Nicholas D. Holschuh
Curriculum Vitae

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Professional Appointments

2016-Present ***Postdoctoral Research Associate,*** *University of Washington*

2012-16 ***NSF Graduate Research Fellow,*** *Pennsylvania State University*
2011-12 ***University Graduate Fellow,*** *Pennsylvania State University*
Methods and applications of radio-frequency geophysics in glaciology.

Summers 2014/15 ***Graduate Research Intern,*** *Chevron Energy and Technology Company*
Improving time shift methods for 4D seismic data analysis

2010-11 ***Research Fellow,*** *Pacific Tsunami Warning Center.*
Investigating the role of fault geometry on tsunamigenesis

2008-10 ***Research Assistant,*** *Department of Geology - Carleton College.*
Investigating the surface water chemistry of Rice County, MN.

Education

2016	*Ph.D. - Geosciences*	Pennsylvania State University	*(NSF Graduate Research Fellow)*
2015	*Graduate Teaching Certification*	Pennsylvania State University	
2011	*B.A. - Geology*	Carleton College	*(Summa Cum Laude)*
2011	*B.A. - Economics*	Carleton College	

Patents

1. Holschuh, N., C. Li, M. A. Meadows, and S. Dobbs (2014). Systems and Methods for Aligning a Monitor Seismic Survey with a Baseline Seismic Survey. *Chevron USA Inc.* **US14565117**, 1–16.

Publications

11. Riverman, K., R. Alley, S. Anandakrishnan, K. Christianson, N. Holschuh, B. Medley, A. Muto, and L. Peters (2019). Enhanced Firn Densification in High-Accumulation Shear Margins of the NE Greenland Ice Stream. *Journal of Geophysical Research: Earth Surface*, 1–18.
10. Alley, R., D. Pollard, B. Parizek, S. Anandakrishnan, M. Pourpoint, N. Stevens, J. MacGregor, K. Christianson, A. Muto, and N. Holschuh (2019). Possible Role for Tectonics in the Evolving Stability of the Greenland Ice Sheet. *Journal of Geophysical Research: Earth Surface*, 1–19.
9. Muto, A., S. Anandakrishnan, R. B. Alley, H. J. Horgan, B. R. Parizek, S. Koellner, K. Christianson, and N. Holschuh (2019). Relating bed character and subglacial morphology using seismic data from Thwaites Glacier, West Antarctica. *Earth and Planetary Science Letters* **507**, 199–206.
8. Holschuh, N., K. Christianson, H. Conway, R. W. Jacobel, and B. C. Welch (2018). Persistent Tracers of Historic Ice Flow in Glacial Stratigraphy near Kamb Ice Stream, West Antarctica. *The Cryosphere* **5**(May), 1–10.
7. Kehrl, L., H. Conway, N. Holschuh, S. Campbell, A. A. V. Kurbatov, and N. E. N. Spaulding (2018). Evaluating the duration and continuity of potential climate records from the Allan Hills Blue Ice Area, East Antarctica. *Geophysical Research Letters* **45**, 4096–4104.
6. Holschuh, N., B. R. Parizek, R. B. Alley, and S. Anandakrishnan (2017). Decoding ice sheet behavior using englacial layer slopes. *Geophysical Research Letters* **44**(11), 5561–5570.
5. Luthra, T., L. L. E. Peters, S. Anandakrishnan, R. R. B. Alley, N. Holschuh, and A. A. M. Smith (2017). Characteristics of the sticky spot of Kamb Ice Stream, West Antarctica. *Journal of Geophysical Research: Earth Surface* **122**(3), 641–653.
4. Holschuh, N., K. Christianson, S. Anandakrishnan, R. R. B. Alley, and R. R. W. Jacobel (2016). Constraining attenuation uncertainty in common midpoint radar surveys of ice sheets. *Journal of Geophysical Research: Earth Surface* **121**(10), 1876–1890.

