

Mattathias (Max) D. Needle

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EDUCATION

University of Washington, Seattle, WA

Ph.D. Candidate, Earth and Space Science, beginning Fall 2016

The Whaleback Anticline: Investigating fold form and mechanics and enabling the design of first-person video-game-based virtual field excursions of outcrops.

Advisor: Juliet G. Crider

Rutgers University, New Brunswick, NJ

M.S. Geology – Fall 2013 - Fall 2016

Thesis: Experimental modeling of salt flow subparallel to basement-involved faults: influence of salt distribution and fault geometries in rift basins.

Advisors: Roy W. Schlische and Martha O. Withjack

Kutztown University, Kutztown, PA

B.Sc. Geology – Fall 2007 - Winter 2010

Undergraduate Research Projects: ¹Scaled physical modeling of primary and progressive orogenic curvature; ²Identification of a large vertebrate burrow from the Mississippian.

Advisors: (1) Sarah E. Tindall, (2) Edward L. Simpson

GEOSCIENCE-RELATED PROFESSIONAL AND TEACHING EXPERIENCE

Teaching Assistant, Fall 2016 – current University of Washington

Grading, tutoring, developing course content, and/or substitute lecturer for the following courses: *Plate Tectonics and Materials of the Earth* (Winters 2021, 2022), *Physical Geology* (Winters 2018, 2019, 2020), *Field Camp-ESS 40X* (Summers 2017, 2018, 2019, 2020, 2021, 2022), *Intro to Space and Space Travel* (Spring 2017, Fall 2020), *Intro to Geology* (Fall 2016, 2019),

Teaching Assistant, Jan 2014 – Spring 2016 Rutgers University

Grading, tutoring, developing course content, and/or substitute lecturer for the following courses: *Earthquakes and Volcanoes* (Spring 2016), *Dinosaurs* (Fall 2014, Winter 2014, Fall 2015—Full Lecturer, Spring 2015), *Planet Earth* (Spring 2015).

Science Explorer Bus Fellow, Jan 2015 – May 2016 Rutgers University

Leading science experiments and delivering lectures to middle-school students throughout New Jersey. The NSF-funded program provides weekly mobile services throughout the school year.

Geoscience Internship, Summer 2015 Murphy Oil and Gas Corp., TX

Multidisciplinary project mapping Kodiak Field in the Mississippi Canyon, Gulf of Mexico. Analyzing well logs, generating synthetics, and mapping salt, faults, and horizons.

Assistant Director, Jan 2014 – May 2016 Rutgers Geology Museum, NJ

Developing interactive educational programs for public; designing graphics and web-based content; leading tours; creating content for monthly theme-based late nights at museum

directed at all educational levels; creating content and activities for winter and spring open houses.

Researcher, Sep 2013 – Aug 2016 Rutgers Experimental Modeling Lab, NJ
Designing, building, running, and analyzing experimental models (with wet clay and silicone putty) simulating strike-slip deformation along margins of salt basins. Wrote a successful grant proposal: “Effect of varying the strike and geometry of pre-existing zones of weakness in clay-putty layered models on structural development with comparisons to the Jeanne d’Arc basin: Second phase of an experimental study,” (with R. Schlische and M. Withjack).

Science Educator, Feb 2013 – Jan 2014 Da Vinci Science Center, PA
Teaching workshops and outreach classes for pre-school through high school children. While employed, developed two week-long day camps (Medieval Science and STEAM), trained other counselors, and developed separate content for elementary and middle school students.

AWARDS AND GRANTS

- Joseph A. Vance Endowed Fellowship (Spring 2022), 1 academic quarter of tuition and research-assistant (RA) stipend
- DEI and Outreach Award, UW ESS Gala (Spring 2022) -- \$250
- Howard A. Coombs Endowed Fellowship for Excellence in Teaching (Spring 2021), 1 academic quarter of tuition and research-assistant (RA) stipend
- Joseph A. Vance Endowed Fellowship (Spring 2021), 1 academic quarter of tuition and research-assistant (RA) stipend
- Royalty Research Fund (2021) with Juliet Crider (P.I.) for project: Designing a pipeline to generate 3D virtual field experiences: Improving access to remote sites for researchers and students -- \$39269 Research Grant
- The Why Do We Care Award: Best Audience Engagement, Best Explanation of Research, UW ESS Gala (Spring 2021) -- \$525
- George Edward Goodspeed Geology Scholarship and the Peter Misch Fellowship (Spring 2019) – 1 academic quarter of tuition and research-assistant (RA) stipend
- Kenneth C. Robbins Fellowship and Joseph A. Vance Endowed Fellowship in Geology (Spring 2018) – 1 academic quarter of tuition and research-assistant (RA) stipend
- Crystal Clear Award for easiest to follow Upgoer-5 talk, UW ESS Gala (Spring 2018) -- \$100
- Analog Modeling of Tectonic Processes Travel Grant (Spring 2017) – travel/lodging
- Rutgers Earth and Planetary Sciences Department Chair Award (Spring 2016) -- \$300
- William and Grace Sparks Graduate Student Research Award (Spring 2015) -- \$3000 Stipend, award recognizes accomplishments in teaching and mentoring undergraduate students
- Husky Energy (2014-16), with R. Schlische and M. Withjack -- \$34000 Research Grant
- Chambliss Academic Achievement Award (2010-11) – Silver Medal for Research Excellence
- Kutztown Undergraduate Research Committee (Fall 2010) – \$700 Travel Grant
- Kutztown Undergraduate Research Committee (Spring 2010) – \$700 Travel Grant
- Outstanding Student-Poster Award (March 2010) – Joint Northeastern-Southeastern Sections Meeting of the Geological Society of America Meeting in Baltimore, MD

