

CONTACT INFORMATION

Hildebrand Department of Petroleum and Geosystems Engineering
The University of Texas at Austin
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EDUCATION

Stanford University, Stanford, California USA
Ph.D., Energy Resources Engineering, January 2019
Advisor: Anthony R. Kovscek
Dissertation: *Fluid-Fluid, Fluid-Mineral Interactions and Reactive Transport in Porous Media*
Ph.D. minor, Mechanical Engineering, January 2019
Advisor: John A. Dabiri (now at Caltech)

University of Toronto, Toronto, Ontario Canada
M.A.Sc., Mechanical Engineering, June 2014
Advisor: David A. Sinton
Thesis: *Microfluidic Visualization of Phase and Flow Phenomena Related to Carbon Dioxide Transport and Usage*
B.A.Sc., Engineering Science, June 2012
Advisor: Brent E. Sleep
Thesis: *Two Phase Dynamics in Porous Media with Applications to Carbon Sequestration*

CURRENT AND PREVIOUS ACADEMIC POSITIONS

University of Texas at Austin	
Assistant Professor, Petroleum and Geosystems Engineering	January 2019 - present
George H. Fancher Assistant Professor	September 2020 - present
Affiliated Faculty, Center for Subsurface Energy and the Environment	January 2019 - present
Affiliated Faculty, Texas Materials Institute	September 2020 - present
Affiliated Faculty, Battery Research Group	September 2021 - present
Co-Director, UT Austin Critical Minerals Group	September 2021 - present

INTERESTS

ACADEMIC I am interested in understanding and controlling the fundamental geochemical processes that determine the formation and recovery of earth resources to achieve energy and environmental sustainability. My current research develops and uses novel micro/nano-visualization approaches to study the geochemical mechanisms underlying processes including critical minerals recovery, solid CO₂ storage, and energy storage to enable an energy transition toward sustainability and carbon neutrality. Our group combines experimentally-obtained visual observations with machine learning-based image processing and geochemistry theory to inform predictive model development.

TEACHING My primary teaching goal is to educate students with fundamental knowledge in the geosciences and engineering, and an ability to think critically and creatively so that students are equipped to meet our society's rising demands towards energy and environmental sustainability. I also aim to help develop their ability and passion towards advancing fundamental geosciences and engineering knowledge. I am interested in teaching both basic and applied courses in sustainability, energy resources, subsurface flow and transport, fluid mechanics, thermodynamics, geochemistry, and general courses in energy and environmental resources to develop the next generation of leaders in the geosciences and engineering.

HONORS, AWARDS, AND ACHIEVEMENTS

UT Austin Nominee, Moore Inventor Fellows Award, 2022
NSF CAREER Award, 2022–2027
UT Austin Nominee, Johnson & Johnson WiSTEM²D Award, 2020
Fellow, George H. Fancher Professorship in Petroleum and Geosystems Engineering, 2020–present
American Chemical Society Petroleum Research Fund Doctoral New Investigator Award, 2020–2022
Protégé of Larry W. Lake, The Academy of Medicine, Engineering, and Science of Texas, 2020
Gerald J. Lieberman Fellowship, 2018-2019
Gordon Research Conference (Microfluidics, Physics and Chemistry of) Best Poster Award, 2017
Gordon Research Seminar (Flow and Transport in Permeable Media) Discussion Leader, 2016
Petroleum Research School of Norway STEP Scholarship, 2016
Hormoz and Fariba Ameri Graduate Education Fellowship in Earth Sciences, 2015-2018
Society of Petroleum Engineers Calgary Section Scholarship, 2104
4th World Petroleum Council Youth Forum Student Invitation Fellowship, 2013
Queen Elizabeth II Graduate Scholarship in Science and Technology, 2013–2014
MIE Research Symposium Best Poster Presentation Award, 2013
Carbon Management Canada International Research Exchange Fellowship, 2013
Gordon Cressy Award for Student Leadership, 2012
Engineering Science Research Opportunities Program Fellowship, 2009

