Curriculum Vitae

Name	Christopher A. Thom
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Research Interests

My research interests lie at the intersection of geophysics, materials science, and engineering. I utilize non-traditional rock deformation techniques such as nanoindentation to measure the rheology of a wide range of geologic materials, including olivine, quartz, calcite, halite, and ice. I also use the D-DIA apparatus to measure the strength of geologic materials at room and elevated temperature to determine the physical mechanisms that limit deformation. I am also interested in the mechanics of earthquake nucleation and the general behavior of faults. I have used atomic force microscopy, white light interferometry, and nanoindentation to examine the scale dependences of roughness and strength in exhumed faults to determine how stresses are distributed in a fault system. I am also interested in using contact mechanics simulations and single asperity friction experiments to elucidate the physical mechanisms that give rise to friction and ultimately, earthquakes.

Education

2014-2019	Ph.D., University of Pennsylvania		
	Earth and Environmental Science		
	Advisor: David L. Goldsby		
	Dissertation: "Scale-Dependent Plasticity and Nanoindentation Creep of		
	Geologic Materials"		
2011-2014	A.B. with Research Distinction, Washington University in St. Louis		
	Earth & Planetary Sciences: Geochemistry		

Academic Experience

2019-present	Postdoctoral Research Assistant , University of Oxford Rock Rheology Laboratory
2014-2019	Graduate Researcher, University of Pennsylvania Experimental Geophysics Laboratory
2015-2018	Teaching Assistant , University of Pennsylvania Department of Earth and Environmental Science
2014	Teaching Assistant, Washington University in St. Louis

Department of Earth & Planetary Sciences

Honors & Awards

2019	NSF EAR Postdoctoral Fellowship (declined)
2019	CTL Teaching Certificate Recipient , Center for Teaching and Learning University of Pennsylvania
2015	Outstanding Student Paper Award (OSPA) , Tectonophysics Section, American Geophysical Union (AGU) Fall Meeting
2014-2019	Benjamin Franklin Fellowship , University of Pennsylvania Department of Earth and Environmental Science
2014	Margaret E. Bewig Memorial Field Camp Award, Wash. U. Department of Earth & Planetary Sciences
2011	Father Pedro Arrupe Service Leadership Award, St. Ignatius HS
Funding	
2019	NSF EAR Postdoctoral Fellowship (\$174,000, declined)
2017	Greg & Susan Walker Endowment Award (\$1776) Department of Earth and Environmental Science, UPenn
2016	Greg & Susan Walker Endowment Award (\$1212) Department of Earth and Environmental Science, UPenn
2015	Graduate and Professional Student Association (\$500) University of Pennsylvania
2015	Greg & Susan Walker Endowment Award (\$627) Department of Earth and Environmental Science, UPenn

Publications

Google Scholar: <u>https://scholar.google.com/citations?user=Qy26PewAAAAJ&hl=en</u> ORCID: <u>https://orcid.org/0000-0001-7510-5956</u>

1. **Thom, C.A.**, Brodsky, E.E., Carpick, R.W., Pharr, G.M., Oliver, W.C., and Goldsby, D.L. (2017), Nanoscale roughness of natural fault surfaces controlled by scale-dependent yield strength. *Geophysical Research Letters*, **44** (18), 9299-9307. doi:10.1002/2017GL074663

2. Kumamoto, K. M., **Thom, C.A.**, Wallis, D., Hansen, L.N., Armstrong, D.E.J., Warren, J.M., Goldsby, D.L., and Wilkinson, A.J. (2017), Size effects resolve discrepancies in 40 years of work on low-temperature plasticity in olivine. *Science Advances*, **3**, e1701338. doi:10.1126/sciadv.1701338

3. **Thom, C.A.**, Carpick, R.W., and Goldsby, D.L. (2018), Constraints on the physical mechanism of frictional aging from nanoindentation. *Geophysical Research Letters*, **45** (24), 13,306-13,311. doi:10.1029/2018GL080561

4. **Thom, C.A.** and Goldsby, D.L. (2019), Nanoindentation studies of plasticity and dislocation creep in halite. *Geosciences*, **9** (2), 79, doi: 10.3390/geosciences9020079

5. Hansen, L.N., Kumamoto, K.M., **Thom, C.A.**, Wallis, D., Durham, W.B., Goldsby, D.L., Breithaupt, T., Meyers, C.D., and Kohlstedt, D.L. (in press), Low-temperature plasticity in olivine: Grain size, strain hardening, and the strength of the lithosphere. doi: 10.1029/2018JB016736

6. Okamoto, K., Brodsky, E.E., **Thom, C.A.**, Smeraglia, L., and Billi, A. (in review at *Geology*), The minimum scale of grooving on a recently ruptured carbonate fault.

