

# SHANE D. SCHOEPFER

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## EDUCATION:

### University of Washington

Doctor of Philosophy in Earth and Space Sciences  
Dissertation Title: *Nutrients, Productivity, and Redox Conditions during Greenhouse Extinctions in the Panthalassic Ocean*  
Advisor: Dr. Peter D. Ward

Seattle, WA

August 2014

### Brown University

Bachelor of Arts in Geology-Biology - magna cum laude  
Master of Science in Geological Sciences  
Thesis Title: *Stable Isotopes of Inorganic Nitrogen Nutrients in Narragansett Bay*  
Advisor: Dr. Warren Prell

Providence, RI

May 2009

May 2009

## PROFESSIONAL EXPERIENCE:

### Assistant Professor, Western Carolina University

*Investigations in Environmental Geology*  
*Methods in Geology*  
*Topics in Geology: Paleoclimate*  
*Environmental Geochemistry*  
*Geology Field Trip: Kentucky*  
*Geology Field Trip: Great Smoky Mountains*  
*The Nature of Science*  
*Earth History and Biodiversity*  
*Geology, Landscapes, and the Human Psyche*

August 2017 - Present

2017-2020

2017-2019

Fall 2017

Spring 2018

Spring 2018

Fall 2018

Spring 2019

Spring 2019

Fall 2019

### Postdoctoral Scholar, University of Calgary

Supervisor: Dr. Charles M. Henderson

December 2014-Present

### Field Camp Instructor

University of Washington  
University of Calgary  
Western Washington University

Summer 2015 - 2018

Summer 2015

Summer 2014

### Contributor to the Sedimentary Geochemistry and Paleoenvironments Project

International effort to compile data from marine sediments, to better understand long-term changes in ocean chemistry.

### Session Organizer

Geological Society of America 2018 Annual meeting in Indianapolis  
Session T119: *Extinction and Survival across the Triassic-Jurassic Boundary*

**Grant Reviewer**

American Chemical Society Petroleum Research Fund

**Guest Editor**

Interrelated Climatic, Oceanic, and Biotic Events During the Triassic-Jurassic Transition: a Global Perspective, a special issue of *Earth Science Reviews*

The Palaeozoic-Mesozoic Transition in South China: Oceanic Environments and Life from the Late Permian to the Late Triassic, a two-part special issue of *Palaeogeography, Paleoclimatology, Palaeoecology*

**Peer Reviewer**

*Global and Planetary Change*

*Geology*

*Earth and Planetary Science Letters*

*AAPG Bulletin*

*Palaeogeography, Paleoclimatology, Palaeoecology*

*Palaeoworld*

*Journal of Asian Earth Sciences*

*Marine and Petroleum Geology*

**Teaching Assistant, University of Washington****2013-2014**

*Dinosaurs*

Winter 2014

*Physical Processes of the Earth*

Fall 2013

*Field Geology*

Summer 2013, 2014

*Invertebrate Paleontology*

Spring 2013

*Introduction to Geological Sciences*

Winter 2013

**Visiting Professor, Colorado College****Fall 2012**

*GY210: block II: The Rocky Mountains as a Physical System*,

*GY210: block III: The Rocky Mountains as a Chemical System*

**NSF GK12 Ocean and Coastal Interdisciplinary Science teaching fellow, Ingraham High School, Seattle, WA** **2011-2012**

**Tidal Estuaries Monitoring and Assessment Program****Summer 2008**

Based at the National Ocean Service's Hollings Marine Lab, Charleston SC

Monitored anthropogenic nutrients and their impact on estuarine fauna throughout the southeast.

**HONORS AND AWARDS:**

Peter Misch Fellowship	2013
Inquisitive Graduate Student Support Grant	2013
Exxon Mobil Graduate Student Support Grant	2013
Robert and Nadine Bassett Fund Student Support Grant	2012
Best Oral Presentation in Geobiology - <i>UW ESS Research Gala</i>	2012
Best Oral Presentation by a Graduate Student - <i>UW ESS Research Gala</i>	2010
Phi Beta Kappa	2009
NOAA Ernest F. Hollings Scholarship	2007

## ONGOING RESEARCH PROJECTS:

### **Paleoceanography of the Ediacaran-Cambrian transition in South China**

- Studying restriction, anoxia, and nutrient cycling on the Yangtze Block at the beginning of the Phanerozoic.
- Studying the relationship between oceanographic conditions and early animal evolution.

