

Curriculum Vitae

# Sean Patrick Long

*Associate Professor of Earth Science  
School of the Environment, Washington State University*

Updated: December 7, 2021

## **Research Interests**

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My research focuses on understanding the structural evolution of contractional and extensional mountain belts, including the Himalayas, the Andes, the North American Cordillera, and the Basin and Range Province. I integrate mapping-based field data with a diverse suite of quantitative datasets, including geochronology, thermochronometry, metamorphic temperatures and pressures, microstructural analyses, regional tectonic reconstructions, and balanced cross sections. Much of my recent research involves field-based evaluations of the predictions of models for the dynamics of mountain belts.

## **Contact Information**

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## **Education**

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Ph.D., Geology	Princeton University, 2010
M.S., Geology	Idaho State University, 2004
B.S., Mathematics	The College of Idaho, 2001

## **Professional Experience**

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2018-present	Associate professor (tenured), School of the Environment, Washington State University
2015-2018	Associate professor ( untenured), School of the Environment, Washington State University
2010-2015	Assistant professor, Nevada Bureau of Mines and Geology, University of Nevada, Reno
2006-2010	Teaching/research assistant, Princeton University
2008 Summer	Intern, Chevron Energy Technology Corporation
2006 Summer	Contract field geologist, New Mexico Bureau of Geology and Mineral Resources
2005-2006	Adjunct instructor/research associate, Idaho State University
2004	Environmental consulting geologist, Glorieta Geoscience, Inc., Santa Fe, New Mexico
2002-2004	Teaching/research assistant, Idaho State University
2002 Spring	Teaching assistant, University of Idaho

## Google Scholar Citation Indices

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<b>Citations:</b>	<b>1751</b>	(1170 since 2016)
<b>h-index:</b>	<b>22</b>	(21 since 2016)
<b>i10-index:</b>	<b>28</b>	(28 since 2016)

## Publications

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(asterisk denotes graduate student advisee author; double asterisk denotes undergraduate student advisee author)

### A. Journal articles and geologic maps:

*In preparation:*

57. Starnes, J.K.\*, **Long, S.P.**, Kohn, M.J., McQuarrie, N., Larson, K.P., Tobgay, T., and Soignard, E., in prep., Structural and metamorphic field gradients define distributed north-vergent shearing in easternmost Bhutan: an alternative style for the South Tibetan Detachment system: submission to Tectonics anticipated Summer, 2022.
56. Blackford, N.R.\*, **Long, S.P.**, Lee, J., and Stevens, J.L.\*\*\*, in prep., Ductile strain in the footwall of the Northern Snake Range-Schell Creek Range detachment system: submission to Journal of Structural Geology anticipated Spring, 2022.
55. **Long, S.P.**, McKay, M.P., Barba, W.K.\*, and Soignard, E., in prep., Thermal architecture of the Salmon River Suture Zone, west-central Idaho: insights from RSCM thermometry: submission to Tectonics anticipated Spring, 2022.

*In review:*

54. Di Fiori, R.V.\*, and **Long, S.P.**, in review, Preliminary Geologic Map of the southern Fish Creek Range, Eureka and Nye Counties, Nevada: Nevada Bureau of Mines and Geology Open-File Report xx-x, 1:15,000-scale, 1 plate, 16 p., submitted on 7-19-21.
53. Di Fiori, R.V.\*, and **Long, S.P.**, in review, Preliminary Geologic Map of the eastern flank of the northern Cortez Mountains, Eureka County, Nevada, Eureka County, Nevada: Nevada Bureau of Mines and Geology Open-File Report xx-x, 1:24,000-scale, 1 plate, 7 p., submitted on 7-19-21.
52. Di Fiori, R.V.\*, and **Long, S.P.**, in review, Preliminary geologic map of the McClure Spring syncline, central Pancake Range, Nye County, Nevada: Nevada Bureau of Mines and Geology Open-File Report xx-x, 1:24,000-scale, 1 plate, 16 p., submitted on 7-19-21.
51. Di Fiori, R.V.\*, and **Long, S.P.**, in review, Preliminary geologic map of the southern Diamond Mountains, Eureka and White Pine Counties, Nevada: Nevada Bureau of

Mines and Geology Open-File Report xx-x, 1:24,000-scale, 1 plate, 18 p., submitted on 7-19-21.

*In revision:*

50. **Long, S.P.**, Lee, J., and Blackford, N.R.\*, in revision, The low-angle breakaway system for the Northern Snake Range Décollement in the Schell Creek and Duck Creek Ranges, eastern Nevada, U.S.A.: implications for displacement magnitude: Geosphere, revisions requested on 11-13-21.

*Published:*

49. Blackford, N.R.\*, **Long, S.P.**, Stout, A.J.\*\*\*, Rodgers, D.W., Cooper, C.M., Kramer, K.\*\*\*, Di Fiori, R.V.\*, and Soignard, E., 2022, Late Cretaceous upper-crustal thermal structure of the Sevier hinterland: implications for the geodynamics of the Nevadaplano: Geosphere: accepted 8-23-21, doi: 10.1130/GES02386.1.
48. **Long, S.P.**, and Robinson, D.M., 2021, Construction of the Lesser Himalayan-Subhimalayan thrust belt: the primary driver of thickening, exhumation, and high elevations in the Himalayan orogen since the middle Miocene: Geology, v. 49, no. 11, p. 1283-1288, doi: 10.1130/G48967.1.
47. Di Fiori, R.V.\*, **Long, S.P.**, Snell, K.E., Fetrow, A.C., Bonde, J.W., and Vervoort, J.D., 2021, The role of shortening in the Sevier hinterland within the U.S. Cordilleran retroarc thrust system: Insights from the Cretaceous Newark Canyon Formation in central Nevada: Tectonics, v. 40, e2020TC006331, doi: 10.1029/2020TC006331.
46. Anderson, R.B.\*, **Long, S.P.**, Horton, B.K., and Soignard, E., 2021, Late Paleozoic Gondwanide deformation in the central Andes: Insights from RSCM thermometry and thermal modeling, southern Bolivia: Gondwana Research, v. 94, p. 222-242, doi: 10.1016/j.gr.2021.03.002.
45. **Long, S.P.**, Kohn, M.J., Kerswell, B.C., Starnes, J.K.\*, Larson, K.P., Blackford, N.R.\*, and Soignard, E., 2020, Thermometry and microstructural analysis imply protracted extensional exhumation of the Tso Moriri UHP nappe, northwestern Himalaya: implications for models of UHP exhumation: Tectonics, v. 39, 36 p., e2020TC006482, doi: 10.1029/2020TC006482.
44. Fetrow, A.C., Snell, K.E., Di Fiori, R.V.\*, **Long, S.P.**, and Bonde, J.W., 2020, Early Sevier orogenic deformation exerted primary control on changes in depositional environment recorded by the Cretaceous Newark Canyon Formation: Journal of Sedimentary Research: v. 90, p. 1175-1197, doi: 10.2110/jsr.2020.52.
43. Zuza, A.V., Thorman, C.H., Henry, C.D., Levy, D.A., Dee, S., **Long, S.P.**, Sandberg, C., and Soignard, E., 2020, Pulsed Mesozoic deformation in the Cordilleran

hinterland and evolution of the Nevadaplano: Insights from the Pequop Mountains, NE Nevada: *Lithosphere*, v. 2020, 24 p., doi:10.2113/2020/8850336.

42. **Long, S.P.**, and Kohn, M.J., 2020, Distributed ductile thinning during thrust emplacement: a commonly overlooked exhumation mechanism: *Geology*, v. 48, p. 368-373, doi:10.1130/G47022.1.
41. Di Fiori, R.V.\*, **Long, S.P.**, Snell, K.E., Fetrow, A., Bonde, J., and Vervoort, J.D., 2020, Syn-contractual deposition of the Cretaceous Newark Canyon Formation, Diamond Mountains, Nevada: Implications for strain partitioning within the U.S. Cordillera: *Geosphere*, v. 16, no. 2, p. 546-566, doi:10.1130/GES02168.1.
40. Starnes, J.K.\*, **Long, S.P.**, Gordon, S.M., Zhang, J., and Soignard, E., 2020, Using quartz fabric intensity parameters to delineate strain patterns across the Himalayan Main Central thrust: *Journal of Structural Geology*: v. 131, 103941, 18 p., doi: 10.1016/j.jsg.2019.103941.
39. McQuarrie, N., Eizenhöfer, P.R., **Long, S.P.**, Tobgay, T., Ehlers, T., Reiners, P.W., Blythe, A., Morgan, L., Gilmore, M., and Dering, G., 2019, The influence of foreland structures on hinterland cooling: evaluating the drivers of exhumation in the Eastern Bhutan Himalaya: *Tectonics*, v. 38, p. 3282-3310, doi: 10.1029/2018TC005340.
38. **Long, S.P.**, Mullady, C.L.\*\*\*, Starnes, J.K.\*, Gordon, S.M., Larson, K.P., Miller, R.B., Pianowski, L.S.\*, and Soignard, E., 2019, A structural model for the South Tibetan detachment system in northwestern Bhutan from integration of temperature, fabric, strain, and kinematic data: *Lithosphere*, v. 11, p. 465-487, doi: 10.1130/L1049.1.
37. **Long, S.P.**, 2019, Geometry and magnitude of extension in the Basin and Range Province (39°N), California, Nevada, and Utah, U.S.A: Constraints from a province-scale cross section: *Geological Society of America Bulletin*, v. 131, p. 99-119, doi: 10.1130/B31974.1.
36. **Long, S.P.**, Heizler, M.T., Thomson, S.N., Reiners, P.W., and Fryxell, J.E., 2018, Rapid Oligocene to early Miocene extension along the Grant Range detachment system, eastern Nevada, U.S.A.: insights from multi-part cooling histories of footwall rocks: *Tectonics*, v. 37, p. 4752-4779, doi: 10.1029/2018TC005073.
35. Anderson, R.B.\*, **Long, S.P.**, Horton, B.K., Thomson, S.N., Calle, A.Z., and Stockli, D.F., 2018, Orogenic wedge evolution of the central Andes, Bolivia (21°S): Implications for Cordilleran cyclicity: *Tectonics*, v. 37, p. 3577-3609, doi: 10.1029/2018TC005132.
34. Calle, A.Z., Horton, B.K., Limachi, R., Stockli, D.F., Uzeda-Orellana, G.V., Anderson, R.B.\*, and **Long, S.P.**, 2018, Cenozoic provenance and depositional

record of the Sub-Andean foreland basin during growth of the central Andean fold-thrust belt, southern Bolivia, *in* Zamora, G., McClay, K.R., and Ramos, V.A., eds., Petroleum basins and hydrocarbon potential of the Andes of Peru and Bolivia: AAPG Memoir 117, p. 483-530, doi: 10.1306/13622132M1173777.

