, 6, 10191–10229.

[8] **Schoenemann, S. W.**, A. J. Schauer, and E. J. Steig (2013), Measurement of SLAP2 and GISP $\delta^{17}O$ and proposed VSMOW-SLAP normalization for $\delta^{17}O$ and $^{17}O_{excess}$, *Rapid Communications in Mass Spectrometry*, 582–590, doi:10.1002/rcm.6486.

[9] **WAIS Divide Project Members** (2013), Onset of deglacial warming in West Antarctica driven by local orbital forcing, *Nature*, 500, 440-444, doi:10.1038/nature12376. *Contributed to writing manuscript, GCM-enabled isotope modeling, and interpretation of isotope records and GCM results.*

[10] Steig, E. J. et al. (2013), Recent climate and ice-sheet changes in West Antarctica compared with the past 2,000 years, *Nature Geoscience*, 6, 372–375.

PRESENTATIONS

American Geophysical Union– Fall Meeting **San Francisco, CA** **Dec 14-18, 2015**
Schoenemann, S. and E. Steig
Seasonal and spatial variation of ^{17}O-excess and d_{excess} in Antarctic precipitation:

Insights from an intermediate complexity isotope model, Abstract PP78843

WAIS Divide Ice Core Project– Science Meeting **La Jolla, CA** **Sept 22-23, 2015**
Seasonal and spatial variation of ^{17}O-excess and d_{excess} in Antarctic precipitation: Insights from an intermediate complexity isotope model and high-resolution seasonal data

American Geophysical Union– Fall Meeting **San Francisco, CA** **Dec 15-19, 2014**
UWHS Climate Science: Uniting University Scientists and High School Teachers in the Development and Implementation of a Dual-Credit STEM-Focused Curriculum-Poster ED23A-0742

American Geophysical Union– Fall Meeting **San Francisco, CA** **Dec 9-13, 2013**
Schoenemann, S., E. Steig, Q. Ding, A. Schauer,
Sea Ice Control of $^{17}O_{excess}$ in Antarctic Precipitation, Abstract PP41D-08

International Partnership in Ice Coring Sciences **Presqu'ile de Giens, France** **Oct, 2012**
Schoenemann, S., E. Steig, Q. Ding, A. Schauer,
Glacial-Interglacial Change of $^{17}O_{excess}$ at WAIS Divide and other Antarctic Cores (poster).

6th Graduate Climate Conference– Session Chair **Packwood Forest, WA** **Oct 26, 2012**
An Introduction and Background to our Favorite Climate Recorder: Paleo Cryosphere!

Colorado College– Visiting Lecturer Interview **Colorado College, CO** **Oct 15, 2012**
What do Ice Cores and Water Isotopes tell us about Past Antarctic Climate?

European Geosciences Union– General Assembly **Vienna, Austria** **Apr 26, 2012**
Schoenemann, S., E. Steig, Q. Ding, A. Schauer,
Ice Core Measurements and GCM Simulation of the Spatial Distribution and Glacial-Interglacial Change of 17O-excess in Antarctica, Abstract EGU2012-1029

American Geophysical Union– Fall Meeting **San Francisco, CA** **Dec 5-8, 2011**
Schoenemann, S., E. Steig, Q. Ding, A. Schauer,
Measurement and GCM Simulation of the Spatial Distribution and Glacial-Interglacial Change of ^{17}O-excess in Antarctica.

Northwest Glaciologist – Science Meeting **Portland, OR** **Oct 19, 2011**
Measurement of the Spatial Distribution and Glacial-Interglacial Change of ^{17}O-excess in West Antarctica.

WAIS Divide Ice Core Project– Science Meeting **La Jolla, CA** **Sept 27-30, 2011**
Measurement of the Spatial Distribution and Glacial-Interglacial Change of ^{17}O-excess in West Antarctica.

Earth & Space Sciences Gala **University of Washington** **Mar 30, 2011**
^{17}O-excess of H_2O from a West Antarctic Ice Core: Method Development and Implementation of $\delta^{17}O$ into a Climate Model.

