Zach Perzan

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Education

Ph.D. **Earth System Science, Stanford University** Expected 2023
Gerald J. Lieberman Fellow
NSF Graduate Research Fellow
Advisor: Kate Maher

B.A. **Geology (Honors), Middlebury College** 2015
Summa Cum Laude

Research Experience

On-farm recharge in the Central Valley of California, Doctoral Researcher 2021 –
With R. Knight and K. Maher (Stanford)
- Collaborative project with Stanford geophysicists and a local water district
- Assimilated novel geophysical data into a massively parallel hydrologic model
- Performed 500,000+ core-hours of hydrologic simulations

Reactive transport modeling of floodplain biogeochemistry, Doctoral Researcher 2018 –
SLAC Floodplain Hydro-Biogeochemistry SFA
- Designed and built a network of water quality sensors at remote field sites, including a data assimilation and modeling workflow
- Built a machine learning model for groundwater quality forecasting

Data-driven groundwater quality forecasting, Doctoral Researcher 2019 – 2021
With K. Maher (Stanford)
- Used time-aware long short-term memory network to forecast water quality
- Awarded outstanding poster at the 2019 Deep Learning Symposium (Judge: Andrew Ng) and Computational Methods in Water Research XXIII

Novel biosensors for trace groundwater contaminants, Researcher 2019 –
With S. Cookson and M. Ferry (Quantitative Biosciences, Inc)
- Developed a field-deployable sensor unit that uses customized biosensor strains to measure trace groundwater contaminants (U, Mo, As, etc)

Using data science to understand the Flint water crisis, Doctoral Researcher 2019 –
With N. Ajami (NSF-ReNUWIt) and K. Maher (Stanford)
- Project examining consumer spending data to analyze Americans' distrust of tap water following the Flint water crisis
- Used modern data science tools to map increases in bottled water spending following Flint and quantify the associated financial cost

Updated: August 2022

Publications

Peer-Reviewed Journals

Perzan, Z., Osterman, G. and Maher, K., 2022, The conflicting role of sediment texture during managed aquifer recharge through a heterogeneous vadose zone (*in prep*)

Perzan, Z., and Chapin, T., 2022, WellSTIC: A cost-effective sensor for performing point dilution tests to measure groundwater velocity in shallow aquifers. (*in review*, Water Resources Research)

Babey, T., Boye, K., Tolar, B., Engel, M., Noel, V., **Perzan, Z.**, et al., 2022, Simulation of anoxic lenses as exporters of reactivity in alluvial aquifer sediments. Geochimica et Cosmochimica Acta, 334, pp. 119-134.

Perzan, Z., Babey, T., Caers, J., Bargar, J.R. and Maher, K, 2021, Local and Global Sensitivity Analysis of a Reactive Transport Model Simulating Floodplain Redox Cycling. Water Resources Research, *57* (12).

Li, Q., Wang, L., **Perzan, Z.**, Caers, J., Brown, G.E., Bargar, J.R., and Maher, K., 2021, Global Sensitivity Analysis of a Reactive Transport Model for Mineral Scale Formation During Hydraulic Fracturing. Environmental Engineering Science, 38 (3).

Damerow, J., Varadharajan, C., Boye, K., et al., 2021, Sample Identifiers and Metadata to Support Data Management and Reuse in Multidisciplinary Ecosystem Sciences. Data Science Journal, 20 (11), pp. 1-19.

Munroe, J., **Perzan, Z.**, and Amidon, W., 2016. Cave sediments constrain the latest Pleistocene advance of the Laurentide ice sheet in the Champlain Valley, Vermont, USA. Journal of Quaternary Science, 31 (8), pp. 893-904.

Schroth, A., Giles, C., Isles, P., Xu, Y., **Perzan, Z.**, and Druschel, G., 2015. Dynamic coupling of iron, manganese, and phosphorous behavior in water and sediment of shallow ice-covered eutrophic lakes. Environmental Science and Technology, 49 (16), pp. 9758-9767.