7. Thom, C.A., Liang, Z., Pharr, G.M., and Goldsby, D.L. (in prep.), Diffusion creep in ice.

8. Seiphoori, A., **Thom, C.A.**, Goldsby, D.L., and Marschall, P. (in prep.), Diagenetic cementation effects on the pore structure and micromechanical properties of Opalinus Clay-shale.

9. Goddard, R., Hansen, L., Wallis, D., Stipp, M., Holyoke III, C., Kohlstedt, D., Goldsby, D., Durham, W., **Thom, C.A.**, and Kumamoto, K. (in prep.), Comparing in-situ and ex-situ stress measurements in polymineralic rocks.

10. **Thom, C.A.**, Brodsky, E.E., and Goldsby, D.L. (in prep.), Linking the minimum scale of grooving to the critical slip distance and material properties.

Invited Talks

2018	McGill University, Dept. of Earth and Planetary Sciences Colloquium , "Re-evaluating the Strength of Geologic Materials with Nanoindentation and Novel in situ X-ray Techniques"
2018	Gordon Research Seminar (Rock Deformation), "Diffusion Creep in Ice"
2017	American Geophysical Union Fall Meeting , "Nanoscale Roughness of Faults Explained by the Scale-Dependent Yield Stress of Geologic Materials"

Conference Abstracts

1. **Thom, C.A.**, Candela, T., Goldsby, D.L., Carpick, R.W., and Brodsky, E. (2015), Scale dependence of fault roughness to nanometer length scales. SCEC Annual Meeting, Palm Springs, California.

2. **Thom, C.A.**, Candela, T., Goldsby, D.L., Carpick, R.W., and Brodsky, E. (2015), Nanoscale characterization of fault roughness by atomic force microscopy. AGU Fall Meeting, San Francisco, California.

3. Dunne, K.B.J., **Thom, C.A.**, Edmonds, D.A., and Jerolmack, D.J. (2016), Connecting meteorology and atmospheric stability to sand-transporting winds in a dune field. R²E²DS Geomorphology Annual Meeting, USGS Headquarters, Reston, Virginia.

4. **Thom, C.A.**, Candela, T., Goldsby, D.L., Carpick, R.W., and Brodsky, E. (2016), Nanoscale characterization of natural fault roughness. Gordon Research Conference (Tribology), Bates College, Lewiston, Maine.

5. **Thom, C.A.**, Brodsky, E.E., and Goldsby, D.L. (2016), The scale-dependence of fault roughness and asperity strength. Gordon Research Conference (Rock Deformation), Proctor Academy, Andover, New Hampshire.

6. **Thom, C.A.**, Brodsky, E.E., and Goldsby, D.L. (2016), The scale-dependence of fault roughness and asperity strength. SCEC Annual Meeting, Palm Springs, California.

7. Kumamoto, K.M., **Thom, C.A.**, Wallis, D., Hansen, L.N., Armstrong, D.E.J., Wilkinson, A.J., Goldsby, D.L., and Warren, J.M. (2016), Olivine strength in the low-temperature plasticity regime measured via spherical nanoindentation. AGU Fall Meeting, San Francisco, California.

8. **Thom, C.A.**, Brodsky, E.E., and Goldsby, D.L. (2016), On the scale-dependence of asperity strength: Insights from studies of fault roughness and nanoindentation hardness. AGU Fall Meeting, San Francisco, California.

9. Hansen, L.N., Kumamoto, K.M., **Thom, C.A.**, Wallis, D., Armstrong, D.E.J., Goldsby, D.L., Wilkinson, A.J., and Warren, J.M. (2017), Size effects in olivine: Reconciling 40 years of study into plasticity near the brittle-ductile transition. Tectonic Studies Group Joint Assembly, Liverpool, England

10. Kumamoto, K.M., **Thom, C.A.**, Wallis, D., Hansen, L.N., Armstrong, D.E.J., Goldsby, D.L., Warren, J.M., and Wilkinson, A.J. (2017), Size effects in olivine control strength in the low-temperature plasticity regime., AGU Fall Meeting, New Orleans, Louisiana.