MEMBERSHIPS IN PROFESSIONAL AND HONORARY SOCIETIES

Member, Society of Engineering Science (SES)
Member, Society of Petroleum Engineers (SPE)
Member, American Chemical Society (ACS)
Member, American Association of Petroleum Geologists (AAPG)
Member, Geochemical Society (GS)
Member, Academy of Association for the Advancement of Science (AAAS)
Member, Society of Women Engineers (SWE)

UNIVERSITY COMMITTEE ASSIGNMENTS

Member, Center Outreach Committee, CSEE, UT Austin, 2021
Member, EnergyNet Panel, PGE, UT Austin, 2021, 2022
Member, Computers Committee, PGE, UT Austin, 2021–present
Member, Ad Hoc Committee on Sustainability Minor, PGE, UT Austin, 2021
Member, Graduate Studies Committee, PGE, UT Austin, 2020-2021
Member, Faculty Recruitment Committee, PGE, UT Austin, 2020-2021
Member, Petroleum Science and Technology Institute for Texas High School Teachers, Department of Petroleum and Geosystems Engineering, UT Austin, 2019–present

OTHER UNIVERSITY SERVICE

Panelist, The Future of Sustainability in Energy, Switch Energy Alliance, UT Austin, 2022
Faculty Advisor, Women in Petroleum and Geosystems Engineering, UT Austin, 2022–present
Session leader, My Introduction To Engineering (MITE) Summer Enrichment Camp, Equal Opportunity in Engineering Program, UT Austin, 2022
Panel Moderator, The Future of Sustainability in Energy, Switch Energy Alliance, UT Austin, 2020
Speaker and Panelist (various topics), UT Energy Week, UT Austin, 2020–present
Graduate and Industry Networking Poster Judge, Graduate Engineering Council, UT Austin, 2019–present
UT Energy Week Poster Judge, UT Energy Club, UT Austin, 2019–present
Chair, Session on Unconventional Resources, Center for Petroleum and Geosystems Engineering Annual Showcase, UT Austin, 2019
Student Paper Contest Judge, Society of Petroleum Engineers UT Austin Chapter, UT Austin, 2019–present
Careers Opportunities On Location Week Lecture, UT Austin, 2019

PROFESSIONAL SOCIETY AND GOVERNMENTAL COMMITTEES

Service to Professional Society

Member, Short Courses Committee, InterPore, 2021–present
Scientific Committee Member, Microfluidics and Energy Symposium, 2020–2021
Technical Advisor, Interface Fluidics, 2017–2019

Journal Reviewer

Scientific Reports; Lab on a Chip; Physical Review Fluids; ACS Omega; Energy and Fuels; Transport in Porous Media; Fuel; Water Resources Research; Colloid and Interface Science Communications; Journal of Colloid and Interface Science; Applied Clay Science; Journal of Petroleum Science and Engineering; Natural Resources Research; Greenhouse Gases: Science and Technology; IEEE Transactions on Geoscience and Remote Sensing; Journal of Natural Gas Science and Engineering; Applied Sciences; Processes; Applied Optics; Catalysts; SPE Journal; International Journal of Greenhouse Gas Control; AIChE Journal; Computational Geosciences; Advanced Functional Materials.

Research Proposal Reviewer

National Science Foundation (NSF), 2020, 2021, 2022, 2023
American Chemical Society (ACS) Petroleum Research Fund, 2019, 2021, 2022

COMMUNITY ACTIVITIES

Conference/Workshop Chair/Co-Chair

President, Stanford Alumni Club of Austin, Austin, TX, 2022–present
Panelist, Women STEM Leadership in Academia, Career Strategies for Women in STEM Seminar Series, City College of New York, 2021
Mentor, Department of Energy Resources Engineering, Stanford University, 2020–present
Convener and Chair, Session H136 Understanding Pore-Scale Mechanisms of Fluid Flow in Porous Media: Modeling and Experimental Approaches, AGU Fall Meeting, 2019

Clean Energy, Education, and Empowerment (C3E) Symposium Organizing Committee, Clean Energy Ministerial, US Department of Energy, 2017–2018