Grants & Fellowships

Stanford SPICE Grant ($1,075) 2021
- Funding to develop a new Indigenous Environmental Justice course

Gerald J. Lieberman Fellowship ($95,549) 2021
- Highly competitive fellowship, awarded for service to the University

McGee-Levorsen Research Grant ($3,705) 2021

Shell Foundation Student Grant ($1,500) 2018

NSF Graduate Research Fellowship (GRFP) ($138,000) 2017

Vermont Geological Society Research Grant ($400) 2013

Middlebury Undergraduate Research Grant ($1,000) 2013

Honors & Awards

Outstanding Poster, Computational Methods in Water Resources XXIII 2020
Outstanding Poster, Stanford Deep Learning Symposium 2019
U.S. Congress "Posters on the Hill" Presenter 2015
- One of 60 students invited to showcase research before Congress

National GeoCUR Award for Excellence in Student Research 2015
- National award recognizing research impact as an undergraduate

John M. White Award for Outstanding Work in Geology ($800) 2015
Outstanding Student Research Paper, Vermont Geological Society 2014

Teaching

Instructor of Record

Indigenous Environmental Justice 2022
ESS226, Stanford University
- Designed a popular new course on Indigenous Environmental Justice
- Broad swath of students, including undergraduates, law students, medical students, earth scientists, and environmental engineering MS students

Teaching Assistant

Contaminant Hydrogeology 2019 – 2022
CEE261, Stanford University
- Graduate-level course for 15-20 MS and PhD students
- Designed new course material, including both problem sets and lectures
- Delivered 1-2 lectures each quarter

Pedagogical Training

Preparing Future Professors Program Winter 2022
- Shadowed a faculty member for 3 months at the University of San Francisco
- Included guest lectures, faculty meetings, field trips, curriculum planning

Designing a Learning-centered Syllabus 2022
Accessibility in Action: Designing for Universal Learning 2022
National Environmental Justice Education and Teaching Workshop 2021
Setting the Foundation: Starting with Learning and Working Backwards 2021

Mentorship

Community College, Undergraduate and Graduate Student Mentees

Graduate

- Ziyan Wu: Preparing manuscript as part of ongoing research project. Recently graduated with MS degree and applying to PhD programs (since 2019)

Undergraduate (4 yr)

- Timothy Dai: Computer science student working on ML emulators (since 2022)
- Marc Berghouse: Now pursuing MS and PhD at the University of Nevada, Reno. Co-author on multiple conference presentations (since 2018)
- Diana Velazquez: Summer Undergraduate Research in Geoscience and Engineering (SURGE; now an REU). Currently PhD student at U. Michigan (2019)

Community College

- Bailey Lewis: Now pursuing BS in Earth Science at UC Berkeley (2019-2020)
- Cassie Weed: Field intern in Wyoming. Now at Bureau of Land Management (2019)
- George Sims: Presented work at the Wyoming Undergraduate Research Day (2018)
- Dustin Proctor: Field intern in Wyoming, co-advised with Callum Bobb. (2018)

Service and Outreach

Graduate Teaching Mentor 2021 –
School of Earth, Stanford University

- Facilitated pedagogy workshops for Stanford faculty, instructors and teaching assistants

Faculty Search Committee Student Representative 2021
School of Earth, Stanford University

- Faculty search focused on candidates with strong DEI proposals

Northern Arapaho Environmental Meeting 2018
Northern Arapaho Tribe, Wind River Reservation

- Outreach event on the Wind River Indian Reservation designed to introduce Middle and High School students to research in Environmental Science

Small Business Innovation and Research Advisor 2019 –
Quantitative BioSciences, Inc

- Helped biotech startup secure three DOE small business research grants
- Provided expertise in making new sensor tech field-deployable

Data Manager and Archivist 2019 –
SLAC-SFA, SLAC National Accelerator Lab

- Developed GitHub data management and archiving platform for large research program across multiple institutions

Lab Safety Coordinator 2019 –
School of Earth, Stanford University

- Manage lab safety training and assessments on behalf of other students

Graduate Student Mentor 2018 – 2020
Earth System Science, Stanford University

- Mentor incoming Earth Science graduate students over their first year

Data Archiving Standard Development 2018 – 2019

ESS-DIVE, Lawrence Berkeley National Lab
- Helped test and create data archiving and sample naming standards used by all DOE Biological and Environmental Research (BER) research programs

Invited Speaker 2019
Stanford Earth Young Investigators, Stanford University
- Discuss graduate school and career path with high school summer interns interested in Earth Science research

Reviewer for: Journal of Hydrology (6), Water Resources Research (2), Environmental Science & Technology, Hydrological Processes, American Geophysical Union Books, Petroleum Research

Conference Presentations

Perzan, Z., Osterman, G., Knight, R., and Maher, K., 2022**,** A geostatistical workflow for evaluating flood-MAR sites using geophysical data. The 11th International Symposium on Managed Aquifer Recharge, Long Beach, CA.