3. Luthra, T., S. Anandakrishnan, J. P. Winberry, R. B. Alley, and N. Holschuh (2016). Basal characteristics of the main sticky spot on the ice plain of Whillans Ice Stream, Antarctica. *Earth and Planetary Science Letters* **440**, 12–19.
2. Holschuh, N., D. Pollard, R. R. B. Alley, and S. Anandakrishnan (2014). Evaluating Marie Byrd Land stability using an improved basal topography. *Earth and Planetary Science Letters* **408**, 362–369.
1. Holschuh, N., K. Christianson, and S. Anandakrishnan (2014). Power loss in dipping internal reflectors, imaged using ice-penetrating radar. *Annals of Glaciology* **55**(67), 49–56.

Awards and Honors

2018 1st Place Presentation - University of Washington Postdoctoral Research Symposium
2016 3rd Place Presentation - Penn State Graduate Student Exhibition
2015 Outstanding Student Paper Award - AGU Fall Meeting
Schenck Teaching Assistant of the Year - PSU College of Earth and Mineral Science
2nd Place Presentation - Penn State Geosciences Colloquium
2014 Dr. Gabriel and Mrs. Katherine Leblanc Fellowship in the Geosciences
2013 Shell Research Facilitation Award
2012 NSF Graduate Research Fellowship
2011 University Graduate Fellowship - Pennsylvania State University
Distinction in Undergraduate Thesis - Economics
Distinction in Undergraduate Thesis - Geology
Phi Beta Kappa Qualification
Sigma Xi Qualification
2010 Duncan Stewart Fellow in Geology
2009 Ernest F. Hollings Scholar

Teaching Experience

Spring 2019 **University of Washington, ESS 203: Glaciers and Global Change**, *(Course Instructor)*
I will be co-teaching ESS203 in Spring, 2019, with Dr. Peter Neff.

Fall 2017 **University of Washington, ESS 431/505: Principles of Glaciology**, *(Course Instructor)*
In this course and the associated lab section, we covered: cloud nucleation, snow deposition and metamorphism, glacier surface energy balance, the physics of ice flow, glacier erosion, and sea ice dynamics.
Teaching Assistant: Laura Kehrl – (Enrollment: 25UG, 3G)

Guest Lecture Positions (# Lectures provided)

05/2017 **240: Geophysics,** *Carleton College* - Active Source Imaging Techniques (2L)
10/2016 **431: Principles of Glaciology,** *UW* - Glacier Sliding and Hydrology (1L)
02/2016 **330: Geology of Climate Change,** *PSU* - Carbon Dating and Calibration (2L)
01/2016 **216: Antarctic Earth Science,** *Carleton College* - Dynamics of the Modern Ice Sheets (2L)
02/2015 **558: Multichannel Seismic Processing,** *PSU* - Correlation, Convolution, and Filtering (4L)
01/2013 **330: Geology of Climate Change,** *PSU* - Black Body Radiation, Heat Transport (3L)

Teaching Assistantships

Fall 2014 **230: Physical Processes in the Geosciences -** PSU, Geosciences
Fall 2010 **331: Intermediate Macroeconomic Theory -** Carleton College, Economics
Spring 2010 **110: Fundamentals of Macroeconomics -** Carleton College, Economics
Winter 2010 **255: Petrology -** Carleton College, Geology
Fall 2010 **250: Mineralogy -** Carleton College, Geology

Other Teaching Experience

2014-16 **Graduate Writing Tutor**, *College of Earth and Mineral Sciences - Pennsylvania State University.*

Field Experience

2017-18 (2 weeks) ***Terrestrial Radar Interferometry,*** *Coleman and Roosevelt Glaciers, Mt. Baker, WA*
Together with 3 graduate and 3 undergraduate students, we conducted a series of repeat GPRi (Gamma Portable Radar interferometer) radar campaigns over the course of summers, 2017-18, in order to measure temporal variations in glacier flow speed. These were calibrated with simultaneous flow-speed measurements taken on glacier, using real-time kinematic GPS.