Global Energy Forum Organizing Committee, Precourt Institute for Energy, Stanford University, 2017 – 2018

Student Energy Competitions Task Force, Precourt Institute for Energy, Stanford University, 2017 – 2018

President, Stanford Energy Club, Stanford University, 2017 – 2018

Department Seminar Committee, Energy Resources Engineering, Stanford University, 2017 – 2018

Undergraduate Mentor Program Chair, Energy Resources Engineering, Stanford University, 2017 – 2018

Faculty Search Committee, Energy Resources Engineering, Stanford University, 2016 – 2017

Oil and Gas Group Leader, Stanford Energy Club, Stanford University, 2016 – 2017

Undergraduate and Graduate student mentor, Stanford University, 2015 – 2018

President, Officer, Society of Petroleum Engineers, Stanford University Chapter, 2015 – 2017

Founder and President, Society of Petroleum Engineers, University of Toronto Chapter, 2013 – 2014

Director of Seminars, Sustainable Engineers Association, 2010 – 2013

Chair, Mentor, Engineering Science Freshman Mentorship Program, 2009 – 2012

President, Project Director Tetra Society, University of Toronto Chapter, 2009 – 2012

PUBLICATIONS

A. Refereed Archival Journal Papers

* Names of graduate students advised directly by Wen Song are underlined.

J1 Gerardo, S., Davletshin, A., Loewy, S., and **Song, W.** From Ashes to Riches: Microscale Phenomena Controlling Rare Earths Recovery from Coal Fly Ash. *Environmental Science & Technology*, 56, 22, 16200-16208, 2022. doi.org/10.1021/acs.est.2c04201.

J2 Hatchell, D., **Song, W.**, and Daigle, H. Effect of interparticle forces on the stability and droplet diameter of Pickering emulsions stabilized by PEG-coated silica nanoparticles. *Journal of Colloid & Interface Science*, 626, 824-835, 2022. doi.org/10.1016/j.jcis.2022.07.004.

J3 Davletshin, A., Underwood, T., and **Song, W.** A Bidirectional Soft Diode for Artificial Systems. *Advanced Functional Materials*, 202200658A, 2022. doi.org/10.1002/adfm.202200658.

J4 Hatchell, D., **Song, W.**, and Daigle, H. Salinity effects on the dynamic stability of Pickering emulsions. *Journal of Colloid & Interface Science*, 608, 2321-2329, 2021. doi.org/10.1016/j.jcis.2021.10.154.

J5 Davletshin, A., Ko, T., Milliken, K., Periwal, P., Wang, C., and **Song, W.** Detection of framboidal pyrite size distributions using convolutional neural networks. *Marine and Petroleum Geology*, 132 (105159), 2021. doi.org/10.1016/j.marpetgeo.2021.105159.

J6 Daigle, H., Cook, A., Fang, Y., Bihani, A., **Song, W.**, and Flemings, P. Gas-driven tensile fracturing in shallow marine sediments. *Journal of Geophysical Research: Solid Earth*, 125 (12), 2020. doi.org/10.1029/2020JB020835.

J7 **Song, W.**, Ramesh, N.N., and Kovscek, A.R. Spontaneous Fingering between Miscible Fluids. *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 584, 123943, 2020. doi.org/10.1016/j.colsurfa.2019.123943.

J8 **Song, W.** and Kovscek, A.R. Spontaneous Clay Pickering Emulsification. *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 577, 158-166, 2019. [doi:10.1016/j.colsurfa.2019.05.030](https://doi.org/10.1016/j.colsurfa.2019.05.030).

- J9 **Song, W.**, Ogunbanwo, F., Steinsbo, M., Ferno, M., and Kovscek, A.R. Mechanisms of Multiphase Reactive Flow using Biogenically Calcite-Functionalized Micromodels. *Lab on a Chip*, 18, 3881-3891, 2018. doi:10.1039/C8LC00793D.

Invited by editor to be featured as the issue cover.

- J10 Harrison, A.L., Dipple, G.M., **Song, W.**, Mayer, K.U., Power, I.M., and Sinton, D. Pore scale visualization of mineral dissolution-precipitation reactions in the vadose zone. *Chemical Geology*, 463, 1-11, 2017. doi:10.1016/j.chemgeo.2017.05.003.