33. **Long, S.P.**, Gordon, S.M., and Soignard, E., 2017, Distributed north-vergent shear and flattening through Greater and Tethyan Himalayan rocks: insights from metamorphic and strain data from the Dang Chu region, central Bhutan: *Lithosphere*, v. 9, p. 774-795, doi: 10.1130/L655.1.
32. Anderson, R.B.\*, **Long, S.P.**, Horton, B.K., Calle, A.Z., and Ramirez, V., 2017, Shortening and structural architecture of the Andean fold-thrust belt of southern Bolivia (21°S): Implications for kinematic development and crustal thickening of the central Andes: *Geosphere*, v. 13, p. 538-558, doi: 10.1130/GES01433.1.
31. **Long, S.P.**, Gordon, S.M., Young, J.P., and Soignard, E., 2016, Temperature and strain gradients through Lesser Himalayan rocks and across the Main Central thrust, south-central Bhutan: implications for transport-parallel stretching and inverted metamorphism: *Tectonics*, v. 35, p. 1863-1891, doi: 10.1002/2016TC004242.
30. Agustsson, K.M., Gordon, S.M., **Long, S.P.**, Seward, G.G.E., Zeiger, K., and Penfold, M.\*, 2016, Pressure–temperature–structural distance relationships within Greater Himalayan rocks in eastern Bhutan: implications for emplacement models: *Journal of Metamorphic Geology*, v. 34, p. 641-662, doi: 10.1111/jmg.12197.
29. **Long, S.P.**, and Soignard, E., 2016, Shallow-crustal metamorphism during Late Cretaceous anatexis in the Sevier hinterland plateau: peak temperature conditions from the Grant Range, eastern Nevada, U.S.A.: *Lithosphere*, v. 8, p. 150-164, doi: 10.1130/L501.1.
28. **Long, S.P.**, and Walker, J.P., 2015, Geometry and kinematics of the Grant Range brittle detachment system, eastern Nevada, U.S.A.: an end-member style of upper-crustal extension: *Tectonics*, v. 34, p. 1837-1862, doi: 10.1002/2015TC003918.
27. Zeiger, K., Gordon, S.M., **Long, S.P.**, Kylander-Clark, A.R.C., Agustsson, K., and Penfold, M.\*, 2015, Timing and conditions of metamorphism and melt crystallization in Greater Himalayan rocks, eastern and central Bhutan: insight from U-Pb zircon and monazite geochronology and trace-element analyses: *Contributions to Mineralogy and Petrology*, v. 169, article 47, 19 p., doi: 10.1007/s00410-015-1143-6.
26. Di Fiori, R.V.\*, **Long, S.P.**, Muntean, J.L., and Edmondo, G.P., 2015, Structural analysis of gold mineralization in the southern Eureka mining district, Nevada: a predictive structural setting for Carlin-type gold deposits: *in* Pennell, W.M., and Garside, L.J., eds., *New Concepts and Discoveries: Geological Society of Nevada*

Symposium Proceedings, May 2015, Sparks, Nevada, v. 1, p. 885-903. (2 peer-reviews)

25. **Long, S.P.**, Thomson, S.N., Reiners, P.W., and Di Fiori, R.V.\*, 2015, Synorogenic extension localized by upper-crustal thickening: an example from the Late Cretaceous Nevadaplano: *Geology*, v. 43, p. 351-354, doi:10.1130/G36431.1.
24. **Long, S.P.**, 2015, An upper-crustal fold province in the hinterland of the Sevier orogenic belt, eastern Nevada, U.S.A.: a Cordilleran Valley and Ridge in the Basin and Range: *Geosphere*, v. 11, p. 404-424, doi:10.1130/GES01102.1.
23. **Long, S.P.**, Henry, C.D., Muntean, J.L., Edmondo, G.P., and Thomas, R.D., 2014, Geologic map of the southern part of the Eureka mining district, and surrounding areas of the Fish Creek Range, Mountain Boy Range, and Diamond Mountains, Eureka and White Pine Counties, Nevada: Nevada Bureau of Mines and Geology Map 183, 1:24,000-scale, 2 plates, 36 p. (3 peer-reviews)
22. Di Fiori, R.V.\*, **Long, S.P.**, Edmondo, G.P., and Muntean, J.L., 2014, Preliminary geologic and alteration maps of Lookout Mountain, Ratto Ridge, and Rocky Canyon, southern Eureka mining district, Eureka County, Nevada: Nevada Bureau of Mines and Geology Open-File Report 14-8, 1:10,000-scale, 2 plates. (non-reviewed)
21. **Long, S.P.**, 2014, Preliminary geologic map of Heath Canyon, central Grant Range, Nye County, Nevada: Nevada Bureau of Mines and Geology Open-File Report 14-6, 1:24,000-scale, 1 plate, 4 p. (non-reviewed)
20. **Long, S.P.**, Henry, C.D., Muntean, J.L., Edmondo, G.P., and Cassel, E.J., 2014, Early Cretaceous construction of a structural culmination, Eureka, Nevada, U.S.A.: implications for out-of-sequence deformation in the Sevier hinterland: *Geosphere*, v. 10, p. 564-584, doi:10.1130/GES00997.1.
19. McQuarrie, N., Tobgay, T., **Long, S.P.**, Reiners, P.W., and Cosca, M.A., 2014, Variable exhumation rates and variable displacement rates: documenting a recent slowing of Himalayan shortening in western Bhutan: *Earth and Planetary Science Letters*, v. 386, p. 161-174, doi:10.1016/j.epsl.2013.10.045.
18. McQuarrie, N., **Long, S.P.**, Tobgay, T., Nesbit, J.N., Gehrels, G., and Ducea, M., 2013, Documenting basin scale, geometry and provenance through detrital geochemical data: lessons from the Neoproterozoic to Ordovician Lesser, Greater, and Tethyan Himalayan strata of Bhutan: *Gondwana Research*, v. 23, p. 1491-1510, doi:10.1016/j.gr.2012.09.002.
17. **Long, S.P.**, McQuarrie, N., Tobgay, T., Coutand, I., Cooper, F.J., Reiners, P.W., Wartho, J., and Hodges, K.V., 2012, Variable shortening rates in the eastern Himalayan thrust belt, Bhutan: insights from multiple thermochronologic and

geochronologic datasets tied to kinematic reconstructions: *Tectonics*, v. 31, TC5004, 23 p., doi:10.1029/2012TC003155.

16. **Long, S.P.**, 2012, Magnitudes and spatial patterns of erosional exhumation in the Sevier hinterland, eastern Nevada and western Utah, USA: Insights from a Paleogene paleogeologic map: *Geosphere*, v. 8, p. 881-901, doi:10.1130/GES00783.1.
15. Lewis, R., Link, P.K., Stanford, L., and **Long, S.**, 2012, Geologic Map of Idaho: Idaho Geological Survey Map 9, 1:750,000-scale, 1 plate, 18 p. (6 peer reviews)
14. Corrie, S.L., Kohn, M.J., McQuarrie, N., and **Long, S.P.**, 2012, Flattening the Bhutan Himalaya: *Earth and Planetary Science Letters*, v. 349-350, p. 67-74, doi:10.1016/j.epsl.2012.07.001.
13. Tobgay, T., McQuarrie, N., **Long, S.**, Kohn, M., and Corrie, S., 2012, The age and rate of displacement along the Main Central thrust in the western Bhutan Himalaya: *Earth and Planetary Science Letters*, v. 319-320, p. 146-158, doi:10.1016/j.epsl.2011.12.005.
12. **Long, S.P.**, McQuarrie, N., Tobgay, T., Grujic, D., and Hollister, L., 2011, Geologic map of Bhutan: *The Journal of Maps*, v2011, p. 184-192, 1:500,000-scale, doi:10.4113/jom.2011.1159. (3 peer reviews)
11. **Long, S.**, McQuarrie, N., Tobgay, T., and Hawthorne, J., 2011, Quantifying internal strain and deformation temperature in the eastern Himalaya: Implications for the evolution of strain in thrust sheets: *Journal of Structural Geology*, v. 32, p. 579-608, doi:10.1016/j.jsg.2010.12.011.
10. **Long, S.**, McQuarrie, N., Tobgay, T., and Grujic, D., 2011, Geometry and crustal shortening of the Himalayan fold-thrust belt, eastern and central Bhutan: *Geological Society of America Bulletin*, v. 123, p. 1427-1447, doi:10.1130/B30203.1.
9. **Long, S.**, McQuarrie, N., Tobgay, T., Rose, C., Gehrels, G., and Grujic, D., 2011, Tectonostratigraphy of the Lesser Himalaya of Bhutan: Implications for the along-strike stratigraphic continuity of the northern Indian margin: *Geological Society of America Bulletin*, v. 123, p. 1406-1426, doi:10.1130/B30202.1.
8. Tobgay, T., **Long, S.**, McQuarrie, N., Ducea, M., and Gehrels, G., 2010, Using isotopic and chronologic data to fingerprint strata: the challenges and benefits of variable sources to tectonic interpretations, the Paro Formation, Bhutan Himalaya: *Tectonics*, v. 29, TC6023, doi:10.1029/2009TC002637.
7. **Long, S.**, and McQuarrie, N., 2010, Placing limits on channel flow: insights from the Bhutan Himalaya: *Earth and Planetary Science Letters*, v. 290, p. 375-390, doi:10.1016/j.epsl.2009.12.033.

6. McQuarrie, N.M., Robinson, D., **Long, S.**, Tobgay, T., Grujic, D., Gehrels, G., and Ducea, M., 2008, Preliminary stratigraphic and structural architecture of Bhutan: Implications for the along strike architecture of the Himalayan system: Earth and Planetary Science Letters, v. 272, p. 105-117, doi:10.1016/j.epsl.2008.04.030.
5. **Long, S.P.**, and Link, P.K., 2007, Geologic Map Compilation of the Malad City 30' x 60' Minute Quadrangle, Idaho: Idaho Geological Survey Technical Report T-07-1, 1:100,000-scale. (non-reviewed)
4. **Long, S.P.**, Link, P.K., Janecke, S.U., Perkins, M.E., and Fanning, C.M., 2006, Multiple phases of Tertiary extension and synextensional deposition of the Miocene-Pliocene Salt Lake Formation in an evolving supradetachment basin, Malad Range, Southeast Idaho, U.S.A.: Rocky Mountain Geology, v. 41, no. 1, p. 1-27, doi:10.2113/gsrocky.41.1.1.
3. Rodgers, D.W., **Long, S.P.**, McQuarrie, N., Burgel, W.D., and Hersley, C.F., 2006, Geologic Map of the Inkom Quadrangle, Bannock County, Idaho: Idaho Geological Survey Technical Report T-06-2, 1:24,000-scale. (non-reviewed)
2. Steely, A.N., Janecke, S.U., **Long, S.P.**, Carney, S.J., Oaks, R.Q., Langenheim, V.E., and Link, P.K., 2005, Evolution of a late Cenozoic supradetachment basin above a flat-on-flat detachment with a folded lateral ramp, SE Idaho, *in* Pederson, J., and Dehler, C.M., eds., Interior Western United States: Geological Society of America Field Guide 6, p. 169-198, doi:10.1130/2005.fld006(08). (1 peer review)
1. **Long, S.P.**, Link, P.K., Janecke, S.U., and Rodgers, D.W., 2004, Geologic map of the Henderson Creek quadrangle, Oneida County, Idaho: Idaho Geological Survey Technical Report T-04-3, 1:24,000-scale. (non-reviewed)

***B. Non-reviewed publications and contract reports:***

4. Consulting contract report for Echo Bay Minerals Company (a Kinross company):  
**Long, S.**, 2019, Structural evaluation of the Curlew exploration site and surrounding region, 16 p.
3. **Long, S.**, and Rodgers, D., 2009, Chapter 1: Geology of the State of Idaho, *in* Winterfield, G.F., and Rapp, R.A., Survey of Idaho Fossil Resources, Volume 1: Introduction to the Geologic History of Idaho: BLM Professional Services Contract No. DLP050083, 64 p.
2. Geologic maps of the Rogers' Ruins, El Paso Canyon, and Surveyor's Canyon 7.5' quadrangles, Otero County, NM: New Mexico Bureau of Geology and Mineral Resources, Sacramento Mountains Mapping Project MWCD20. Published in:  
Newton, T., Timmons, S., Rawling, G., Frederick, P., Kludt, T., Land, L., Timmons, M., and Walsh, P., 2009, Sacramento Mountains Hydrogeology

Study, New Mexico Bureau of Geology and Mineral Resources Open-File Report 518, 64 p., 2 plates.