PROFESSIONAL AND DEPARTMENTAL ACTIVITIES AND SERVICE (2016 – CURRENT)

- Structure-from-Motion/UAV mentoring and coordination (2017-current)
- Pen pal for Letters to a Pre-Scientist (2019-20), outreach
- UndocuAlly Educator (trained at UW Fall 2019)
- Chair and session convener, GSA (Fall 2017), “Advances in Understanding Fault Systems, Plate Boundaries and Deformation: Observations and Experiments”
- Builder of an interactive augmented-reality sandbox for science education, STF-supported / ESS Dept (Spring – Fall 2017), with fellow ESS grad students, Keith Hodson and Mike Turzewski
- Graduate student liaison for ESS department colloquium, ESS Dept. (Fall 2016- Winter 2020, Fall 2021-current), coordinated lunches for invited speakers and grad students
- (2x) First-place Artist of Annual Pint Glass Challenge, ESS Dept. (2017, 2018)
- ESS Student Research Gala
 - 2022: “A workflow for designing virtual field trips that leverage 3D outcrop models” (session: DEI and Outreach)
 - 2021: “Designing interactive 3D virtual field experiences to improve access to remote outcrops” (session: New Ideas, Proposed Research, Educational Horizons)
 - 2019: “Reconstructing a folded surface: from point cloud to NURBS” (session: Structure and Tectonics)
 - 2018: “Understanding rounded rock forms: Stories from the Big-Water-Animal’s Back” (session: Up-Goer-5)
 - 2017: “Scaled physical experiments of salt flow subparallel to basement-involved normal faults” (session: Pre-ESS work)

INVITED DEMOS/PRESENTATIONS/TALKS

- Tech Demo (leader): “Virtual reality demo: Interactive Structural Geology Field Trips” @ GSA Connects 2022, with Jacky Mooc and Juliet Crider. Sponsored by U. of Washington and GSA Foundation, Oct. 2022
- Short Course (leader/organizer): “How to Create your Own 3D Videogame–Style Geologic Field Trip and Host it Online: Accessible, Immersive Data Visualization for Education and Research.”
 - Geological Society of America Connects, October 2022
 - Northeastern Section Geological Society of America Connects, March 2022
 - Geological Society of America Connects, October 2021
- Workshop: Inclusive field research practices for the 21st century @ Midcontinent Paleobotanical Colloquium, June 2021; “Designing interactive 3D virtual field experiences to improve access to remote outcrops.”
- Guest Lecturer: University of Costa Rica, Remote Field Geology course, June 2021; “Different ways to acquire and interact with digital 3D data for Structural Geology.”
- Presenter: GSA Foundation, December 2020; “Field Camp in Changing Landscapes.”

WORKSHOPS ATTENDED

- *America’s Geoheritage Workshop II: Identifying, Developing, and Preserving America’s Natural Legacy* (Winter 2021) – National Science Academy, remote workshop.
- *Teaching Quantitative Structural Geology* (Fall 2019) – Pollard/Martel, Phoenix, AZ.

- *Structural Geology and Tectonics Forum* (Winter 2018) – National Science Foundation, Arizona State University, Tempe, AZ.
- *Analog Modeling of Tectonic Processes* (Spring 2017) – Bureau of Economic Geology, Univ. of Texas, Austin, TX.
- *Introduction to Structure from Motion Photogrammetry* (Fall 2016) - GSA/UNAVCO, Denver, CO.
- *Integrated Basin Analysis* (Fall 2015) - ExxonMobil Exploration Company, Lehigh University, Bethlehem, PA.