### **Reconstructing Productivity in Paleomarine Systems**

- Compiling data from modern ocean sediment cores, to better quantify the relationship between the accumulation rate of proxies (such as organic carbon, phosphorus, and barium) and the primary productivity of phytoplankton in the overlying water column.

### **High-Resolution Paleoenvironmental Studies in South China**

- Contributing geochemical analyses to a comprehensive study of the Penglaitan section (Guangxi), likely the highest resolution extant record of the latest Permian.
- Contributing to ongoing work on the Shangsi section (Sichuan), including a study of latest Permian redox conditions and the development of marine refugia in the Early Triassic.

### **The Triassic-Jurassic extinction in the Panthalassic Basin**

- Applying paleoproductivity tools to the Kennecott Point section (British Columbia), to better understand how nitrogen limitation affected phytoplankton in the open ocean during the prolonged Mesozoic greenhouse period.
- Samples collected from the accreted Mino-Tamba terrane of Japan will allow for future comparative studies across the Panthalassic basin.

### **The Permian-Triassic extinction in Western Pangaea and the Panthalassic Ocean**

- Conducting a series of linked outcrop and core studies of the Late Permian and Early Triassic ranging from southern Idaho to northeastern British Columbia.
- Focusing on proxies for nutrient cycling and productivity, to better understand changes in the intensity of coastal upwelling during latest-Permian global warming.

### **Cretaceous Paleoenvironments of the James Ross Basin, Antarctica**

- Using trace element geochemistry to reconstruct the depositional environment of the James Robb Basin during the latest Cretaceous, based on samples collected during two six-week cruises on the Antarctic research vessel *Laurence M. Gould* in 2010-2011.

## INSTRUMENTAL EXPERTISE:

Extensive experience measuring organic C and N isotopes using a continuous flow Elemental Analyzer-Isotope Ratio Mass Spectrometer (EA-IRMS).

Extensive experience measuring C and O isotopes in carbonates using a Kiel III autosampler and dual inlet Isotope Ratio Mass Spectrometer (IRMS).

Experience preparing samples for mineral and chemical composition measurements using X-ray fluorescence (XRF), X-ray diffraction (XRD), and Inductively Coupled Plasma Atomic Absorption Spectroscopy (ICP-AES).

Experienced with thin section petrography and use of JEOL 773 electron microprobe.

Certified in safe use of handheld XRF (HH-XRF) for rapid trace element measurements.

## **PUBLIC TALKS:**

University of Georgia	2019
Sigma Xi Science Café, Sylva, NC	2019
University of Alabama	2019
Appalachian State University	2018
Nanjing Institute of Geology and Paleontology, Jiangsu, China	2016
University of Calgary, Calgary, AB	2016
Arkansas Tech University, Russellville, AR	2015
UW Earth and Space Sciences Research Gala, Seattle WA	2014
Colorado College, Colorado Springs, CO	2012
UW Earth and Space Sciences Research Gala, Seattle WA	2012
UW Program on Climate Change, Graduate Climate Seminar, Seattle, WA	2011
UW Earth and Space Sciences Research Gala, Seattle WA	2010

## **FUNDED GRANT PROPOSALS:**

### **The Permian-Triassic nitrogen cycle: from South China to North America Funded by the Chinese State Key Laboratory of Modern Paleontology and Stratigraphy May 2018**

- Proposal for geochemical study of core and outcrop material from Permian-Triassic South China and British Columbia
- Valued at 80k yuan renminbi (\$13,000) of research support.

### **Biostratigraphy and Geochemical characterization of Early Triassic Montney deposition Funded by Progress Energy, December 2015**

- Proposal for complete biostratigraphic and geochemical study of a 400 m core of the Early Triassic Montney Formation in northeastern British Columbia.
- Proposal based on preliminary geochemical results generated at the University of Calgary using handheld XRF.
- Valued at \$120k of salary and in kind support.

### **Application for GK12 Ocean and Coastal Interdisciplinary Science teaching fellowship Funded by NSF, Spring 2012**

- Program provided graduate student support to active researchers who were helping to teach marine science in Seattle area public schools.
- Worked with science teachers at Ingraham High School to develop activity in support of the Biology, Earth Science, and Marine Biology curricula.