1. Reports for Chevron Energy Technology Corporation, New Ventures Team, San Ramon, CA: 1) **Long, S.P.**, 2008, Tectonic and depositional setting of the upper Jurassic northern Tethyan margin; 2) **Long, S.P.**, 2008, Jurassic-Cretaceous tectonic and depositional setting of Egypt's Western Desert.

### ***C. Ph.D. Dissertation:***

**Long, S.P.**, 2010, The evolution of eastern Himalayan deformation: geometry and kinematics of the Himalayan fold-thrust belt, eastern and central Bhutan [Ph.D. Dissertation]: Princeton, Princeton University, 475 p., 51 figures, 13 tables, 3 plates.

#### *Advisor:*

Nadine McQuarrie (Princeton)

#### *Examining committee:*

Lincoln Hollister (Princeton), Adam Maloof (Princeton), Chris Andronicos (Cornell)

### ***D. M.S. Thesis:***

**Long, S.P.**, 2004, Geology of the Henderson Creek quadrangle, Oneida County, Idaho: multiple phases of Tertiary extension and deposition [Master's Thesis]: Pocatello, Idaho State University, 158 p., 31 figures, 3 tables, 2 plates.

#### *Advisors and examining committee:*

David Rodgers (Idaho State), Paul Link (Idaho State), Susanne Janecke (Utah State)

## **Grants Awarded**

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2021 – \$284,698 – NSF Tectonics program, EAR-2118117

Lead PI: Matthew Kohn (Boise State), **PI: Long (WSU)**

Project title: Collaborative Research: How do ultrahigh pressure metamorphic sheets form and exhumate? A case study from the Tso Moriri complex, India.

2020 - \$177,094 – NSF Tectonics program, EAR-2022973

**Lead PI: Long (WSU)**, PI: Jeffrey Lee (Colorado School of Mines)

Project Title: Collaborative Research: Calibrating quartz fabric intensity as a function of strain magnitude: a field-based investigation in the Snake Range core complex, Nevada.

2020 - \$197,832 – NSF Tectonics program, EAR-2015601

Lead PI: Matthew McKay (Missouri State), **PI: Long (WSU)**

Project title: Collaborative research: Evaluating the drivers of exhumation during accretionary orogenesis: A field-based investigation in the Salmon River Suture Zone, Idaho.

2017 - \$17,127 – USGS EdMap program, agreement no. G17AC00130

**PI: Long** (WSU)

Project title: Structural analysis of the McClure Spring syncline, Pancake Range, Nevada: characterizing the style and timing of contractional deformation in the Sevier hinterland.

2016 - \$596,788 – NSF Major Research Instrumentation program, EAR-1626670

PI: Jeffrey Vervoort (WSU), co-PI: John Wolff (WSU), **co-PI: Long** (WSU), co-PI Erin Thornton (WSU), co-PI Brian Kennedy (University of Idaho)

Project title: MRI: Acquisition of a laser-ablation, multi-collector ICP-MS for research and training in Earth, Environmental, and Anthropological Sciences.

2015 - \$117,000 – NSF Tectonics program, EAR-1524765

Lead PI: Kathryn Snell (UC-Boulder - \$141,010), **PI: Long** (WSU), PI: Joshua Bonde (UNLV - \$131,000)

Project title: Collaborative Research: The record of Early Cretaceous growth of the Nevadaplano from syn-orogenic deposits of the Sevier hinterland.

2014 - \$15,068 – Makoil, Inc.

**PI: Long** (UNR)

Project title: Analysis of the thermal history of the central Grant Range: testing models for development of Railroad Valley petroleum systems.

2013 - \$39,216 – USGS Statemap program, agreement no. G13AC00235

**PI: Long** (UNR)

Project title: Northern Grant Range mapping project: evaluating structural models for the Grant Canyon and Bacon Flat oil fields.

2013 - \$123,000 – NSF Tectonics program, EAR-1250510.

**Lead PI: Long** (UNR), PI: Brian Horton (UT-Austin - \$130,500)

Project title: Collaborative Research: Thrust belt response to rapid surface uplift of the Altiplano: A field test of Cordilleran cyclicity in southern Bolivia.

2012 - \$46,000 – Timberline Resources, Corporation

**PI: Long** (UNR)

Project title: Focused geologic mapping and structural analysis in the southern Eureka mining district: testing structural models of mineralization.

2012 - \$392,960 – NSF Tectonics program, EAR-1220300

**Lead PI: Long** (UNR), total split evenly with co-PI Stacia Gordon (UNR).

Project title: Did channel flow drive the thermo-mechanical evolution of the eastern Himalaya? A field-based test in northeast Bhutan.

2012 - \$14,317 – University of Nevada, Reno, College of Science

**Lead PI: Long** (UNR), co-PI Stacia Gordon (UNR).

Project title: Funding for purchase of mineral separation equipment.

2011 - \$61,213 – USGS Statemap program, agreement no. G11AC20244

**Lead PI: Long** (UNR), co-PI John Muntean (UNR), co-PI Chris Henry (UNR).

Project title: South Eureka mining district mapping project: understanding connections between tectonics, magmatism, and gold deposits.

2010 - \$45,000 - Timberline Resources, Corporation

**Lead PI: Long** (UNR), co-PI John Muntean (UNR), co-PI Chris Henry (UNR).

Project title: Geologic framework of the southern Eureka mining district.

2009 - \$2,310 – Geological Society of America graduate student research grant

**PI: Long.**

Project title: Convergence partitioning in the eastern Himalaya: the role of the Bhutan fold-thrust belt.

## **Invited Talks**

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36. May, 3, 2022 – Geological Society of Nevada 2020 Symposium: “Advances in understanding Mesozoic tectonism and structural relations across the northern Great Basin” session  
Title: “*Geometry of Cordilleran contractional deformation across the Great Basin at 39°N: insights from retro-deformation of a province-wide cross section*”
36. December 14, 2021 – American Geophysical Union annual meeting, New Orleans, LA: “Growth and Modification of Continental Crust in Extensional and Compressional Regions” session.  
Title: “*Tracking crustal thickness changes accommodated by Cordilleran contraction and Basin and Range extension: Insights from a reconstructed cross section across Nevada and Western Utah*”
35. November 10, 2021 - Idaho State University Department of Geosciences colloquium  
Title: “*The widening of the West: How much, when, and why?*”
34. December 1, 2020 – University of Liverpool, Herdman Society lecture series  
Title: “*The widening of the West: How much, when, and why?*”
33. November 17, 2020 – Columbia Basin Geologic Society monthly meeting, Spokane  
Title: “*The widening of the West: How much, when, and why?*”
32. November 16, 2020 – San Jose State University Geology Department seminar series  
Title: “*The widening of the West: How much, when, and why?*”
31. January 24, 2020 – Texas A&M University, Department of Geology and Geophysics, Weekly Seminar Series

Title: *"The widening of the West: How much, when, and why?"*

30. Sept 25, 2019 – Geological Society of America annual meeting, Phoenix, AZ,  
“From Oceanic Subduction to Inter-Continental Collision: Examples of Convergent  
Margin Processes in Non-Collisional and Collisional Settings” session  
Title: *“Distributed stretching gradients between major Himalayan shear zones, and  
their role in mass transfer”*
29. May 10, 2019 – Oregon State University, Department of Geology and Geophysics,  
Structure, Tectonics, and Geomorphology group meeting  
Title: *“Stretching, flattening, and thermally-inverting the Himalayan orogenic belt  
in Bhutan”*
28. May 9, 2019 – Oregon State University, Department of Geology and Geophysics,  
Weekly Seminar Series  
Title: *“How much, when, and why was the West widened?”*
27. May 6, 2019 – University of Nevada, Reno, Department of Geological Sciences  
seminar series  
Title: *“How much, when, and why was the West widened?”*
26. February 27, 2019 – Northern Arizona University, School of Earth and Sustainability  
Title: *“How much, when, and why was the West widened?”*
25. January 7, 2018 – National Association of Geoscience Teachers 5<sup>th</sup> Biennial  
Structural Geology and Tectonics Forum: “Tectonics of Western North America:  
What’s New” session  
Title: *“New perspectives on the construction and extensional collapse of the  
Nevadaplano: A summary of recent progress”*
24. November 9, 2017 – Washington State University, School of the Environment  
Geology Seminar Series  
Title: *“Stretching, flattening, and thermally-inverting the Himalayan orogenic  
belt in Bhutan”*
23. October 25, 2017 – Geological Society of America annual meeting, Seattle, WA:  
“New Perspectives on Cordilleran Tectonics, Paleogeography, and Metallogeny”  
session.  
Title: *“A summary of recent progress on understanding the structural evolution  
and paleogeography of the Nevadaplano”*
22. October 21, 2017 - Geological Society of America annual meeting, Seattle, WA:  
“Challenges in Tectonics 4: Planetary Evolution in Four Dimensions – The New  
Global Tectonics” session

Title: *“Integration of geometry, kinematics, burial timing, and exhumation timing to understand 4-D thrust belt evolution: an example from the Himalayan orogen in Bhutan”*

21. February 17, 2016 – University of Nevada, Las Vegas, Geoscience Department Seminar Series  
Title: *“Creation and synorogenic collapse of a structural culmination in the Nevadaplano: Sevier giveth, gravity taketh away”*
20. January 29, 2016 – Central Washington University, Department of Geological Sciences, Seminar Series  
Title: *“Creation and synorogenic collapse of a structural culmination in the Nevadaplano: Sevier giveth, gravity taketh away”*
19. September 14, 2015 – Utah State University, Department of Geology, Distinguished Speaker Series  
Title: *“Creation and synorogenic collapse of a structural culmination in the Nevadaplano: Sevier giveth, gravity taketh away”*
18. September 11, 2015 – Washington State University, School of the Environment Geology Seminar Series  
Title: *“Creation and synorogenic collapse of a structural culmination in the Nevadaplano: Sevier giveth, gravity taketh away”*
17. May 18, 2015 – Geological Society of Nevada 2015 Symposium: “Regional Geology and Metallogeny of the Great Basin” session  
Title: *“Map pattern and style of regional-scale contractional deformation in the Sevier hinterland in eastern Nevada: insights from sub-volcanic paleogeologic maps”*
16. April 2, 2015 - Nevada Petroleum and Geothermal Society monthly meeting, Reno  
Title: *“A newly-defined fold province in eastern Nevada: a Valley and Ridge in the Basin and Range”*
15. October 2, 2014 – Bhutan Department of Geology and Mines, Thimpu, Bhutan  
Title: *“A summary of the 2012-2014 research of the University of Nevada, Reno group in eastern and central Bhutan”*
14. January 15, 2014 – University of Texas, Austin, Jackson School of Geosciences, Petrology, Geochemistry, Structure, & Tectonics talk series  
Title: *“A record of shortening rates in the Himalayan thrust belt in Bhutan: integrating geochronology, thermochronology, deformation geometry, and kinematics”*
13. December 6, 2013 – University of Arizona Department of Geosciences weekly Cordilleran seminar