- J11 **Song, W.** and Kovscek, A.R. Direct visualization of pore-scale fines migration and formation damage during low-salinity waterflooding. *Journal of Natural Gas Science and Engineering*, 34, 1276-1283, 2016. doi:/10.1016/j.jngse.2016.07.055.

- J12 **Song, W.** and Kovscek, A.R. Functionalization of micromodels with kaolinite for investigation of low salinity oil-recovery processes. *Lab on a Chip*, 15 (16), 3314-3325, 2015. doi:10.1039/C5LC00544B.

Invited by editor to be featured as the issue cover.

- J13 **Song, W.**, de Haas, T.W., Fadaei, H., and Sinton, D. Chip-off-the-old-rock: the study of reservoir-relevant geological processes with real-rock micromodels. *Lab on a Chip*, 14 (22), 4382-4390, 2014. doi:10.1039/C4LC00608A.

This article was highlighted in a Chemistry World article.

- J14 **Song, W.**, Fadaei, H., and Sinton, D. Determination of dew point conditions for CO₂ with impurities using microfluidics. *Environmental Science and Technology*, 48 (6), 3567-3574, 2014. doi:10.1021/es404618y.

Refereed Journal Publications Currently Under Review

- J15 Sujit S. Datta, Ilenia Battiato, Martin Ferno, Ruben Juanes, Shima Parsa, Valentina Prigiobbe, Eric Santanach-Carreras, **Wen Song**, and David Sinton. Lab on a Chip for a Low-Carbon Future. *In Review*.

- J16 Fukuyama, D., Daigle, H., and **Song, W.** Capillarity-driven hydrate film formation on subsea carbon storage. *In Review*.

- J17 Fukuyama, D., Daigle, H., Nole, M., and **Song, W.** Onset of convection from hydrate formation and salt exclusion in marine sands. *In Review*.

- J18 Xia, S. and **Song, W.** Biogenic calcite precipitation on flow diversion to enhance oil recovery. *In Review*.

- J19 Haugen, M., Benali, B., Føyen, T., **Song, W.**, Fernø, M.A., Brattekås, B. Calcite-functionalized micromodels for pore-scale investigations of CO₂ storage security. *In Review*.

B. Refereed Conference Proceedings

* Names of graduate students advised directly by Wen Song are underlined.

- C1 Davletshin, A., Ko, T., Milliken, K., Periwai, P., Wang, C., and **Song, W.** Object detection in SEM images using CNN: Geological application on size distribution of pyrites in Mudrocks. *Microscopy and Microanalysis*. 28 (S1), 2964-2965. doi:10.1017/S1431927622011102.

- C2 Hatchell, D., **Song, W.**, and Daigle, H. Effect of Inter-Particle van der Waals Attraction on the Stability of Pickering Emulsions in Brine. *SPE ATCE 2021*. SPE-206112-MS. [Online due to COVID-19]

- C3 Hagen, M., Benali, B., Føyen, T., **Song, W.**, Fernø, M.A., and Brattekås, B. Calcite-functionalized micromodels for pore-scale investigations of CO₂ storage security. *SCA Annual Meeting 2021*. SCA2021-U023. [Online due to COVID-19]

C. News Highlights

- N1 Mendoza-Moyers, Diego and Bruess, Elena. Decision looms on future of Spruce power plant, San Antonio's biggest source of power — and pollution. San Antonio Express-News. December 24, 2021. mysanantonio.com/sa-inc/article/Spruce-power-plant-16726545.php.
- N2 Cantrell, Mary. Rare earth mining project at Round Top near Sierra Blanca could have significant implications for entire Big Bend region. The Big Bend Sentinel. December 8, 2021. bigbendsentinel.com/2021/12/08/rare-earth-mining-project-round-top-near-sierra-\blanca-could-have-significant-implications-for-entire-big-bend-region/.