Perzan, Z., 2022, Groundwater modeling in the face of uncertainty. ISMARx, Long Beach, CA.

Wang, L., **Perzan, Z.,** Babey, T., et al., 2021, Uncertainty quantification of water exchanges due to beaver-induced inundation**.** American Geophysical Union Annual Meeting**.**

Babey, T., **Perzan, Z.,** Rogers, D.B., Wang., L., Pierce, S., Bargar, J. and Maher, K., 2021, Hydr-biogeochemical response of oxic-anoxic interfaces to beaver dam construction in a simulated floodplain aquifer**.** American Geophysical Union Annual Meeting**.**

Perzan, Z., Babey, T., and Maher, K., 2020, Interpreting Parameter Interactions using Global Sensitivity Analysis on a Hillslope-scale Reactive Transport Model**.** American Geophysical Union Annual Meeting**.**

Perzan, Z., Babey, T., and Maher, K., 2020, Short-term water quality forecasting with continuous-time recurrent neural networks. Computational Methods in Water Resources XXIII.

Babey, T., Boye, K., **Perzan, Z.**, Bargar, J.R., and Maher, K., 2020, Simulation of biogeochemical cycling in a synthetic alluvial aquifer. Computational Methods in Water Resources XXIII.

Perzan, Z., Boye, K., Berghouse, M., Fendorf, S., Bargar, J.R., and Maher, K., 2019, Seasonal nutrient cycling between the saturated and unsaturated zones in a contaminated floodplain. American Geophysical Union Annual Meeting, San Francisco, CA.

Perzan, Z., 2019, Forecasting groundwater quality using continuous-time recurrent neural networks. Stanford Deep Learning Symposium, Stanford, CA.

Babey, T., **Perzan, Z.**, Boye, K., Bobb., C., Bargar, J.R., and Maher, K, 2019, Modeling of biogeochemical responses to hydrologic transitions in floodplain aquifers. American Geophysical Union Annual Meeting, San Francisco, CA.

Roycroft, S., Boye, K., **Perzan, Z.**, Johnson, R., Dam, W., Noel, V., Fendorf., S., Bargar, J.R., 2019, Uranium mobilization across saturated-unsaturated interfaces. Goldschmidt2019, Barscelona, Spain.

Bargar, J.R., Noel, V., **Perzan, Z.**, Boye, K., Janot, N., Williams, K.H., 2019, Hydrological-Biogeochemical controls over uranium redox rates. SSSA International Soils Meeting, San Diego, CA.

Manley, T.O., **Perzan, Z.**, Herdman, L., and Chen, T., 2018, Circulation dynamics of Missisquoi Bay: A new look at the question of water quality and causeways. Geological Society of America – Northeastern Section Meeting, Burlington, VT

Perzan, Z., Manley, P.L., Manley, T.O., Manary, T., Kraft, M., Juteau, J-P., and Singer, J.,2016, Sediment transport dynamics of a shallow bay: Missisquoi Bay, Lake Champlain, VT. Association for the Sciences of Limnology and Oceanography (ASLO) Meeting, Santa Fe, NM

Perzan, Z., Munroe, J., and Amidon, W., 2015, A potential long-term climate record from Weybridge Cave, Vermont, USA. U.S. Congress: "Posters on the Hill", Washington, D.C.

Perzan, Z., Amidon, W., and Munroe, J., 2014, Investigation of last interglacial sediment in Weybridge Cave, Vermont. Geological Society of America (GSA) Annual Meeting, Vancouver, Canada

Perzan, Z., Amidon, W., and Munroe, J., 2014, A potential pre-Wisconsinan paleoenvironmental record from Weybridge Cave, VT. Vermont Geological Society Meeting, Middlebury, VT

Perzan, Z., Munroe, J., and Amidon, W., 2014, Origin and significance of clastic sediments within Weybridge Cave, VT. Geological Society of America – Southeastern Section Meeting, Blacksburg, VA