- Title: *“What can a mid-Tertiary unconformity tell us about deformation and erosion in the Nevadaplano?”*
12. December 5, 2013 – University of Arizona Department of Geosciences colloquium  
Title: *“A record of shortening rates in the Himalayan thrust belt in Bhutan: integrating geochronology, thermochronology, deformation geometry, and kinematics”*
  11. November 21, 2013 – University of California, Berkeley, Department of Earth and Planetary Science department seminar  
Title: *“A record of shortening rates in the Himalayan thrust belt in Bhutan: integrating geochronology, thermochronology, deformation geometry, and kinematics”*
  10. November 20, 2013 – University of California, Davis, Department of Earth and Planetary Science seminar series  
Title: *“A record of shortening rates in the Himalayan thrust belt in Bhutan: integrating geochronology, thermochronology, deformation geometry, and kinematics”*
  9. May 2, 2013 - Nevada Petroleum and Geothermal Society monthly meeting, Reno, NV  
Title: *“What can the mid-Tertiary unconformity tell us about deformation and erosion in the Nevadaplano?”*
  8. November 15, 2012 – California Institute of Technology, Division of Geological and Planetary Sciences, geology club seminar  
Title: *“What can the mid-Tertiary unconformity tell us about deformation and erosion in the Nevadaplano?”*
  7. September 24, 2012 - University of Nevada, Reno, Department of Geological Sciences seminar series  
Title: *“What can the mid-Tertiary unconformity tell us about deformation and erosion in the Nevadaplano?”*
  6. February 2, 2012 – Bhutan Department of Geology and Mines, Thimpu, Bhutan  
Title: *“A summary of the work of the Princeton Group, 2007-2011, part 1: stratigraphy, depositional age constraints, and the new geologic map of Bhutan”*
  5. November 16, 2011 – University of Nevada, Las Vegas, Geoscience Department seminar series  
Title: *“Spatial patterns of internal strain and deformation temperature in the Himalayan fold-thrust belt, Bhutan”*
  4. May 2, 2011 – University of Nevada, Reno, Department of Geological Sciences seminar series

Title: “*Spatial patterns of internal strain and deformation temperature in the Himalayan fold-thrust belt, Bhutan: Implications for the development of strain in thrust sheets*”

3. March 9, 2011 – Idaho State University Department of Geosciences colloquium  
Title: “*Spatial patterns of internal strain and deformation temperature in the Himalayan fold-thrust belt, Bhutan*”
2. February 28, 2011 – Boise State University Department of Geosciences seminar  
Title: “*Spatial patterns of internal strain and deformation temperature in the Himalayan fold-thrust belt, Bhutan*”
1. November 4, 2010 – Nevada Petroleum Society monthly meeting, Reno, NV  
Title: “*Constructing the Himalayan fold-thrust belt: a view from Bhutan*”

### **Conference Abstracts**

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(asterisk denotes graduate student advisee author; double asterisk denotes undergraduate student advisee author)

102. **Long, S.P.**, 2022, Geometry of Cordilleran contractional deformation across the Great Basin at 39°N: insights from retro-deformation of a province-wide cross section (invited presentation): Geological Society of Nevada, 2022 Symposium.
101. Di Fiori, R.V.\*, **Long, S.P.**, and Vervoort, J., 2022, Timing and structural analysis of the McClure Spring syncline: a ~15 km-long isoclinal fold in the central Pancake Range in eastern Nevada: Geological Society of Nevada, 2022 Symposium.
100. Fetrow, A.C., Snell, K.E., Di Fiori, R.V.\*, **Long, S.P.**, and Bonde, J.W., 2021, To split or to lump? The importance of facies analysis for interpreting stable isotope paleoclimate proxies from lacustrine and palustrine carbonates: American Geophysical Union 102 (66), Fall Meet. Suppl., Abstract PP15C-0937, doi: 10.1002/essoar.10508665.1
99. **Long, S.P.**, 2021, Tracking crustal thickness changes accommodated by Cordilleran contraction and Basin and Range extension: Insights from a reconstructed cross section across Nevada and Western Utah: American Geophysical Union 102 (66), Fall Meet. Suppl., Abstract T23A-02. (invited presentation)
98. **Long, S.P.**, and Robinson, D.M., 2021, Construction of the high-taper Lesser Himalayan-Subhimalayan thrust belt: the primary driver of Himalayan thickening and high elevations Since 15 Ma: American Geophysical Union 102 (66), Fall Meet. Suppl., Abstract T41B-07.
97. **Long, S.P.**, Kohn, M.J., Kerswell, B.C., Starnes, J.K.\*, Larson, K.P., Blackford, N.R.\*, and Soignard, E., 2021, Protracted Eocene to Oligocene exhumation of the Tso Moriri UHP nappe, northwestern Himalaya: insights from thermometry and

microstructural analysis: American Geophysical Union 102 (66), Fall Meet. Suppl., Abstract D145D-0053.

96. Di Fiori, R.V.\*, **Long, S.P.**, Snell, K.E., Fetrow, A.C., Bonde, J.W., and Vervoort, J.D., 2021, Shortening in the Sevier hinterland within the larger framework of the Cordilleran retroarc thrust system: insights from mapping and geochronology of the Cretaceous Newark Canyon Formation in central Nevada, U.S.A.: American Geophysical Union 102 (66), Fall Meet. Suppl., Abstract T52B-06.
95. Blackford, N.R.\*, **Long, S.P.**, Stout, A.J.\*\*\*, Rodgers, D.W., Cooper, C.M., Kramer, K.\*\*\*, Di Fiori, R.V.\*, and Soignard, E., 2021, Late Cretaceous upper-crustal thermal structure of the Cordilleran hinterland plateau in eastern Nevada and western Utah: Quantifying the thermal effects of lithospheric delamination: American Geophysical Union 102 (66), Fall Meet. Suppl., Abstract T15C-0176.
94. Barba, W.K.\*, **Long, S.P.**, McKay, M.P., and Soignard, E., 2021, Defining the thermal architecture of the Salmon River Suture Zone in west-central Idaho using RSCM thermometry: Geological Society of America Abstracts with Programs, Vol. 53.
93. Kohn, M.J., **Long, S.P.**, Kerswell, B., Starnes, J.K.\*, Larson, K.P., Blackford, N.\*, and Soignard, E., 2020, Quartz petrofabrics and RSCM thermometry constrain the P-T-t history of the UHP Tso Moriri metamorphic complex, northern India: cool, shallow, and possibly slow: American Geophysical Union 101 (65), Fall Meet. Suppl., Abstract V041-13.
92. **Long, S.P.**, and Kohn, M.J., 2020, Distributed ductile thinning (DDT) during thrusting: an overlooked exhumation mechanism for mid-crustal rocks: American Geophysical Union 101 (65), Fall Meet. Suppl., Abstract V041-12.
91. Di Fiori, R.V.\*, **Long, S.P.**, Fetrow, A.C., Snell, K.E., Bonde, J.W., and Vervoort, J.D., 2020, Shortening episodes in the Sevier hinterland within the larger context of the Cordilleran retroarc thrust system: Insights from the Cretaceous Newark Canyon Formation in central Nevada: American Geophysical Union 101 (65), Fall Meet. Suppl., Abstract T039-0012.
90. Fetrow, A.C., Snell, K.E., Di Fiori, R.V.\*, **Long, S.P.**, and Bonde, J.W., 2020, Paleoelevation estimates suggest low surface elevations for the mid-Cretaceous Newark Canyon Formation within the Sevier hinterland: American Geophysical Union 101 (65), Fall Meet. Suppl., Abstract EP026-03.
89. **Long, S.P.**, Mullady, C.L.\*\*\*, Starnes, J.K.\*, Gordon, S.M., Larson, K.P., Pianowski, L.S.\*, Miller, R.B., and Soignard, E., 2020, Integrating temperature, fabric, strain, and kinematic data to illuminate the structural evolution of the South Tibetan Detachment System in northwestern Bhutan: Geological Society of America Abstracts with Programs, Vol. 52, No. 6., doi: 10.1130/abs/2020AM-354901.

88. Blackford, N.R.\*, **Long, S.P.**, Stout, A.\*\*\*, Rodgers, D.W., Kramer, K.\*\*\*, Di Fiori, R.V.\*, and Soignard, E., 2020, Upper-crustal thermal structure of the Sevier hinterland plateau, eastern Nevada and western Utah, U.S.A.: constraints from RSCM and CAI thermometry integrated with structural reconstructions: Geological Society of America Abstracts with Programs, Vol. 52, No. 6., doi: 10.1130/abs/2020AM-355044.
87. Starnes, J.K.\*, **Long, S.P.**, Kohn, M.J., McQuarrie, N., Larson, K.P., Togbay, T., and Soignard, E., 2020, Microstructural and thermobarometry data define distributed north-vergent shearing in easternmost Bhutan: an alternative style for the South Tibetan Detachment system: Geological Society of America Abstracts with Programs, Vol. 52, No. 6., doi: 10.1130/abs/2020AM-35646.
86. Gordon, S.M., Zamora, C.L., Kauffman, R., Gonzales-Clayton, R., and **Long, S.P.**, 2020, Two-stage exhumation of the Himalayan metamorphic core: insights from Greater Himalayan rocks in central and eastern Bhutan: Geological Society of America Abstracts with Programs, Vol. 52, No. 6., doi: 10.1130/abs/2020AM-351190.
85. Heizler, M.T., Holland, M.E., and **Long, S.P.**, 2020, Muscovite MDD: In vacuo argon release via volume diffusion: Goldschmidt Abstracts, v. 2020, doi: 10.46427/gold2020.1013.
84. Zuza, A., Levy, D., Henry, C., **Long, S.**, and Dee, S., 2020, Non-lithostatic pressure in North American core complexes: EGU General Assembly, Abstract 11435, doi: 10.5194/egusphere-egu2020-11435.
83. Fetrow, A.C., Snell, K.E., Di Fiori, R.V.\*, **Long, S.P.**, and Bonde, J.W., 2019, Assessing how mid-latitude North America responded to a warmed Cretaceous climate using stable single and clumped isotope geochemistry: Eos Trans., American Geophysical Union 100 (64), Fall Meet. Suppl., Abstract PP13C-1468.
82. **Long, S.P.**, Heizler, M.T., Thomson, S.N., Reiners, P.W., and Fryxell, J.E., 2019, Slab rollback as a driver of the earliest episode of distributed extension in the Nevadaplano: a case study from the Oligocene-early Miocene Grant Range detachment system in eastern Nevada: Geological Society of America Abstracts with Programs, Vol. 51, No. 5., doi: 10.1130/abs/2019AM-336971.
81. **Long, S.P.**, 2019, Distributed stretching gradients between major Himalayan shear zones, and their role in mass transfer (invited presentation): Geological Society of America Abstracts with Programs, Vol. 51, No. 5., doi: 10.1130/abs/2019AM-336942.
80. Kramer, K.\*\*\*, **Long, S.P.**, Di Fiori, R.V.\*, and Soignard, E., 2019, Evaluating the spatial extent of anomalous upper-crustal heating in the Nevadaplano: insights from

RSCM thermometry in the Fish Creek Range in east-central Nevada: Geological Society of America Abstracts with Programs, Vol. 51, No. 5., doi: 10.1130/abs/2019AM-338446.