ORAL PRESENTATIONS

A. Invited

A.1. *External to UT Austin*

- I1 Geosciences Group, Lawrence Berkeley National Laboratory. Berkeley, CA, February 2023.
- I2 Aramco Americas. Virtual, December 2022.
- I3 Department of Energy Science and Engineering, Stanford University. Stanford, CA, November 2022.
- I4 Department of Earth and Environmental Engineering, Columbia University. New York City, NY, November 2022.
- I5 Gordon Research Conference on Liquid Phase Electron Microscopy. Ventura, CA, October 2022.
- I6 Global Academic SuperSession, Interface Fluidics. Edmonton, Canada, September 2022. [virtual]
- I7 Lithium RD&D Virtual Center, U.S. Department of Energy. July 2022. [virtual]
- I8 Department of Petroleum Engineering, Louisiana State University. Baton Rouge, LA, April 2022. [virtual]
- I9 Interface Fluidics. Edmonton, Canada, April 2022. [virtual]
- I10 ACS Spring Meeting. San Diego, CA, March 2022. [virtual]
- I11 Tesla. Austin, TX, March 2022.
- I12 Aramco Americas. Virtual, January 2022. [virtual]
- I13 Lithium RD&D Virtual Center, U.S. Department of Energy. December 2021. [virtual]
- I14 EnergyX. Austin, TX, November 2021.
- I15 ACS Fall Meeting. Philadelphia, PA, August 2021. [virtual]
- I16 International Microfluidics and Energy Symposium. April 2021. [*Keynote*, Online due to COVID-19]
- I17 Department of Mechanical Engineering, City College of New York. March 2021. [Online due to COVID-19]
- I18 Department of Petroleum Engineering, University of Wyoming. Laramie, WY, November 2020. [Online due to COVID-19]
- I19 Department of Energy Resources Engineering, Stanford University. Stanford, CA, October 2020. [Panelist, Online due to COVID-19]
- I20 Stanford University Chapter of the Society of Petroleum Engineers, Department of Energy Resources Engineering, Stanford University. Stanford, CA, October 2020. [Online due to COVID-19]
- I21 ACS Colloids and Surface Science Symposium. Houston, TX, June 2020. [*Keynote lecture*] [Online due to COVID-19]
- I22 ACS Spring Meeting. Philadelphia, PA, March 2020. [Canceled due to COVID-19]
- I23 Shell. Houston, TX, February 2020.
- I24 Department of Geophysics, Stanford University. Stanford, CA, January 2020.

- I25 AGU Fall Meeting. San Francisco, CA, December 2019.
- I26 Society of Engineering Science Annual Technical Meeting. St. Louis, MO, October 2019.
- I27 Physics of Microfluidics Symposium. Austin, TX, June 2019.
- I28 Gordon Research Seminar: Carbon Capture, Utilization and Storage. Les Diablerets, Switzerland, May 2019.
- I29 Microscale Transport for Improving Petroleum Recovery. Upstream Research Company, ExxonMobil, Spring, TX, April 2018.
- I30 Pore-Scale Transport for Hydrocarbon Recovery. Hildebrand Department of Petroleum and Geosystems Engineering, University of Texas at Austin, Austin, TX, April 2018.
- I31 Microfluidics for Subsurface Energy and Environmental Resources. Department of Mechanical and Industrial Engineering, University of Toronto, Toronto, Canada, March 2018.
- I32 Micro/Nanoengineering for Subsurface Energy and Environmental Resources. Department of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, MA, February 2018.
- I33 Pore-Scale Fluid-Mineral Interactions related to Multiphase Reactive Transport. Department of Civil and Environmental Engineering, Massachusetts Institute of Technology, Cambridge, MA, November 2017.
- I34 Wettability in Reactive Transport through Carbonates and Implications for CO₂ Storage Security. Global Climate and Energy Project Student Energy Lectures, Stanford University, Stanford, CA, July 2017.
- I35 Wettability in Transport through Carbonates. Stanford Center for Carbon Storage Annual Meeting, Stanford University, Stanford, CA, May 2017.
- I36 Micro- and Nano-Fabricated Visualization Platforms for studying Hydrocarbon Recovery and CO₂ storage. IEEE SFBA Nanotechnology Council's 13th Annual Symposium, Milpitas, CA, May 2017.
- I37 Direct Visualization of Pore-Scale Phenomena related to Multiphase Reaction and Transport through Porous Media. Department of Mechanical and Industrial Engineering, University of Toronto, Toronto, Canada, September 2016.
- I38 Wettability in Reactive Transport through Carbonates. Gordon Research Seminar: Flow and Transport in Permeable Media. Girona, Spain, July 2016.
- I39 Direct Visualization of Pore-Scale Fines Migration and Formation Damage during Low-Salinity Waterflooding. Center for Integrated Petroleum Research, University of Bergen, Bergen, Norway, June 2016.
- I40 Pore-Scale Visualization of Clay Particle Release in response to Changes in Brine Composition. Pore Scale Seminar, Department of Energy Resources Engineering, Stanford University, Stanford, CA, April 2015.