RESEARCH PUBLICATIONS

Peer-Reviewed Journal Publications

- Needle, M. D.**, Mooc, J., Akers, J. F., Crider, J. G., 2022, The Structural Geology Query Toolkit for digital 3D models: Design custom immersive virtual field experiences: *Journal of Structural Geology*, 163, 104710.
- Needle, M. D.**, Crider, J. G., Mooc, J., & Akers, J. F., 2022, Virtual field experiences in a web-based video game environment: open-ended examples of existing and fictional field sites: *Geoscience Communication*, 5(3), 251-260.
- Simpson, E. L., Malenda, H. F., **Needle, M. D.**, Hilbert-Wolf, H. L., Steullet, A., Boling, K., Wizevich, M. C., Tindall, S. E. 2011, Upper Cretaceous dinosaur tracks from the upper and capping sandstone members of the Wahweap Formation, Grand Staircase-Escalante National Monument, Utah, U.S.A.: *New Mexico Museum of National History and Science*, Bulletin 53, FR 3, p. 380-383.
- Simpson, E. L., Hilbert-Wolf, H. L., Wizevich, M. C., Tindall, S. E., Fasinski, B. R., Storm, L. P., **Needle, M. D.**, 2010, Predatory digging behavior by dinosaurs: *Geology*, v. 38, no. 8, p. 699-702.
- Storm, L. P., **Needle, M. D.**, Smith, C. J., Fillmore, D. L., Szajna, M., Simpson, E. L., Lucas, S. G., 2010, Large vertebrate burrow from the Upper Mississippian Mauch Chunk Formation, eastern Pennsylvania, USA: *Palaeogeography, Palaeoclimatology, Palaeoecology*, v. 298, no. 3-4, p. 341-347.

Abstracts Presented at Professional Meetings

- Needle, M. D.** and Crider, J. G., New ways of looking at the Whaleback Anticline: a video-game based virtual field experience to enhance access, learning, and scientific discovery, 2022: *Geological Society of America Abstracts with Programs*, v. 54, no. 3.
- Needle, M. D.**, Mooc, J., Akers, A. F., Crider, J. G., The Structural Geology Query Toolkit for digital 3D models: design your own virtual field experience, 2021: *Geological Society of America Abstracts with Programs*, v. 52, no. 6.
- Needle, M. D.**, Mooc, J., Wang, A. W., Akers, A. F., Crider, J. G., Virtual field work at the Whaleback Anticline: Measuring fold geometry in a WebGL-based game, 2020: *Geological Society of America Abstracts with Programs*, v. 52, no. 6.
- Needle, M. D.**, Crider, J. G., Gray, M. B., Weil, A. B., Does curvature correspond to fold-related strain in the anticlines at Bear Valley, Shamokin, PA? 2019: *Geological Society of America Abstracts with Programs*, v. 51, no. 5.

- Gray, M. B., Weil, A. B., Crider, J. G., **Needle, M. D.**, Strain within folded layers at the Whaleback Anticline, Shamokin, PA, USA, 2019: Geological Society of America Abstracts with Programs, v. 51, no. 5.
- Needle, M. D.**, Crider, J. G., 2018, Developing a virtual tour of the Whaleback Anticline for mobile devices: American Geophysical Union Fall 2018 Abstracts.
- Needle, M. D.**, Crider, J. G., 2018, Flexible, quantitative, 3D curve fitting for folds: from point cloud to NURBS: Geological Society of America Abstracts with Programs, v. 50, no. 6.
- Needle, M. D.**, Crider, J. G., 2018, Extracting fold form for scientific investigations and education: Structural Geology and Tectonics Forum 2018 Abstracts.
- Crider, J. G., Gray, M. B., **Needle, M. D.**, Weil, A. B., 2017, Enhancing scientific and educational resources at the Whaleback Anticline, Bear Valley, Pennsylvania: Geological Society of America Abstracts with Programs, v. 49, no. 6.
- Needle, M. D.**, Schlische, R. W., Withjack, M. O., 2017, Scaled physical experiments of salt flow subparallel to basement involved normal faults: Analog Modeling of Tectonic Processes 2017 Abstracts.
- Sinclair, I. K., Bateman, C., Withjack, M. O., **Needle, M. D.**, Schlische, R. W., McIlroy, C., Emberley, N., 2017, Basin-margin reactivation due to episodic rifting in Jeanne d'Arc Basin: experimental models and outcrop analogs: GeoConvention 2017 Abstracts.
- Needle, M. D.**, Tindall, S. E., and Sussman, A. J., 2010, A deeper look into orogenic curvature: analog models in cross section: Geological Society of America Abstracts with Programs, v. 42, no. 5.
- Needle, M. D.**, Tindall, S. E., and Sussman, A. J., 2010, Physical modeling of primary and progressive orogenic curvature: Geological Society of America Abstracts with Programs, v. 42, no. 1.
- Folk, S. N., **Needle, M. D.**, and Tindall, S. E., 2010, Modeled effects of deep-seated fault offset and strike on supracrustal geometries in basement-cored uplifts: Geological Society of America Abstracts with Programs, v. 42, no. 5.
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