79. Anderson, R.B.\*, **Long, S.P.**, Horton, B.K., Calle, A.Z., and Soignard, E., 2019, Carboniferous expansion of the Hercynian Orogeny across southern Bolivia: Insights from RSCM thermometry and thermal modeling: Geological Society of America Abstracts with Programs, Vol. 51 No. 5., doi: 10.1130/abs/2019AM-338094.
78. Blackford, N.\*, **Long, S.P.**, Rodgers, D.W., Di Fiori, R.V.\*, and Soignard, E., 2019, Quantifying the upper-crustal thermal structure of the Nevadaplano: preliminary depth-temperature relationships from the Schell Creek and Deep Creek Ranges: Geological Society of America Abstracts with Programs, Vol. 51, No. 5., doi: 10.1130/abs/2019AM-332953.
77. Starnes, J.K.\*, **Long, S.P.**, McQuarrie, N., Larson, K., Tobgay, T., and Soignard, E., 2019, Metamorphic and deformation temperature trends in the Himalayan thrust belt in easternmost Bhutan: preliminary insights from RSCM thermometry and quartz petrofabrics: Geological Society of America Abstracts with Programs, Vol. 51, No. 5., doi: 10.1130/abs/2019AM-338760.
76. Di Fiori, R.V.\*, and **Long, S.P.**, 2019, Kilometer-scale isoclinal folding within the Sevier hinterland in eastern Nevada: insights from new mapping in the Pancake Range: Geological Society of America Abstracts with Programs, Vol. 51, No. 5. doi: 10.1130/abs/2019AM-335186.
75. Di Fiori, R.V.\*, **Long, S.P.**, Fetrow, A.C., Snell, K.E., Bonde, J.W., and Vervoort, J., 2019, Syn-contractional deposition of the Cretaceous Newark Canyon Formation, Diamond Mountains, Nevada: Implications for strain partitioning within the North American Cordillera: Geological Society of America Abstracts with Programs, Vol. 51, No. 5., doi: 10.1130/abs/2019AM-335173.
74. **Long, S.P.**, Mullady, C.L.\*\*\*, Starnes, J.K.\*, Gordon, S.M., Larson, K.P., Miller, R.B., Pianowski, L.S.\*, and Soignard, E., 2019, A structural model for the South Tibetan detachment system in northwestern Bhutan, in Laskowski, A.K., Orme, D.A., Hubbard, M., Lageson, D.R., and Thomson, K.D., Abstract volume of the 34<sup>th</sup> Himalaya-Karakoram-Tibet Workshop, Bozeman, MT, June 4-7, 2019, p. 56.
73. Dee, S., Zuza, A.V., Henry, C.D., Ressel, M.W., Thorman, C.H., Blackmon, J.E., and **Long, S.P.**, 2019, Insights into Mesozoic contraction, Cenozoic extension, mineralization, and earthquake hazards from geologic mapping of the Pequop Mountains, NE Nevada, in Thorleifson, L.H., Minnesota Geological Survey Geologic Mapping Forum abstracts, Minneapolis, MN, April 10-12, 2019, p. 33-34.
72. Zuza, A.V., Henry, C.D., Ressel, M.W., Thorman, C.H., Dee, S.M., and **Long, S.P.**, 2019, Probing the core of the North American Cordillera – Insights from geological

mapping of the Pequop Mountains, NE Nevada: Geological Society of America Abstracts with Programs, Vol. 51, No. 4., doi: 10.1130/abs/2019CD-329170.

71. Di Fiori, R.V.\*, **Long, S.P.**, Fetrow, A.C., Snell, K.E., and Bonde, J., 2018, Cretaceous syntectonic sedimentation and folding in the Diamond Mountains, eastern Nevada: a record of out-of-sequence contractional deformation in the Sevier hinterland: Eos Trans., American Geophysical Union 99 (63), Fall Meet. Suppl., Abstract T41E-0355.
70. Anderson, R.B.\*, **Long, S.P.**, Horton, B.K., Thomson, S.N., Calle, A.Z., and Stockli, D.F., 2018, Thrust belt response to rapid surface uplift and implications for Cordilleran cyclicity in the central Andes, Eos Trans., American Geophysical Union 99 (63), Fall Meet. Suppl., Abstract T53A-06.
69. Starnes, J.K.\*, **Long, S.P.**, Zhang, J., and Gordon, S.M., 2018, Applying quartz fabric intensity parameters to delineate strain gradients across shear zones: examples from the Main Central thrust in western Bhutan: Eos Trans., American Geophysical Union 99 (63), Fall Meet. Suppl., Abstract T21D-0229.
68. Fetrow, A.C., Snell, K.E., Di Fiori, R.V.\*, **Long, S.P.**, and Bonde, J.W., 2018, Palustrine environments of the Early Cretaceous 'Nevadaplano' record warm and wet conditions: Eos Trans., American Geophysical Union 99 (63), Fall Meet. Suppl., Abstract PP51A-08.
67. **Long, S.P.**, 2018, Magnitude, distribution, and driving mechanisms of Basin and Range extension: insights from a province-wide cross section at 39°N: Eos Trans., American Geophysical Union 99 (63), Fall Meet. Suppl., Abstract T43C-05.
66. Anderson, R.B., **Long, S.P.**, Horton, B.K., Thomson, S.N., Calle, A.Z., and Stockli, D.F., 2018, Insight into orogenic wedge evolution in the central Andes of southern Bolivia (21°S) from integration of thermochronology and thrust belt kinematics: Implications for Cordilleran cyclicity: South American Symposium on Isotope Geology, Cochabamba, Bolivia, July 22-25, 2018.
65. Fetrow, A.C., Snell, K.E., DiFiori, R., **Long, S.P.**, and Bonde, J.W., 2018, Basin evolution analysis of Newark Canyon Formation, Nevada: A reconstruction of palustrine and lacustrine carbonate depositional environments: Rocky Mountain GeoBiology Symposium, Golden, CO, April 7.
64. **Long, S.P.**, 2018, New perspectives on the construction and extensional collapse of the Nevadaplano: A summary of recent progress (invited presentation): National Association of Geoscience Teachers 5th Biennial Structural Geology and Tectonics Forum.
63. **Long, S.P.**, 2017, A summary of recent progress on understanding the structural evolution and paleogeography of the Nevadaplano (invited presentation): Geological

Society of America Abstracts with Programs, Vol. 49, No. 6, doi:  
10.1130/abs/2017AM-301454.

62. **Long, S.P.**, and McQuarrie, N., 2017, Integration of geometry, kinematics, burial timing, and exhumation timing to understand 4-D thrust belt evolution: an example from the Himalayan orogen in Bhutan (invited presentation): Geological Society of America Abstracts with Programs, Vol. 49, No. 6, doi: 10.1130/abs/2017AM-301501.
61. **Long, S.P.**, Gordon, S.M., and Soignard, E., 2017, Large-scale, distributed structural thinning in the Himalayan orogen: a case study from central Bhutan: Geological Society of America Abstracts with Programs, Vol. 49, No. 6, doi: 10.1130/abs/2017AM-301530.
60. **Long, S.P.**, Gordon, S.M., Young, J.P., and Soignard, E., 2017, Temperature and strain gradients across the Main Central thrust in south-central Bhutan: implications for the origin of inverted metamorphism and the contribution of transport-parallel stretching to cumulative mass transfer: Geological Society of America Abstracts with Programs, Vol. 49, No. 6, doi: 10.1130/abs/2017AM-301512.
59. Stout, A.J.\*\* , **Long, S.P.**, and Soignard, E., 2017, Extensional strain, contractional strain, and peak thermal conditions in the White Pine Range, eastern Nevada: insights from a structural reconstruction integrated with RSCM thermometry: Geological Society of America Abstracts with Programs, Vol. 49, No. 6, doi: 10.1130/abs/2017AM-305633.
58. Pianowski, L.S.\* , Vervoort, J.D., **Long, S.P.**, and Gordon, S.M., 2017, Timing of metamorphism in the Main Central thrust zone in south-central Bhutan: insights from preliminary garnet and monazite geochronology: Geological Society of America Abstracts with Programs, Vol. 49, No. 6, doi: 10.1130/abs/2017AM-306954.
57. Anderson, R.B.\* , **Long, S.P.**, Thomson, S.N., Calle, A.Z., Horton, B.K., and Stockli, D.F., 2017, Deformation history and wedge dynamics of the central Andes in southern Bolivia (~21°S): Insights from new apatite (U-Th)/He, apatite fission track, and zircon (U-Th)/He ages: Geological Society of America Abstracts with Programs, Vol. 49, No. 6, doi: 10.1130/abs/2017AM-304165.
56. Di Fiori, R.V.\* , Long, S.P., Snell, K.E., Bonde, J., and Vervoort, J.D., 2017, Aptian-Albian deposition within an axially-drained syntectonic basin in the Sevier hinterland in north-central Nevada: insights from mapping and U-Pb geochronology from the Newark Canyon Formation in the Cortez Mountains: Geological Society of America Abstracts with Programs, Vol. 49, No. 6, doi: 10.1130/abs/2017AM-298693.
55. Starnes, J.K.\* , **Long, S.P.**, Zhang, J., and Gordon, S.M., 2017, Using quartz petrofabric intensity parameters to delineate shear zones: a case study from the Main

Central thrust in western Bhutan: Geological Society of America Abstracts with Programs, Vol. 49, No. 6, doi: 10.1130/abs/2017AM-297707.

54. Fetrow, A.C., Snell, K.E., **Long, S.P.**, and Bonde, J.W., 2017, A paleoclimatic record from the “Nevadaplano” during the Middle Cretaceous using stable isotopes and clumped isotope paleothermometry: Goldschmidt Abstracts, v. 2017, p. 1146.
53. **Long, S.P.**, and Walker, J.P., 2016, The Grant Range in eastern Nevada: a ‘proto’ core complex exhumed entirely by brittle, low-angle ( $\leq 15^\circ$ ) detachment faults: Eos Trans., American Geophysical Union 97 (61), Fall Meet. Suppl., Abstract T21A-2795.
52. Di Fiori, R.V.\*, **Long, S.P.**, Rafferty, K., Snell, K., and Bonde, J., 2016, Early Cretaceous, syn-contractional deposition within the Sevier hinterland in central Nevada: preliminary insights from geologic mapping in the Diamond Mountains: Eos Trans., American Geophysical Union 97 (61), Fall Meet. Suppl., Abstract T51D-2970.
51. Starnes, J.K.\*, **Long, S.P.**, Gordon, S.M., and Soignard, E., 2016, Peak metamorphic temperatures across the Main Central thrust and through Greater Himalayan rocks in western Bhutan: preliminary insights from Raman spectroscopy of carbonaceous material thermometry: Eos Trans., American Geophysical Union 97 (61), Fall Meet. Suppl., Abstract V33D-3150.
50. **Long, S.P.**, and Walker, J.P., 2016, A structural model for brittle detachment faulting in the central Grant Range and the Grant Canyon and Bacon Flat oil fields in Railroad Valley, eastern Nevada: AAPG Pacific Section and Rocky Mountain Section Joint Meeting, October 2-5, 2016, Las Vegas, NV.
49. Anderson, R.B.\*, **Long, S.P.**, Horton, B.K., Calle, A.Z., and Ramirez, V., 2016, Retroarc crustal shortening and structural architecture of the Andean fold-thrust belt of southern Bolivia ( $21^\circ\text{S}$ ): Implications for kinematic development and crustal thickening of the central Andes: Geological Society of America Abstracts with Programs, Vol. 48, No. 7, doi: 10.1130/abs/2016AM-284079.
48. Anderson, R.B.\*, **Long, S.P.**, Horton, B.K., Calle, A.Z., and Ramirez, V., 2016, Regional geologic map across the Andean retroarc fold-thrust belt of southern Bolivia: New insights on the Subandean Zone, Interandean Zone, and Eastern Cordillera at  $21^\circ\text{S}$ : Geological Society of America Abstracts with Programs, Vol. 48, No. 7, doi: 10.1130/abs/2016AM-285926. (**1<sup>st</sup> place, Geological Society of America Best Student Map Competition, 2016 Annual Meeting**)
47. Zamora, C., Gordon, S.M., **Long, S.P.**, Kylander-Clark, A., and McDonald, C., 2016, Exhumation and cooling history of Greater Himalayan rocks in the eastern Himalaya: a U-Pb and  $^{40}\text{Ar}/^{39}\text{Ar}$  thermochronology study from central and eastern

Bhutan: Geological Society of America Abstracts with Programs, Vol. 48, No. 7, doi: 10.1130/abs/2016AM-285232.