A.2. Internal to UT Austin

- I41 PGE External Advisory Committee, UT Austin. Austin, TX, October 2022.
- I42 UT Energy Week, UT Austin. Austin, TX, March 2022.
- I43 UT Energy Week, UT Austin. Austin, TX, March 2022. [Panel]
- I44 Center for Subsurface Energy and the Environment, UT Austin. Austin, TX, January 2022.
- I45 UT Energy Institute, UT Austin. Austin, TX, October 2021.
- I46 UT Energy Symposium, UT Austin. Austin, TX, March 2020. [Panelist]
- I47 University of Texas Energy Symposium. Austin, TX, March 2020.
- I48 UT Austin Energy Institute Annual Showcase. Austin, TX, October 2019.
- I49 UT Austin Center for Petroleum and Geosystems Engineering Annual Showcase. Austin, TX, August 2019.

- I50 Department of Petroleum and Geosystems Engineering, University of Texas at Austin, Austin, TX, April 2019.
- I51 External Advisory Committee Meeting, Department of Petroleum and Geosystems Engineering, University of Texas at Austin, Austin, TX, April 2019.
- I52 Digital Rocks Petrophysics Inaugural Meeting, Department of Petroleum and Geosystems Engineering, University of Texas at Austin, Austin, TX, March 2019.
- I53 Bureau of Economic Geology, University of Texas at Austin, Austin, TX, February 2019.

B. Topical Conferences, Webinars, and Meetings

- T1 Song, W. A passive bidirectional soft valve. *Society of Engineering Science 2022 Annual Conference*. College Station, TX, October 2022.
- T2 Song, W. Carbon storage as a solid hydrate using geochemical microfluidics. *Society of Engineering Science 2022 Annual Conference*. College Station, TX, October 2022.
- T3 Song, W. Dendritic electrodeposition from dilute solutions. *Gordon Research Conference: Electrochemical Interfaces in Energy Conversion and Storage*. Ventura, CA, August 2022.
- T4 Song, W. Hydrate film formation in subsea carbon storage. *Gordon Research Conference: Flow and Transport in Permeable Media*. Les Diablerets, Switzerland, July 2022.
- T5 Strawson, J., Hatchell, D., and Song, W. Use of Nanoparticle-Stabilized Emulsions for Targeted Solvent Delivery. *AGU Fall Meeting*. New Orleans, LA, December 2021. [Online due to COVID-19]
- T6 Fukuyama, D., Song, W., and Daigle, H. Mass transport processes at the pore scale during hydrate formation. *AGU Fall Meeting*. New Orleans, LA, December 2021. [Online due to COVID-19]
- T7 Davletshin, A. and Song, W. In-situ SEM Visualization of Organic-rich Shale Pyrolysis. *AGU Fall Meeting*. New Orleans, LA, December 2021. [Online due to COVID-19]
- T8 Gerardo, S., Davletshin, A., and Song, W. Implications of Microscale Morphology and Surface Reactivity in REEs Recovery from Coal Fly Ash. *AGU Fall Meeting*. New Orleans, LA, December 2021. [Online due to COVID-19]
- T9 Hatchell, D., Song, W., and Daigle, H. Effect of Inter-Particle van der Waals Attraction on the Stability of Pickering Emulsions in Brine. *SPE ATCE 2021*. SPE-206112-MS. [Online due to COVID-19]
- T10 Hagen, M., Benali, B., Føyen, T., Song, W., Fernø, M.A., and Brattekkås, B. Calcite-functionalized micromodels for pore-scale investigations of CO₂ storage security. *SCA Annual Meeting 2021*. SCA2021-U023. [Online due to COVID-19]
- T11 Hatchell, D., Song, W., and Daigle, H. Effect of nanoparticle surface modification on the stability of CO₂-in-brine Pickering foams. *ACS Fall Meeting 2021*. Atlanta, GA, August 2021. [Online due to COVID-19]
- T12 Davletshin, A., Ko, L.T., Milliken, K., Periwal, P., Wang, C.C., and Song, W. Object Detection in SEM Images Using Convolutional Neural Networks: Application on Pyrite Framboid Size-Distribution in Fine-Grained Sediments. *AGU Fall Meeting*. San Francisco, CA, December 2020. [Online due to COVID-19]
- T13 Fukuyama, D., Daigle, H., Nole, M., and Song, W. Induction of convective flow due to salt exclusion during hydrate formation in coarse-grained sediments. *AGU Fall Meeting*. San Francisco, CA, December 2020. [Online due to COVID-19]
- T14 Hatchell, D., Griffith, C., Wen Song, W., and Hugh Daigle, H. Effect of Nanoparticle Wettability on the Stability and Coalescence of Pickering Emulsions. *AGU Fall Meeting*. San Francisco, CA, December 2020. [Online due to COVID-19]