**STUDENT  
MENTORING:**

**Hannah Cothren – Senior thesis project**

- A study of nitrogen cycling and primary productivity across the Permian-Triassic boundary, at the Penglaitan section in South China.

**Matthew Comins – Senior thesis project**

- A study of the nitrogen cycle during the Early Triassic recovery interval, based on the Chaohu section in South China

**Eldridge Machen – Senior thesis project**

- A comprehensive study of the relationship between volcanism and paleoenvironmental conditions at the Penglaitan section in South China.

**Kevin Cottingham – Senior thesis project**

- Reconstructing carbonate environments in the Cache Creek terrane of British Columbia and testing redox proxy applicability in carbonate lithofacies.

**Samuel Moorer – Undergraduate independent study**

- Conducting a geochemical study of the Guadalupian-Lopingian boundary in the Cache Creek terrane of British Columbia

**Hannah Hogan – Undergraduate independent study**

- A study of volcanic influence on early-Changhsingian marine environments in South China

**Amanda Godbold – Master's thesis project**

- Assembling a comprehensive paleoenvironmental study of an earliest Triassic 'refuge' from the Shangsi section in Sichuan, China. Amanda presented her results at the 2016 Geological Society of America annual meeting, and won an award for Best Student Presentation in Geobiology.

**Chen Shen – Master's thesis project**

- Using a high-resolution geochemical dataset from the Montney Formation to understand the effects of Milankovitch cycles on marine environments in the Early Triassic. Chen is now pursuing a PhD at McGill University.

**Ranjot Brar – Senior thesis project**

- Collected biostratigraphic samples from the Phosphoria Formation of southern Idaho in the summer of 2015; we are now integrating conodont biostratigraphy with geochemistry in Late Permian rocks from Idaho, Alberta, and northeastern British Columbia.

**Galen Griggs – UW undergraduate laboratory assistant**

- Galen assisted with stable isotope measurements on samples from the Peck Creek section in northeastern British Columbia. Galen is now pursuing a Ph.D. at UC Davis.

## PUBLICATIONS:

Lei Xiang, Hua Zhang, **Shane D. Schoepfer**, Chang-qun Cao, Quan-feng Zheng, Dong-xun Yuan, Yao-feng Cai, Shu-zhong Shen. 2018. Oceanic redox evolution around the end-Permian mass extinction at Meishan, South China. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **in press**.

\*Zhong-Qiang Chen, Thomas J Algeo, **Shane D Schoepfer**. 2019. The Permian–Triassic transition in the eastern Paleo-Tethys and adjacent regions: Environmental and biotic changes in ocean and on land. *Palaeogeography, Palaeoclimatology, Palaeoecology*, Volume 519, Pages 1-7.

Shu-zhong Shen, Jahandar Ramezani, Chang-qun Cao, Jun Chen, Douglas H. Erwin, Lei Xiang, Hua Zhang, **Shane D. Schoepfer**, Charles M. Henderson, Quan-feng Zheng, Samuel A. Bowring, Yue Wang, Xiang-dong Wang, Dong-xun Yuan, Yi-chun Zhang, Lin Mu, Jun Wang, Ya-sheng Wu. 2018. A sudden end-Permian mass extinction in South China. *Geological Society of America Bulletin*, Volume 131, Pages 205-223.

Lei Xiang, Hua Zhang, **Shane D. Schoepfer**, Chang-qun Cao, Shu-zhong Shen. 2018. Evolution of primary producers and productivity across the Ediacaran-Cambrian transition. *Precambrian Research*, Volume 313, Pages 68-77.

\*Zhong-Qiang Chen, Thomas J. Algeo, Yadong Sun, **Shane D. Schoepfer**. 2017. The Paleozoic-Mesozoic transition in South China: Oceanic environments and life from Late Permian to Late Triassic. *Palaeogeography, Palaeoclimatology, Palaeoecology*, Volume 486, Pages 1-5.

**Shane D. Schoepfer**, Thomas S. Tobin, James D. Witts, Robert J. Newton. 2017. Intermittent euxinia in the high-latitude James Ross Basin during the latest Cretaceous and earliest Paleocene. *Palaeogeography, Palaeoclimatology, Palaeoecology*. Volume 477, Pages 40-54.

Amanda L. Godbold, **Shane D. Schoepfer**, Charles M. Henderson. 2017. Precarious Ephemeral Refugia during the Earliest Triassic. *Geology*. Volume 45(7), Pages 607-610.