Zegrahm Eco Expeditions **Seattle, WA** **Feb 4, 2011**
Antarctic Climate Evidence: How We Know What We Know

FUNDING, HONORS, AND AWARDS

Funded Grants

E. J. Steig, A. J. Schauer, S. W. Schoenemann (Oct 1, 2013-Jan 31, 2017), Development of a laser spectroscopy system for analysis of ^{17}Oexcess on ice cores, Grant Opportunities For Academic Liaison With Industry, Paleoclimate Program, Antarctic Instrumentation & Support, Antarctic Glaciology, Climate & Large-Scale Dynamics, $357,627.00

S. W. Schoenemann (2014−2015), Reconstruction of Holocene temperatures from Greenland lake sediment cores using a novel method: Clumped Isotopes, Quaternary Research Center, University of Washington, $3300

Pending Grants

S. W. Schoenemann (Jan 1, 2017-Dec 31 2017), Snowpack, Precipitation Isotopes and Climate Relationships to inform Paleoclimate Reconstructions from Alpine Lake Sediment Cores, Montana Space Grant Consortium, $75,919

Funded Fellowships

S. W. Schoenemann (2013−2014), Reconstruction of Holocene temperatures from Greenland lake sediment cores using a novel

method: Clumped Isotopes, Earth & Space Sciences Departmental Award, Pilot Study $2500

S. W. Schoenemann (Summer 2011), From Water Isotopes to Temperature: Climate Reconstructions from Ice Cores, NASA/UWHS Research Assistant Fellowship, NASA Global Climate Change Education/Program on Climate Change, ~$4250.

Other Awards

- Misch Research Assistant Fellowship (1 quarter), Earth & Space Sciences Departmental Award, May, 2012
- Best Surface Processes, Oral Presentation, Earth & Space Science, Oct 26, 2010
- Top Scholar Research Assistantship
  Graduate School's Fund for Excellence and Innovation (GSFEI), University of Washington, Autumn, 2009

OUTREACH & SERVICE

Paper Reviewer – *Journal of Quaternary Science, Climate Dynamics* **2013 – PRESENT**

Presenter – *Washington Science Teachers Association* **Shorecrest, WA** **Oct 24, 2015**
Next Generation Science Standards and Climate Change in the high school classroom

Research Presenter – *Science Inside Out* **Seattle, WA** **Nov, 2013**
College of the Environment

Program on Climate Change, UW in High School **Seattle, WA** **2010 – 2015**
Curriculum design and development for UW Atmos211

Pacific Science Center **Seattle, WA** **2010 – 2012, 2015**
Polar Science Weekend (annual event)

H.M. Jackson High School **Mill Creek, WA** **Apr 11, 2012**
Climate Expeditions: Adventures in Polar Research
Developed in concert with the Ice Drilling Program Office – Dartmouth, NH

UW in High School, University of Washington **Seattle, WA** **Mar 10, 2012**
Orbital Forcing of Climate, Interpreting Temperature Variations recorded in Ice Cores

Bremerton High School **Bremerton, WA** **Feb 22, 2012**
Climate Expeditions: Adventures in Polar Research

Ingraham High School **Northgate, WA** **Jan 5, Feb 2, 2012**
Antarctic Climate Evidence from Ice Cores

National Science Teachers Association–Regional Meeting **Seattle, WA** **Dec 9, 2011**
Climate Expeditions: Adventures in Polar Research

ACADEMIC PROFESSIONAL DEVELOPMENT

Sixth Graduate Climate Conference– UW	**Pack Forest, WA**	**Oct 26-28, 2012**
Program on Climate Change– Summer Institute (*Topic: Hydrologic Cycle)*	**Friday Harbor, WA**	**Sept 2011**
Program on Climate Change– Summer Institute (*Topic: Climate Feedbacks)*	**Friday Harbor, WA**	**Sept 2010**
Fourth Graduate Climate Conference – UW	**Pack Forest, WA**	**Oct 15-17, 2010**
Meeting the Global Energy and Climate Challenge– University of Colorado Boulder	**Boulder, CO**	**Aug 22-23, 2008**
Global Climate Change Summit – OSU	**Columbus, OH**	**Jan 2007**
Climate Friendly Parks Workshop– RMNP	**Estes Park, CO**	**Mar 20-22, 2007**

TECHNICAL SKILLS

Laboratory development and design, Matlab, Microsoft Word, Microsoft Excel, Microsoft PowerPoint, Mac Keynote, Adobe Illustrator, Grant Writing 2007, 2008, & 2010 NSF Graduate Research Fellowship Program, and 2011, 2012, 2013 NSF Office of Polar Programs, Effective Communication, Interpersonal Skills, Organizational Skills, and Digital Photography

REFERENCES

Rob Thomas – The University of Montana Western
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Eric Steig – University of Washington
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ADDITIONAL REFERENCES

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