11. Hansen, L.N., Kumamoto, K.M., **Thom, C.A.**, Wallis, D., Goldsby, D.L., Durham, W.B., and Kohlstedt, D.L., The grain-size dependence of yield strength during low-temperature plasticity of olivine: Evidence for weak lithospheric mantle., AGU Fall Meeting, New Orleans, Louisiana.

12. **Thom, C.A.**, Carpick, R.W., and Goldsby, D.L. (2017), The physical mechanism of frictional aging revealed by nanoindentation creep., AGU Fall Meeting, New Orleans, Louisiana.

13. **Thom, C.A.**, Brodsky, E.E., Carpick, R.W., Pharr, G.M., Oliver, W.C., and Goldsby, D.L. (2017), Nanoscale roughness of faults explained by the scale-dependent yield stress of geologic materials., AGU Fall Meeting, New Orleans, Louisiana. (*Invited*).

14. Hansen, L.N., Wallis, D., Breithaupt, T., Kumamoto, K., **Thom, C.**, Goldsby, D., Durham, W., and Kohlstedt, D. (2018), A unified model for low- and high-temperature deformation of olivine., Tectonics Studies Group Joint Assembly, Plymouth, England.

15. Goddard, R., Hansen, L., Wallis, D., Stipp, M., Holyoke III, C., Kohlstedt, D., Goldsby, D., Durham, W., Kumamoto, K., and **Thom, C.** (2018), Stress partitioning in polymineralic rocks constrained by subgrain piezometry and D-DIA experiments. Gordon Research Conference (Rock Deformation), Proctor Academy, Andover, New Hampshire.

16. Wallis, D., Hansen, L.N., Kumamoto, K.M., **Thom, C.**, Plumper, O., Goldsby, D., Durham, W.B., Armstrong, D.E.J., Goddard, R., Breithaupt, T., Warren, J.M., Kohlstedt, D.L, and Wilkinson, A.J.

(2018), Dislocation interactions control the strength of olivine deforming by low-temperature plasticity. Gordon Research Conference (Rock Deformation), Proctor Academy, Andover, New Hampshire.

17. **Thom, C.A.**, Liang, Z., Pharr, G.M., and Goldsby, D.L. (2018), Diffusion creep in ice. Gordon Research Conference (Rock Deformation), Proctor Academy, Andover, New Hampshire.

18. Goddard, R., Hansen, L., Wallis, D., Stipp, M., Holyoke III, C., Kohlstedt, D., Goldsby, D., Durham, W., Kumamoto, K., and **Thom, C.** (2018), Comparing in-situ and ex-situ stress measurements in polymineralic rocks. AGU Fall Meeting, Washington D.C.

19. Goldsby, D.L., **Thom, C.A.**, Liang, Z., and Pharr, G.M. (2018), Diffusion creep of ice. AGU Fall Meeting, Washington D.C.

20. **Thom, C.A.** and Goldsby, D.L. (2018), Nanoindentation studies of plasticity and dislocation creep of halite. AGU Fall Meeting, Washington D.C.

Teaching Experience

2018	Head Teaching Assistant , GEOL 100: Introduction to Geology University of Pennsylvania
2018	Instructor , Nanoindentation Summer Camp (NSF funded workshop) Nanomechanics, Inc., Oak Ridge, Tennessee
2017	Substitute Lecturer , GEOL 103: Natural Disasters University of Pennsylvania
2017	Teaching Assistant , GEOL 103: Natural Disasters University of Pennsylvania
2016	Head Teaching Assistant , GEOL 100: Introduction to Geology University of Pennsylvania
2015	Teaching Assistant , GEOL 100: Introduction to Geology University of Pennsylvania
2014	Teaching Assistant , Epsc 116a: Resources of the Earth Washington University in St. Louis

Professional Service

2018	Convener , MR018. An Integrated Approach for Observations, Experiments, and Models of Earth Deformation (PPEM), AGU Fall Meeting, Washington D.C.
2018	Instructor, Nanoindentation Summer Camp (NSF funded workshop), Nanomechanics, Inc., Oak Ridge, Tennessee
2017	Convener , MR012: Localized deformation of lithospheric materials: From grains to tectonic plates. AGU Fall Meeting, San Francisco, California

Memberships & Affiliations

2017-present	Advanced Photon Source (APS)
2015-present	Southern California Earthquake Center (SCEC)
2013-present	American Geophysical Union (AGU)
2012-present	Geological Society of America (GSA)