Lei Xiang, **Shane D. Schoepfer**, Shu-zhong Shen, Chang-qun Cao, Hua Zhang. 2017. Evolution of oceanic uranium and molybdenum reservoir size around the Ediacaran-Cambrian transition at western Zhejiang, South China. *Earth and Planetary Science Letters*. Volume 464, Pages 84-94.

Hanlie Hong, Qian Fang, Lulu Zhao, **Shane Schoepfer**, Chaowen Wang, Nina Gong, Zhaohui Li, Zhong-Qiang Chen. 2017. Weathering and alteration of volcanic ashes in various depositional settings during the Permian-Triassic transition in South China: Mineralogical, elemental, and isotopic approaches. *Palaeogeography, Palaeoclimatology, Palaeoecology*. Volume 486, Pages 46-57.

Guijie Zhang, Xiaolin Zhang, Dongping Hu, Dandan Li, Thomas J. Algeo, James Farquhar, Charles M Henderson, Liping Qin, Megan Shen, Danielle Shen, **Shane Schoepfer**, Kefan Chen, Yanan Shen. 2016. Redox chemistry changes in the Panthalassic Ocean linked to the end-Permian mass extinction and delayed Early Triassic biotic recovery. *Proceedings of the National Academy of Sciences*. Volume 114(8), Pages 1806-1810.

**Shane D. Schoepfer**, Thomas J. Algeo, Peter D. Ward, Kenneth H. Williford, James W. Haggart. 2016. Testing the limits in a greenhouse ocean: Did low nitrogen availability limit marine productivity during the end-Triassic mass extinction? *Earth and Planetary Science Letters*, Volume 451, Pages 138-148.

Lei Xiang, **Shane D. Schoepfer**, Hua Zhang, Dong-xun Yuan, Chang-qun Cao, Quan-feng Zheng, Charles M. Henderson, Shu-zhong Shen. 2015. Oceanic redox evolution across the end-Permian mass extinction at Shangsi, South China. *Palaeogeography, Palaeoclimatology, Palaeoecology*, Volume 448, Pages 59-71.

Eva E. Stüeken, Julien Foriel, Roger Buick, **Shane D Schoepfer**, 2015. Selenium isotope ratios, redox changes and biological productivity across the end-Permian mass extinction. *Chemical Geology*, Volume 410, Pages 28-39.

Alex H. Kasprak, Julio Sepúlveda, Rosalyn Price-Waldman, Kenneth H. Williford, **Shane D. Schoepfer**, James W. Haggart, Peter D. Ward, Roger E. Summons, Jessica H. Whiteside, 2015. Episodic photic zone euxinia in the northeastern Panthalassic Ocean during the end-Triassic extinction. *Geology*, Volume 43, Pages 307-310.

**Shane D. Schoepfer**, Jun Shen, Hengye Wei, Richard V. Tyson, Ellery Ingall, Thomas J. Algeo. 2015. Total organic carbon, organic phosphorus, and biogenic barium fluxes as proxies for paleomarine productivity. *Earth Science Reviews*, Volume 49, Pages 23-52.

Hengye Wei, Jun Shen, **Shane D. Schoepfer**, Leo Krystyn, Sylvain Richoz, and Thomas J. Algeo, 2015. Environmental controls on marine ecosystem recovery following mass extinctions, with an example from the Early Triassic. *Earth Science Reviews*, Volume 49, Pages 108-135.

Jun Shen, **Shane D. Schoepfer**, Qinglai Feng, Lian Zhou, Jianxin Yu, Huyue Song, Hengye Wei, and Thomas J. Algeo, 2015. Marine productivity changes during the Permian-Triassic boundary crisis and Early Triassic recovery. *Earth Science Reviews*, Volume 49, Pages 136-162.

Gregory J. Barord, Fredrick Dooley, Andrew Dunstan, Anthony Ilano, Karen N. Keister, Heike Neumeister, Thomas Preuss, **Shane Schoepfer**, Peter D. Ward. 2014. Comparative Population Assessments of *Nautilus* sp. in the Philippines, Australia, Fiji, and American Samoa Using Baited Remote Underwater Video Systems. *PLoS ONE* 9(6): e100799.