2014 (8 weeks) ***Surface and Borehole Geophsyics,*** *WAIS Divide, West Antarctica*
We conducted a seismic AVO survey, using both a surface geophone array and a borehole seismometer stationed in the relict WAIS Divide Ice Core borehole. We also deployed a 3MHz radar system, and performed shallow refraction seismic surveys to compute firn density profiles at several locations along a transect perpendicular to the ice divide.

Funded Proposals

I have received over 15 travel funding, research, and outreach facilitation proposals funded. **At present I do not have status to act as a PI, but I have assisted with the writing and submission of 14 NASA, NSF, and Foundation grant proposals.**

Advising

I have participated in the advising of the following students:

2017+	Andrew Hoffman	*(Grad - UW)* Surface elevation change, Thwaites Glacier
2017+	Ben Hills	*(Grad - UW)* Radar reflection power interpretation, NEGIS
2016+	Annika Horlings	*(Grad - UW)* Surface elevation change over Thwaites Glacier
2017	Adam Stanford-Moore	*(UG - Stanford)* Radar interferometry on Mt. Baker, WA
2017	Ethan Guzek	*(UG - UW)* Englacial structures at subglacial lake Whillans
2016	Priyanka Bose	*(UG - PSU)* Basal crevasse mapping, Kamb Ice Stream
2015	Gina Sarkawi	*(UG - PSU)* Radar data processing on Kamb Ice Stream

Service

2013-Present **Referee** - Nature, Geology, The Cryosphere, IEEE, Journal of Glaciology

2017-Present **Session Convener** - AGU Fall Meeting, GSA Annual Meeting

2017-Present **Proposal Review Panelist and External Reviewer** - NASA, NSF

2012-Present **Member of the Following Departmental Committees:**
Diversity Committee - University of Washington Earth and Space Sciences *(Member, 2017+)*
Earth and Space Sciences Museum Board - PSU *(Student Member, 2015-16)*
Faculty Committee - PSU Department of Geosciences *(Student Representative, 2012-15)*

2017-Present **NASA Sea Level Change Team**
Determined through an open call for proposals, NASA has selected 8 teams to collaborate to identify, quantify, and project decadal sea level change. Together with Dr. Knut Christianson, I am responsible for altimetry integration into predictions of future sea level rise from the ice sheets.

2016-Present **ICESat-II Science Definition Team**
Working with Dr. Ben Smith at the University of Washington's Applied Physics lab, I assist with algorithm testing and optimization for the ice sheet surface height determination scheme in development for the upcoming ICESat-II mission.

Outreach

2017/18 **Polar Science Weekend**
Presented ice dynamics and ice-core exhibits at the Pacific Science Center as part of Polar Science Weekend.

2017/18 **Middle School Curriculum Development and Science Night**
Worked with Guy Lawrence (TOPS School, Seattle Public School System) to develop outreach events for his middle school science classroom.

2017/18 **UW Earth and Space Sciences Diversity and Inclusion Committee**

A student, faculty, and postdoc committee dedicated to formulating department priorities for recruiting, admission, and culture to foster departmental diversity.

2016 **Chair - Geoscience Graduate Colloquium Committee**
Lead the organization of Penn State's annual Geosciences colloquium, a two day conference where geoscience students from Penn State University and Tohoku University presented their research in both oral and poster formats.

2015-16 **Chair - Student Museum Committee, Penn State Earth and Mineral Sciences Museum**
I organized and a lead a student run committee for museum exhibit development and curation. Through this committee, I lead the development of an exhibit on ocean acidification currently on display in Penn State's EMS Museum. This committee been converted into a 1 credit seminar in the PSU department of Geosciences.

2015-16 **Museum Board Member - Penn State Earth and Mineral Sciences Museum**
Student representative to the campus museum evaluation board.

2012-15 **Student Representative to the Faculty - Penn State Department of Geosciences**
I acted as an advocate for student interests at Penn State's Geoscience faculty meetings.