46. Gordon, S.M., Zamora, C., Kauffman, R., **Long, S.**, Agustsson, K., Gonzales-Clayton, B., and Kylander-Clark, A.R.C., 2016, Two-stage exhumation of Greater Himalayan rocks: P-T-t-D results from mid-crustal rocks of central and eastern Bhutan: Goldschmidt Abstracts, v. 2016, p. 974.
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44. **Long, S.P.**, Thomson, S.N., Reiners, P.W., and Di Fiori, R.V.\*, 2015, The role of upper-crustal thickening in spatially-focusing synorogenic extension: a case study from the Late Cretaceous-Paleocene Nevadaplano: Eos Trans., American Geophysical Union 96 (60), Fall Meet. Suppl., Abstract T21B-2812.
43. Anderson, R.B.\*, **Long, S.P.**, Ramirez, V., Horton, B.K., and Calle, A.Z., 2015, Crustal shortening and structural architecture of the Interandean and Subandean zones of southern Bolivia (21°S): constraints from a new balanced cross section: Eos Trans., American Geophysical Union 96 (60), Fall Meet. Suppl., Abstract T23A-2923.
42. Calle, A.Z., Horton, B.K., Anderson, R.B.\*, and **Long, S.P.**, 2015, Late Cretaceous-Cenozoic evolution of the central Andean foreland basin system in the Eastern Cordillera to Subandean Zone, southern Bolivia: Eos Trans., American Geophysical Union 96 (60), Fall Meet. Suppl., Abstract T23A-2924.
41. Gordon, S.M., Kauffman, R., Gonzales-Clayton, B., **Long, S.**, and Kylander-Clark, A., 2015, Monazite growth from the Eocene to the Miocene: new interpretations of the metamorphic history of Greater Himalayan rocks in the eastern Himalaya: Eos Trans., American Geophysical Union 96 (60), Fall Meet. Suppl., Abstract V41A-3058.
40. **Long, S.P.**, and Walker, J.P., 2015, Flexural isostatic folding during brittle, low-angle detachment faulting, Grant Range, eastern Nevada: a long-duration 'fixed hinge': Geological Society of America Abstracts with Programs, Vol. 47, No. 7, p. 370.
39. **Long, S.P.**, 2015, Map pattern and style of regional-scale contractional deformation in the Sevier hinterland in eastern Nevada: insights from sub-volcanic paleogeologic maps: *in* Pennell, W.M., and Garside, L.J., eds., New Concepts and Discoveries: Geological Society of Nevada Symposium Program with Abstracts, May 2015, Sparks, Nevada, v. 1, p. 78-79.

38. Di Fiori, R.V.\*, **Long, S.P.**, Muntean, J.L., and Edmondo, G.P., 2015, Structural analysis of gold mineralization in the southern Eureka mining district, Eureka County, Nevada: a predictive structural setting for Carlin-type mineralization: *in* Pennell, W.M., and Garside, L.J., eds., *New Concepts and Discoveries: Geological Society of Nevada Symposium Program with Abstracts*, May 2015, Sparks, Nevada, v. 1, p. 48-49.
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36. Penfold, M.L.\*, **Long, S.P.**, Gordon, S.M., Seward, G.G.E., Agustsson, K.S., and Zeiger, K.J., 2014, Deformation temperature, kinematics, and internal strain during emplacement of Greater Himalayan rocks in north-central and northeastern Bhutan: *Eos Trans., American Geophysical Union 95 (59)*, Fall Meet. Suppl., Abstract T21B-4596.
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34. Agustsson, K.M., Gordon, S.M., **Long, S.P.**, Seward, G.G.E., Zeiger, K.J., and Penfold, M.L.\*, 2014, Flattening of the Greater Himalayan zone within the eastern Himalaya: insights from pressure–temperature–structural distance trends from central and eastern Bhutan: *Eos Trans., American Geophysical Union 95 (59)*, Fall Meet. Suppl., Abstract T21B-4599.
33. Gordon, S.M., Kauffman, R., Gonzales-Clayton, B., Kylander-Clark, A., Agustsson, K., and **Long, S.P.**, 2014, Along-strike variations in the timing of melt crystallization and metamorphism across central and eastern Bhutan: new insights from LASS monazite geochronology and trace-element abundances: *Eos Trans., American Geophysical Union 95 (59)*, Fall Meet. Suppl., Abstract T13D-03.
32. Di Fiori, R.V.\*, **Long, S.P.**, Muntean, J.L., and Edmondo, G.P., 2014, Structural analysis of gold mineralization in the southern Eureka mining district, Nevada: a predictive structural setting for Carlin-type gold deposits: *Geological Society of America Abstracts with Programs*, Vol. 46, No. 6, p. 462. **(2<sup>nd</sup> place, Geological Society of America Best Student Map Competition, 2014 Annual Meeting)**
31. Calle, A.Z., Horton, B.K., **Long, S.P.**, Anderson, R.B.\*, and Ramirez, V., 2014, Shortening, exhumation, and sedimentation in the Andean thrust belt and foreland basin of southern Bolivia: *Memorias del XXI Congreso Geológico Boliviano*, Cochabamba, Bolivia, October 16-19, 2014.

30. Calle, A.Z., Horton, B.K., **Long, S.P.**, Ramirez, V., and Anderson, R.B.\*, 2014, Shortening, exhumation, and sedimentation in the fold-thrust belt and foreland basin system of southern Bolivia: Actas del XIX Congreso Geológico Argentino (Eds. Martino, Lira, Guerreschi, Baldo, Franzese, Krohling, Manassero, Ortega, and Pinotti), p. 1572-1573, Cordoba, Argentina.
29. Agustsson, K.S., Gordon, S.M., **Long, S.P.**, Seward, G.G.E., Zeiger, K.J., and Penfold, M.L.\*, 2013, Testing the channel flow model in the eastern Himalaya, eastern Bhutan: insights from preliminary thermobarometric data: Eos Trans., American Geophysical Union 94 (58), Fall Meet. Suppl., Abstract V51B-2651.
28. Zeiger, K.J., Gordon, S.M., **Long, S.P.**, Kylander-Clark, A., Agustsson, K., and Penfold, M.L.\*, 2013, Testing the driving forces for exhumation of the Greater Himalayan Sequence in northeast Bhutan: implications of split-stream U-Pb zircon geochronology: Geological Society of America Abstracts with Programs, Vol. 45., No. 7, p. 797.
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25. **Long, S.P.**, 2011, Magnitude and spatial patterns of erosional exhumation in the Nevadaplano, eastern Nevada and western Utah: insights from a Paleogene paleogeologic map: Eos Trans., American Geophysical Union 92 (56), Fall Meet. Suppl., Abstract T11B-2314.
24. McQuarrie, N., **Long, S.P.**, Tobgay, T., and Nesbit, J.N., 2011, Documenting basin scale, geometry and provenance through detrital geochemical data: lessons from Neoproterozoic to Ordovician strata of Bhutan: Eos Trans., American Geophysical Union 92 (56), Fall Meet. Suppl., Abstract T13F-2470.
23. Rodgers, D.W., and **Long, S.P.**, 2011, Creation and collapse of the northern Cache-Pocatello culmination, southeastern Idaho: Eos Trans., American Geophysical Union 92 (56), Fall Meet. Suppl., Abstract T11B-2313.
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“klippe”: Eos Trans., American Geophysical Union 92 (56), Fall Meet. Suppl., Abstract T21A-2307.

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20. **Long, S.P.**, McQuarrie, N., Tobgay, T., Grujic, D., and Hollister, L., 2010, A new 1:500,000-scale geologic map of Bhutan: a detailed view of eastern Himalayan stratigraphy and structural geometry: Eos Trans., American Geophysical Union, 91(55), Fall Meet. Suppl., Abstract T43B-2176.
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18. Tobgay, T., McQuarrie, N., and **Long, S., P.**, 2010, Constraining age and rate of the Main Central Thrust displacement in western Bhutan: Eos Trans., American Geophysical Union, 91(55), Fall Meet. Suppl., Abstract T43B-2184.
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16. McQuarrie, N., Leier, A., and **Long, S. P.**, 2010, Exhumation, subsidence, sedimentation and evacuation: linking surface processes to mantle geodynamics in the Andean plateau: Geological Society of America Abstracts with Programs, Vol. 42., No. 5, p. 183.
15. **Long, S.P.**, McQuarrie, N., and Tobgay, T., 2010, Internal strain and deformation temperature of Lesser Himalayan thrust sheets, Bhutan: *in* Leech, M.L., Klemperer, S.L., and Mooney, W.D., eds., Proceedings for the 25<sup>th</sup> Himalaya-Karakoram Tibet Workshop, San Francisco, California, U.S.A.: U.S. Geological Survey, Open-File Report 2010-1099, 2 p., <http://pubs.usgs.gov/of/2010-1099/long/>.
14. McQuarrie, N., and **Long S.P.**, 2010, Magnitude of strain in a low-grade Greater Himalayan section, central Bhutan: implications for channel flow: *in* Leech, M.L., Klemperer, S.L., and Mooney, W.D., eds., Proceedings for the 25<sup>th</sup> Himalaya-Karakoram Tibet Workshop, San Francisco, California, U.S.A.: U.S. Geological Survey, Open-File Report 2010-1099, 2 p., <http://pubs.usgs.gov/of/2010-1099/mcquarrie/>
13. Whynot, N., Grujic, D, **Long, S.**, and McQuarrie, N., 2010, Apparent temperature gradient across the Lesser Himalayan Sequence: Raman spectroscopy on

carbonaceous material in the eastern Bhutan Himalaya: *in* Leech, M.L., Klemperer, S.L., and Mooney, W.D., eds., Proceedings for the 25<sup>th</sup> Himalaya-Karakoram Tibet Workshop, San Francisco, California, U.S.A.: U.S. Geological Survey, Open-File Report 2010-1099, 2 p., <http://pubs.usgs.gov/of/2010-1099/whynot/>

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11. Tobgay, T., McQuarrie, N., and **Long, S.**, 2009, Metamorphic grade of the Paro Formation, western Bhutan and its implications: *Eos Trans., American Geophysical Union*, 90(54), Fall Meet. Suppl., Abstract T43C-2126.
10. **Long, S.P.**, and McQuarrie, N., 2009, Placing limits on channel flow: is central Bhutan STD-free?: *Geological Society of America Abstracts with Programs*, Vol. 41, No. 7, p. 586.
9. Dixon, I.T.E., Leier, A.L., McCartney, T., McQuarrie, N., and **Long, S.P.**, 2009, Exploring the relationship between upper crustal deformation, sedimentation, and surface uplift in the Altiplano of the Central Andes, Bolivia: *Geological Society of America Abstracts with Programs*, Vol. 41, No. 7, p. 657.
8. **Long, S.P.**, McQuarrie, N., Tobgay, T., Gehrels, G., and Grujic, D., 2008, Tectonostratigraphy of the Lesser Himalaya of Bhutan: Deducing the Paleostratigraphy of the Northern Indian Margin: *Eos Trans., American Geophysical Union*, 89(53), Fall Meet. Suppl., Abstract T31E-07.
7. Tobgay, T., McQuarrie, N., Hollister, L., **Long, S.**, and Gehrels, G., 2008, The Paro Formation provenance and its tectonometamorphic history, Bhutan Himalaya: *Eos Trans., American Geophysical Union*, 89(53), Fall Meet. Suppl., Abstract T15-2044.
6. **Long, S.P.**, McQuarrie, N., Tobgay, T., and Gehrels, G., 2007, Preliminary stratigraphy and structure of the Lesser Himalayan portion of the Himalayan fold-thrust belt, eastern Bhutan: *Eos Trans., American Geophysical Union*, 88(52), Fall Meet. Suppl., Abstract T23D-1649.
5. Leier, A., **Long, S.P.**, and McQuarrie, N., 2006, Oligo-Miocene deposition along the eastern margin of the Altiplano plateau, Salla, Bolivia: *Eos Trans., American Geophysical Union*, 87(52), Fall Meet. Suppl., Abstract T33C-0527.
4. **Long, S.P.**, Leier, A., and McQuarrie, N., 2006, New Constraints on the Temporal and Spatial Evolution of the Central Andean Huarina Backthrust Belt South of La Paz, Bolivia: *Geological Society of America Abstracts with Programs*, Vol. 38, No. 7, p. 414.