**Shane D. Schoepfer**, Charles M. Henderson, Geoffrey H. Garrison, Julien Foriel, Peter D. Ward, David Selby, James C. Hower, Thomas J. Algeo, Yanan Shen. 2013. Termination of a continent-margin upwelling system at the Permian-Triassic boundary (Opal Creek, Alberta, Canada). *Global and Planetary Change*, Volume 105, Pages 21-35.

**Shane D. Schoepfer**, Charles M. Henderson, Geoffrey H. Garrison, Peter D. Ward. 2012. Cessation of a productive coastal upwelling system in the Panthalassic Ocean at the Permian-Triassic Boundary. *Palaeogeography, Palaeoclimatology, Palaeoecology*, Volumes 313-314, Pages 181-188.

Patrick A. Flight, **Shane D. Schoepfer**, David M. Rand. 2010. Physiological stress and the fitness effects of Mpi genotypes in the acorn barnacle *Semibalanus balanoides*. *Marine Ecology Progress Series* Volume 404, Pages 139-149.

Andres Aslan, Karl Karlstrom, William C. Hood, Rex D. Cole, Thomas W. Oesleby, Charles Betton, M. Magdalena Sandoval, Andy Darling, Sam Kelley, Adam Hudson, Bryan Kaproth, **Shane Schoepfer**, Mary Benage, Rachel Landman. 2008. River incision histories of the Black Canyon of The Gunnison and Unaweep Canyon: Interplay between late Cenozoic tectonism, climate change, and drainage integration in the western Rocky Mountains, in Raynolds, R.G., ed., *Roaming the Rocky Mountains and Environs: Geological Field Trips: Geological Society of America Field Guide* 10, Pages 175-202.

\*Indicates non-reviewed editorial contribution

**CONFERENCE  
PRESENTATIONS:**

*Precursors: Environmental Disturbance in the Panthalassic Realm Prior To The TJB*

**Oral Presentation:** Geological Society of America 2018 Annual Meeting – Indianapolis

*Did Nitrogen Limitation Control Primary Productivity During Greenhouse Climates? How Can We Tell?*

**Invited Oral Presentation:** Geological Society of America 2017 Annual Meeting – Seattle

*High-Resolution Biostratigraphic and XRF-Geochemical Correlation of the Montney Formation, NEBC w/ Charles Henderson*

**Oral Presentation:** Geoconvention 2017 – Calgary

*Porcupine Creek – a Permian-Triassic Boundary Section from the Enigmatic Cache Creek Terrane, British Columbia*

**Oral Presentation:** Geological Society of America 2016 Annual Meeting – Denver

*Open Ocean Nitrogen Limitation Preceded the End-Triassic Mass Extinction: Evidence from Haida Gwaii, British Columbia*

**Oral Presentation:** Geological Society of America 2015 Annual Meeting – Baltimore

*Marine Environmental Responses to Volcanism in the latest Changhsingian: Evidence from Penglaitan, Guangxi*

**Oral Presentation:** Geological Society of America 2014 Annual Meeting – Vancouver

*Nitrogen Limitation and Productivity in the Permian-Triassic Greenhouse Ocean*

**Poster Presentation:** American Geophysical Union 2014 Fall Meeting – San Francisco

*Gradients in Nutrient Distribution and Productivity in Northeast Panthalassa across the PTB*

**Oral Presentation:** Geological Society of America 2012 Annual Meeting – Charlotte

*Extreme Nitrogen Limitation Corresponds with Marine Extinctions During the Triassic-Jurassic Transition*

**Oral Presentation:** Geological Society of America 2011 Annual Meeting - Minneapolis

*Increasing Nitrogen Limitation at the P/Tr Boundary: A Pan-Oceanic Phenomenon?*

**Oral Presentation:** Geological Society of America 2011 Annual Meeting – Minneapolis

*Termination of a Productive Upwelling System in Eastern Panthalassa at the P/T Boundary: Evidence from Opal Creek, AB*

**Oral Presentation:** Geological Society of America 2010 Annual Meeting - Denver

*Examination of Gunnison River influences on Cactus Park Lake Beds using Heavy Mineral and Geochemical Analyses*

**Poster Presentation:** American Geophysical Union 2008 Fall Meeting – San Francisco

*Quaternary Abandonment and Sedimentary Fill History of Cactus Park and Unaweep Canyon, Uncompahgre Plateau, Colorado*

**Poster Presentation:** Geological Society of America 2007 Annual Meeting – Philadelphia