2014 **Data Sonification Team - Penn State Polar Center**
Worked with Dr. Mark Ballora and Dr. David Pollard to convert Ice Sheet time-series data to sound. This was done as a public exhibit on novel ways to communicate climate data.

Conference Proceedings (Presenting Author)

2018

34. Holschuh, N. (2018a). Beyond Ice Thickness: Inferring the Flow Dynamics and Physical Properties of Ice Sheets Using Radar. *University of Oregon: Geosciences Colloquium Series*. Eugene, OR.
33. Holschuh, N., K. Christianson, J. D. Paden, R. B. Alley, and S. Anandakrishnan (2018). Reinterpreting the Global Paleo-Ice Sheet Record through Observed, In Situ Subglacial Landforms at Thwaites Glacier. *WAIS Workshop*. Stony Point, NY.
32. Holschuh, N., D. Lilien, K. Christianson, and E. Bagshaw (2018). Using radar to evaluate the thermal stabilization of ice stream shear margins. *SCAR Open Science Meeting*. Davos, Switzerland.
31. Holschuh, N. (2018b). Challenges to layer tracing and insights from direction-of-arrival analysis for Antarctic englacial layers. *AntArchitecture Workshop*. Davos, Switzerland.
30. Holschuh, N., D. Lilien, and K. Christianson (2018b). Using radar to understand the processes controlling ice flow speed in Greenland. *University of Washington Postdoctoral Research Symposium*. Seattle, WA.

2017

29. Holschuh, N., D. Lilien, and K. Christianson (2017a). Estimating the Heat Production and Distribution across Ice-Stream Shear Margins Using Surface Velocities. *AGU Fall Meeting*. New Orleans, LA.
28. Holschuh, N., D. Lilien, and K. Christianson (2017b). Disentangling the thermal and hydrologic signals expressed in radar data collected near EGRIP. *NEGIS Workshop*. Copenhagen, DK.
27. Christianson, K., N. Holschuh, S. Anandakrishnan, R. Alley, J. Paden, L. Peters, and J. Sprick (2017). A Varied Subglacial Landscape Under Thwaites Glacier, West Antarctica. *Geological Society of America Fall Meeting*. Seattle, WA.
26. Holschuh, N., K. Christianson, H. Conway, and R. Jacobel (2017). Record of the ice sheet interior response to Siple Coast Ice Stream variability from glacial stratigraphy. *WAIS Workshop*. Coupeville, WA.
25. Holschuh, N. (2017a). Ground-based radar stratigraphy across Antarctica. *AntArchitecture Workshop*. Edinburgh, Scotland.
24. Holschuh, N. (2017b). The intersection of electromagnetics and ice physics. *Department of Earth and Space Science Colloquium Series (UW)*. Seattle, WA.
23. Holschuh, N. (2017c). Active Source Imaging of the Cryosphere. *Carleton Geology Lecture Series*. Northfield, MN.
22. Holschuh, N., K. Christianson, H. Conway, and R. W. Jacobel (2017). The effects of subglacial volcanism on ice dynamics near the onset of the Siple Coast Ice Streams. *European Geophysical Union Annual Meeting*. Vienna, Austria.

2016

21. Holschuh, N., K. Christianson, S. Anandakrishnan, R. B. Alley, and R. W. Jacobel (2016). Common-midpoint radar surveys of ice sheets: a tool for better ice and bed property inversions. *AGU Fall Meeting*. San Francisco, CA.
20. Holschuh, N. (2016a). A framework for interpreting internal layer slopes as a record of past and present ice-sheet boundary conditions. *WAIS Workshop*.
19. Holschuh, N., R. Alley, and S. Anandakrishnan (2016). Investigating the Potential for Reconfiguration of the Antarctic and Greenland Ice Sheets. *Penn State Geosciences - Graduate Student Colloquium*. University Park, PA.
18. Holschuh, N., B. R. Parizek, R. B. Alley, and S. Anandakrishnan (2016). Structures, Radars, and Antarctic Adventure. *Seminar Series - Carleton College Department of Geology*. Northfield, MN.