3. **Long, S.P.**, Link, P.K., Janecke, S.U., Perkins, M.E., and Fanning, C.M., 2005, Multiple phases of tertiary extension and synextensional deposition in an evolving supradetachment basin, Malad Range, Southeast Idaho: Geological Society of America Abstracts with Programs, Vol. 37, No. 7, p. 204.
2. Janecke, S.U., Steely, A.N., Carney, S.J., and **Long, S.P.**, 2005, The Evolution of fold-prone supradetachment basins: examples of translation and breakup from Montana and SE Idaho: Geological Society of America Abstracts with Programs, Vol. 37, No. 7, p. 497.
1. **Long, S.P.**, Link, P.K., Rodgers, D.W., Janecke, S.U., and Perkins, M.E., 2004, Eocene to Recent normal faulting and syntectonic sedimentation, Henderson Creek quadrangle, Southeast Idaho: Geological Society of America Abstracts with Programs, Vol. 36, No. 4, p. 21.

### **Teaching Experience**

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30 semesters total (2002 to present); n = number of students in each course

#### **Washington State University:** rank: Associate Professor

- Fall 2021: SOE 340 – Structural Geology and Plate Tectonics (4 credits, n = 22)  
SOE 541 – Orogenic Systems (3 credits; n = 8)
- Spring 2021: Sabbatical
- Fall 2020: Sabbatical
- Spring 2020: SOE 210 – Earth’s History and Evolution (4 credits; n = 80)
- Fall 2019: SOE 340 – Structural Geology and Plate Tectonics (4 credits, n = 31)  
SOE 498/598 – Geology Seminar (1 credit, n = 13)
- Spring 2019: SOE 210 – Earth’s History and Evolution (4 credits, n = 59)
- Fall 2018: SOE 542 – Extensional Tectonics (3 credits; n = 9)
- Summer 2018: GEOL 408 – Field Geology (3 credits; n = 6)
- Spring 2018: GEOL 340 – Structural Geology (4 credits; n = 15)
- Summer 2017: GEOL 408 – Field Geology (3 credits; n = 19)
- Spring 2017: GEOL 340 – Structural Geology (4 credits; n = 12)  
GEOL 498/598 – Geology Seminar (1 credit; n = 11)
- Fall 2016: GEOL 541 – Orogenic Systems (3 credits; n = 9)
- Spring 2016: GEOL 340 – Structural Geology (4 credits; n = 8)

#### **University of Nevada, Reno:** rank: Assistant Professor

- Summer 2015: GEOL 451 – Field Camp (6 credits; n = 19) – served as Director
- Summer 2014: GEOL 451 – Field Camp (6 credits; n = 23) – served as Director
- Summer 2013: GEOL 451 – Field Camp (6 credits; n = 23) – served as Director
- Summer 2012: GEOL 451 – Field Camp (3 credits; n = 26) – taught half of course
- Spring 2012: GEOL 701A – Balanced Cross-Sections (2 credits; n = 6)
- Fall 2011: GEOL 731 – Orogenic Systems (3 credits; n = 11)

#### **Princeton University:** rank: Teaching Assistant during Ph.D. program

- Fall 2009: ENV 399 – Environmental Decision Making (1 credit; n = 16)

- ENV 499 – Environmental Change, Poverty and Conflict (1 credit; n = 8)
- Spring 2009: GEO 210 – Earthquakes, Volcanoes, and Other Hazards laboratory (1 credit, 2 sections; n = 26)
- Spring 2008: GEO 210 – Earthquakes, Volcanoes, and Other Hazards laboratory (1 credit, 1 section; n = 17)
- Fall 2007: GEO 235 – The Physical Earth laboratory (1 credit, 1 section; n = 14)

**Idaho State University:** rank: Adjunct Instructor

- Spring 2006: GEOL 1101 – Physical Geology (3 credits; n = 79)  
GEOL 1100 – Geology and Human Affairs (3 credits; n = 51)  
GEOL g4409 – Remote Sensing laboratory (1 credit; n = 21)
- Fall 2005: GEOL 1101 – Physical Geology (3 credits; n = 70)  
GEOL 1110 – Physical Geology laboratory (1 credit, 2 sections; n = 70)  
GEOL g4402 – Geomorphology laboratory (1 credit; n = 24)
- Summer 2005: GEOL 1100 – Geology and Human Affairs (3 credits; n = 7)

**Idaho State University:** rank: Teaching Assistant during M.S. program

- Spring 2004: GEOL 1110 – Physical Geology laboratory (1 credit, 1 section; n = 27)  
GEOL 4421 – Structural Geology laboratory (1 credit; n = 16)
- Spring 2003: GEOL 1110 – Physical Geology laboratory (1 credit, 2 sections; n = 32)  
GEOL 4421 – Structural Geology laboratory (1 credit; n = 18)
- Fall 2002: GEOL 1110 – Physical Geology laboratory (1 credit, 3 sections; n = 48)

**University of Idaho:** rank: Teaching Assistant during undergraduate work

- Spring 2002: GEOL 101L - Physical Geology laboratory (1 credit, 2 sections; n = 40)

## **Courses Designed and Taught**

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### **Undergraduate level:**

**Physical Geology** (ISU GEOL 1101): This course addresses several grand challenges of Earth science, including the need to better understand biogeochemical cycles, the rock cycle, climate change, the hydrologic cycle, and renewable and non-renewable resources. One of the main objectives is that students develop a general understanding of the scientific process that will then be used to evaluate human interactions with the natural world. Students will become familiar with many Earth science terms, concepts, and methods, and will be required to perform basic research and simple scientific procedures, including gathering data, organizing information, and communicating what they have learned through written work. This process will enhance critical thinking, logic and communications and discussion skills useful to multiple disciplines.

**Earth's History and Evolution** (WSU SOE 210): This course provides an overview of the origins and evolution of Earth and its life-forms over geologic time, by teaching how the science of Geology has been applied to the study of the rock and fossil record. We will cover topics including the origins of the solar system, plate tectonics, and the atmosphere and oceans, as well as an introduction to geologic time, absolute and relative dating methods, principles of stratigraphy, and interpretation of the fossil record. By the end of this course students should have a good understanding of the basics of the scientific process of inquiry, the requirements and limitations of scientific theories, and a full appreciation of the true magnitude of geologic time.

**Structural Geology and Plate Tectonics** (WSU GEOL 340/SOE 340): Over geologic time scales, due to the application of stresses, Earth materials such as rocks deform through a variety of processes, at scales that range from submicroscopic to regional. This course presents a thorough examination of the mechanisms by which Earth materials deform, and the geologic structures that result from this deformation. An understanding of structural geology is fundamental to multiple geologic fields, including exploration for natural resources such as oil, gas, coal, and precious metals, exploration for groundwater and geothermal energy resources, and evaluation and mitigation of natural geologic hazards.

**Field geology** (WSU GEOL 408/UI GEOL 490/UNR GEOL 451): Through a series of field-based exercises, students will learn new skills and integrate knowledge gained through their previous coursework in order to understand complex geologic field relations in three dimensions. The focus of this course is to master advanced field skills, including note taking, lithologic description, measurement of planar and linear features, structural analysis, and geologic mapping. Students will synthesize real-world data that they collected, in order to generate geologic maps, illustrate the geometries of deformed rocks using cross-sections, and produce descriptive and interpretive written reports. This course is enhanced by the spectacular geologic setting of the Dillon, MT, region.

**Graduate level:**

**Orogenic Systems** (WSU GEOL 541/SOE 541/UNR GEOL 731): Orogenic belts are the result of contractional deformation at convergent plate margins, which produces the thickest crust and highest elevations on Earth. Much of this deformation is accommodated through formation of fold-thrust belts, which can accommodate 100's of km of crustal shortening. An understanding of the geometry, kinematics, and dynamics of fold-thrust belts is critical to the study of compressional tectonics. In addition, because fold-thrust belts and associated foreland basin systems host a large percentage of the world's oil, gas, and coal, understanding orogenesis is critical to the hunt for natural resources. The purpose of this class is to gain an understanding of orogenesis by undergoing a semester-long case study on the North American Cordillera. Key to this goal will be a week-long field trip, organized as a transect through the frontal thrust belt in Alberta.

**Extensional tectonics** (WSU SOE 542): Tectonic extension is accommodated by normal faults and normal-sense shear zones, which work together to thin and elongate the upper and lower crust, respectively. An understanding of the geometry and dynamics of how these structures act to thin the crust is critical to the study of tectonics. Also, because normal faults form primary conduits for fluid flow and mineralization, an understanding of extensional tectonics is fundamental to the hunt for natural resources. In this course, we will undergo a semester-long case study on the Basin and Range province in Nevada and Utah (includes a week-long field trip), the world's finest active extensional province.

## **Teaching Evaluations Summary**

(all metrics are out of a maximum possible value of 5.00)

Term	University	Course	Course title	Instructor overall	Course quality	Explanations/ examples	Available/ approachable	Knowledge/ enthusiasm	n
FA 2011	UNR	GEOLOGY 731	Orogenic Systems	4.83	-	4.50	4.75	-	6
SPR 2013	UNR	GEOLOGY 451	Summer Field Camp	4.25	-	4.25	-	-	20
SUM 2014	UNR	GEOLOGY 451	Summer Field Camp	4.71	-	4.39	-	4.74	20
SUM 2015	UNR	GEOLOGY 451	Summer Field Camp	4.69	-	4.67	-	4.67	16
SPR 2016	WSU	GEOLOGY 340	Structural Geology	4.67	-	4.67	4.67	4.89	9
FA 2016	WSU	GEOLOGY 541	Orogenic Systems	4.89	-	4.67	5.00	4.78	9
SPR 2017	WSU	GEOLOGY 340	Structural Geology	4.80	4.80	4.90	4.90	5.00	10
SPR 2017	WSU	GEOLOGY 498/598	Geology Seminar	5.00	5.00	5.00	5.00	5.00	7
SUM 2017	WSU	GEOLOGY 408	Field Geology	5.00	5.00	5.00	5.00	5.00	8
SUM 2017	UI	GEOLOGY 490	Field Geology II	5.00	5.00	5.00	5.00	5.00	11
SPR 2018	WSU	GEOLOGY 340	Structural Geology	5.00	5.00	4.90	5.00	5.00	13
SUM 2018	WSU	GEOLOGY 408	Field Geology	5.00	5.00	5.00	5.00	5.00	3
FA 2018	WSU	SOE 542	Extensional Tectonics	4.70	4.30	4.70	4.70	5.00	9
SPR 2019	WSU	SOE 210	Earth's History and Evolution	4.30	4.10	4.50	4.50	4.80	32
FA 2019	WSU	SOE 340	Structural Geology/Plate Tectonics	4.70	4.50	4.70	4.70	4.90	24
FA 2019	WSU	SOE 498/598	Geology Seminar	4.80	4.20	5.00	5.00	5.00	5
SPR 2020	WSU	SOE 210	Earth's History and Evolution	4.60	4.30	4.70	4.90	4.90	59

## **Graduate Student Mentoring**

2020-: Co-advisor to Keita Hasegawa (WSU M.S. student – degree in progress).

2018-: Primary advisor to Nolan Blackford (WSU Ph.D. student – degree in progress).

2016-2021: Primary advisor to Jesslyn Starnes (WSU Ph.D. student, completed 2021).

Dissertation: Integrating metamorphic and structural datasets to evaluate the thermal, kinematic, and geometric framework of the Himalayan thrust belt in Bhutan [Ph.D. dissertation]: Washington State University, 213 p., 37 figures, 12 tables.