2015

17. Holschuh, N., K. Christianson, S. Anandakrishnan, and R. Alley (2015). What I'm Thankful for this Year: Radar's ability to independemtly measure the electrical properties of the ice column. *Penn State Geosciences - Geodynamics Colloquium*. University Park, PA.
16. Holschuh, N., B. Parizek, R. Alley, and S. Anandakrishnan (2015a). Internal Reflector Slope Fields as a Proxy for Ice Sheet Velocity Structure. *WAIS Workshop*. Loveland, CO.
15. Holschuh, N., B. Parizek, R. Alley, and S. Anandakrishnan (2015b). Discriminating between Steady-State and Transient Controls on Englacial Structures. *International Symposium on Contemporary Ice-Sheet Dynamics: ocean interaction, meltwater, and non-linear effects*. Cambridge, UK.
14. Holschuh, N., B. R. Parizek, R. B. Alley, S. Anandakrishnan, and R. B. Alley (2015). Using the Englacial Geometry of West Antarctica to Determine its Future Stability. *Advances in Polar Research since the International Polar Year*. University Park, PA.

2014

13. Holschuh, N., K. Christianson, S. Anandakrishnan, and R. Alley (2014). Bistatic Radar case Studies from Antarctica and Greenland. *WAIS Workshop*. Julian, CA.

2013

12. Holschuh, N., D. Pollard, S. Anandakrishnan, and R. Alley (2013a). Consequences of a Deeper Bed for Marie Byrd Land Stability. *WAIS Workshop*. Sterling, VA.
11. Holschuh, N. and S. Anandakrishnan (2013). The Effects of Reflector Geometry on Radar Data Acquisition. *International Glaciological Society Symposium on Radioglaciology*. Lawrence, KS.
10. Holschuh, N., D. Pollard, S. Anandakrishnan, and R. Alley (2013b). Improving our Understanding of Marie Byrd Land Geometry through Geophysical Observations and Flow Modeling. *Midwest Glaciology Meeting*. University Park, PA.
9. Holschuh, N., D. Pollard, S. Anandakrishnan, and R. Alley (2013c). Inferring Ice Sheet Basal Topography using Surface Observations and Flow Modeling. *NSF Review Panel for the Center for Remote Sensing of Ice Sheets*. Elizabeth City, NC.
8. Holschuh, N. (2013). Below the Ice: Investigating the Subsurface Environment of Thwaites Glacier through Radio Echo Sounding. *Penn State Polar Day*. University Park, PA.
7. Holschuh, N., D. Pollard, S. Anandakrishnan, and R. Alley (2013d). Inferring Bed Topography in West Antarctica through Ice Surface Inversion. *Penn State Geosciences - Graduate Student Colloquium*. University Park, PA.

2011

6. Holschuh, N. (2011a). A Systematic Analysis of Potential Leading Indicators in the United States through Vector Autoregression. *Economics Comprehensive Poster Session - Carleton College*. Northfield, MN.
5. Holschuh, N. (2011b). An Analysis of Tsunami Sensitivity to Fault Plane Orientation Using a Rapid Linear Model. *Geology Comprehensive Symposium - Carleton College*. Northfield, MN.

2010

4. Holschuh, N., G. Fryer, and D. Wang (2010). Improving Tsunami Warning Protocols with a Rapid Linear Model. *Sigma Xi Induction Banquet*. Northfield, MN.
3. Fryer, G., N. Holschuh, D. Wang, and N. Becker (2010). Improving Tsunami Warning with a Rapid Linear Model. *AGU Fall Meeting*. San Francisco, CA.

2. Holschuh, N. and G. Fryer (2010). Improving Tsunami Warning Protocols through the Incorporation of Historical Data. *Hollings Scholar Symposium*. Silver Spring, MD.

2009

1. Holschuh, N. and B. Haileab (2009). A Preliminary Geochemical Analysis of Spatial and Temporal Variations in the Surface Water Chemistry of Rice County, MN. *Geological Society of America National Conference*. Portland, OR.