2016-2020: Primary advisor to Russell Di Fiori (WSU Ph.D. student, completed 2020).

Dissertation: Investigating the space-time evolution of Cordilleran deformation and deposition in central Nevada: Insights from Early Cretaceous syn-tectonic basins [Ph.D. dissertation]: Washington State University, 251 p., 36 figures, 8 tables, 5 plates.

2015-2018: Co-advisor to Laura Pianowski (WSU M.S. student, completed 2018).

Thesis: Pianowski, L.S., 2018, Timing of metamorphism in the Main Central thrust zone in south-central Bhutan: Insights from garnet and monazite geochronology [Master's Thesis]: Pullman, Washington State University, 78 p. 12 figures.

2013-2019: Primary advisor to Ryan Anderson (WSU Ph.D. student, completed 2019).

Dissertation: Anderson, R.B., 2019, The geometry, kinematics, and timing of the central Andean thrust belt of southern Bolivia: A field based test of cordilleran cyclicity [Ph.D. dissertation]: Washington State University, 303 p., 42 figures, 16 tables.

2012-2014: Primary advisor to Melissa Penfold (UNR M.S. student, completed 2014).

Thesis: Penfold, M.L., 2014, Microstructural analysis of Greater Himalayan rocks in northern Bhutan [Master's Thesis]: Reno, University of Nevada, 93 p., 23 figures.

2012-2014: Primary advisor to Russell Di Fiori (UNR M.S. student, completed 2014).

Thesis: Di Fiori, R.V., 2014, Focused geologic mapping and structural analysis of the southern Eureka mining district; assessing structural controls and spatial patterns of mineralization [Master's Thesis]: Reno, University of Nevada, 71 p., 14 figures, 1 plate.

### **Undergraduate Student Mentoring**

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2021-2022: Senior research project advisor to Hadeel Mohamed Masoud Al Harthi (WSU B.S. student)

2020-2022: Junior-Senior research project advisor to Julia Stevens (WSU B.S. student)

2020-2021: Senior thesis advisor to Dominik Vlaha (WSU B.S. 2021)

Thesis: Using quartz fabric intensity and kinematic vorticity to characterize the style and distribution of shearing on the Main Central Thrust in western Bhutan [Senior thesis]: Pullman, Washington State University, 13 p., 6 figs., 1 table.

2019-2020: Senior thesis advisor to Spencer McNamara (WSU B.S. 2020)

2019-2020: Senior thesis advisor to Austyn Gentry (WSU B.S. 2020)

Thesis: Geometry of Eocene detachment faults and half-grabens of the Okanagan and Kettle Domes, northeastern Washington: Insights from regional cross sections [Senior thesis]: Pullman, Washington State University, 18 p., 3 figs., 1 table.

2019: Summer research experience advisor to Quinn Zunino (WSU B.S. student)

2018-2019: Senior research advisor to Evon Branton (WSU B.S. 2019)

2017-2019: Honors College senior thesis advisor to Kimberly Kramer (WSU B.S. 2019).

Thesis: Determining the peak geothermal field gradients of the Fish Creek Range, Nevada, U.S.A. [Senior thesis]: Pullman, Washington State University, 30 p., 11 figs.

2017-2018: Senior research advisor to Connor Mullady (WSU B.S. 2018).

2016-2017: Senior thesis advisor to Austin Stout (WSU B.S. 2017).

Thesis: Extensional strain, contractional strain, and peak thermal conditions in the White Pine Range, eastern Nevada: insights from a structural reconstruction integrated with RSCM thermometry [Senior thesis]: Pullman, Washington State University, 19 p., 5 figs.

2009: Mentor for Chris Hepburn (Princeton B.S. 2010) Junior

Independent Work Paper: "The internal strain and deformation of Bhutan"

2008: Mentor for Natasha Lavdovsky (Princeton B.S. 2009) Junior

Independent Work Paper: "Finite strain in the Pennsylvania Appalachians"

## **Awards**

2013 – Charles J. Mankin Memorial Award, for co-authorship on Geologic Map of Idaho

2010 – Arnold Guyot Teaching Award, Princeton University

2000 – NASA Space Grant for Idaho scholarship, The College of Idaho

2000 – Glenn D. Weed Memorial Scholarship, The College of Idaho

1999 – Ralph and Merle Kyle Mathematics Scholarship, The College of Idaho

## **Professional Societies**

Geological Society of America (GSA): 2004-present

American Geophysical Union (AGU): 2006-present

Nevada Petroleum and Geothermal Society (NPGS): 2011-2015

Geological Society of Nevada (GSN): 2011-2015

American Association of Petroleum Geologists (AAPG): 2001

## **Service**

### **Journal editing:**

2015-2020: Associate Editor, American Geophysical Union journal *Tectonics*.

### **Graduate student committees:**

2021-: Evan Soderberg (WSU Ph.D.) – degree in progress

2021-: Alexis Richardson (WSU M.S.) – degree in progress

2020-: Jonathan Stanfield (WSU M.S.) – degree in progress

2020-: Jarred Zimmerman (WSU Ph.D.) – degree in progress

2020-: Payton McCain (Texas A&M Ph.D.) – degree in progress

2019-2021: Shannon Conner (WSU M.S.)

2019-2021: Claire Puleio (WSU M.S.)

2018-: Ross Salerno (WSU Ph.D.) – degree in progress

2017-2019: Chris Brown (WSU Ph.D.)  
2017: Shaina Cohen (Boise State University Ph.D.)  
2017: Gilbert Ching (WSU M.S.)  
2016-: Austin Green (WSU Ph.D.) – degree in progress  
2016-2018: Da Wang (WSU Ph.D.)  
2016-2019: Clay McDonie (WSU M.S.)  
2016-2019: Andrew Canada (University of Idaho Ph.D.)  
2016: Daniel Gurganus (WSU M.S.)  
2016-2017: Somiddho Bosu (University of Alabama M.S.)  
2016-2017: Alex Johnson (WSU M.S.)  
2014-2016: Carolina Zamora (UNR M.S.)  
2014-2016: Jesse Walters (Boise State University M.S.)  
2012-2015: Gwen Linde (UNR Ph.D.)  
2012-2014: Kenjo Agustsson (UNR M.S.)  
2012-2014: Kate Zeiger (UNR M.S.)  
2012-2013: Kyle Gray (UNR M.S.)  
2011-2014: Jack Rigsbee (UNR M.S.)  
2010-2012: Jonathan Payne (UNR M.S.).

**Department-level committees:**

2021-2022: WSU School of the Environment Earth surface processes faculty search committee (chair)  
2019-2020: WSU School of the Environment plant ecophysiology faculty search committee  
2019-2020: WSU School of the Environment graduate studies committee  
2018-2019: WSU School of the Environment vision and strategy committee  
2018: WSU School of the Environment microprobe technician search committee  
2017-2018: WSU School of the Environment geology revitalization committee (chair)  
2016-2017: WSU School of the Environment geology revitalization committee  
2015-2016: WSU School of the Environment undergraduate studies committee  
2015: UNR NBMG neotectonic geologist faculty search committee  
2014: UNR NBMG economic geologist faculty search committee  
2013: UNR NBMG personnel committee  
2012-2013: UNR Department of Geological Sciences and Engineering geological engineering faculty search committee (2 positions)  
2012: UNR NBMG personnel committee  
2011-2012: UNR Department of Geological Sciences and Engineering geological engineering faculty position search committee

**University-level committees:**

2013-2014: UNR College of Science instrumentation committee

**Other committees/service:**

2021: Earth Sciences Proposal Review Panel member for NSF Tectonics Program  
2018-present: Washington Geological Survey STATEMAP advisory committee  
2017-2019: Registered Student Organization faculty advisor, WSU Geology Club

2016-present: Idaho Geological Survey geological mapping advisory committee

**Media outreach:**

2020: Interviewed by KREM-2 News in Spokane about March 31 M6.5 Idaho earthquake

2019: Interviewed as geologist for WSU 'Ask Dr. Universe'

**Conference session chairing:**

2022: Co-convenor of "Tectonic and magmatic thickening of the Mesozoic North American Cordillera" session at the Cordilleran Geological Society of America meeting, Reno, NV

2021: Co-convenor of "Tectonic, Topographic, and Exhumation History of the Himalaya-Tibetan Orogen" session at the American Geophysical Union annual meeting, New Orleans, LA

2015: Co-chair of "Regional Geology" session at the Geological Society of Nevada Symposium, Reno, NV

2014: Co-chair of "Mesozoic Paleogeography of the North American Cordillera" session at the Joint Rocky Mountain/Cordilleran Geological Society of America meeting, Bozeman, MT

**Journal article reviews (2011-present):** Earth-Science Reviews, Geology, GSA Bulletin, Tectonics, Earth and Planetary Science Letters, Geosphere, G-Cubed, Journal of Structural Geology, Paleogeography-Paleoclimatology-Paleoecology, Journal of Geophysical Research, Gondwana Research, Precambrian Research, AAPG Bulletin, International Journal of Earth Sciences, Canadian Journal of Earth Sciences, Island Arc, GSA Field Trip Guides, Terra Nova, Rocky Mountain Geology, The Journal of Maps, Geological Society of Nevada

**Proposal reviews (2011-present):** NSF Tectonics, NSF Geophysics, NSF Frontiers, NSF Postdoctoral Fellowships, ACS-Petroleum Research Fund, ACS-PRF New Directions, Graduate Women in Science, Chilean National Science and Technology Commission FONDEYCT

**Field Work**

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August, 2021 (1 week):	Salmon River Suture Zone, western Idaho
June, 2021 (1 week):	Northern Snake Range, eastern Nevada
October, 2020 (1 week):	Salmon River Suture Zone, western Idaho
September, 2020 (2 weeks):	Northern Snake and Schell Creek Ranges, eastern Nevada
June, 2019 (1 week):	Northern Snake Range, eastern Nevada
July-Aug, 2018 (3 weeks):	Ladakh, northwestern Indian Himalaya
March-Aug, 2017 (1 week):	Salmon River Suture Zone, western Idaho
Aug., 2017 (1 week):	Diamond, Fish Ck., and Pancake Ranges, eastern Nevada
Oct., 2016 (3 weeks):	Eastern Himalaya, Bhutan
July, 2016 (1 week):	Diamond and Fish Creek Ranges, eastern Nevada
Oct., 2014 (3 weeks):	Eastern Himalaya, Bhutan

Sept.-Nov., 2013 (5 weeks)	Grant Range, eastern Nevada
July-Aug., 2013 (3 weeks)	Central Andes, Bolivia
Feb.-Mar., 2013 (4 weeks)	Eastern Himalaya, Bhutan
May-Sept., 2012 (5 weeks)	Diamond and Fish Creek Ranges, eastern Nevada
Feb.-Mar., 2012 (5 weeks)	Eastern Himalaya, Bhutan
June-Aug., 2011 (9 weeks)	Diamond and Fish Creek Ranges, eastern Nevada
Oct., 2010 (1 week)	Diamond and Fish Creek Ranges, eastern Nevada
April-May, 2010 (9 weeks)	Eastern Himalaya, Bhutan
Sept.-Nov., 2008 (13 weeks)	Eastern Himalaya, Bhutan
Aug., 2007 (3 weeks)	Gardner Canal, British Columbia Coast Range
April-June, 2007 (12 weeks)	Eastern Himalaya, Bhutan
July-Aug., 2006 (4 weeks)	Sacramento Mountains, southern New Mexico
June, 2006 (3 weeks)	Central Andes, Bolivia
Sept.-Oct., 2005 (2 weeks)	Bannock Range, southeast Idaho
June-Oct., 2003 (9 weeks)	Malad Range, southeast Idaho