- T15 Davletshin, A., Ko, L., Milliken, K., Periwal, P., and Song, W. Object Detection in SEM Images Using Convolutional Neural Networks: Application on Pyrite Framboid Size-Distribution in Fine-Grained Sediments. *AAPG 2020 Annual Convention and Exhibition*. Houston, TX, September 2020. [Online due to COVID-19]
- T16 Gerardo, S. and Song, W. Coal Fly Ash Characterization for Rare Earth Elements Recovery. *AAPG 2020 Annual Convention and Exhibition*. Houston, TX, September 2020. [Online due to COVID-19]
Sheila was invited to serve as a Session Moderator for AAPG ACE 2021.
- T17 Fukuyama, D., Nole, M., Song, W., and Daigle, H. Pairing the development of an open-source CO₂-CH₄ hydrate reservoir simulator with phase behavior observations of real-rock micromodel experiments. *10th International Conference on Gas Hydrates*. Singapore, Singapore, June 2020.
- T18 Davletshin, A., Kuo, T., and Song, W. SEM Image Automation using Machine Learning Techniques - Step 1: Building a Tool for Size-Distribution of Pyrite Framboids. Bureau of Economic Geology. Austin, TX, August 2019. [Talk]
- T19 Gerardo, S. and Song, W. Nanofluid Flooding: Mapping Recovery Mechanisms, Salinity, and Oil Film Distribution. CPGE Annual Showcase. Austin, TX, August 2019. [Poster]
- T20 Obasi, C.E. and Song, W. Development of Nanoparticle-Stabilized Smart Capsules for Targeted Solvent Enhanced Oil Recovery. CPGE Annual Showcase. Austin, TX, August 2019. [Poster]
- T21 Davletshin, A., Gerardo, S., Obasi, C.E., and Song, W. Microfluidics for Subsurface Energy Management. Physics of Microfluidics Symposium. Austin, TX, August 2019. [Poster]
- T22 Song, W. Pore-Scale Observations into CO₂ Storage Security. *Gordon Research Conference: Carbon Capture, Utilization and Storage*. Les Diablerets, Switzerland, May 2019. [Poster]
- T23 Song, W. and Kovseck, A.R. Spontaneous Fractal Fingering between Miscible Fluids. *Gordon Research Conference: Flow and Transport in Permeable Media*. Newry, ME, July 2018. [Poster]
- T24 Song, W. and Kovseck, A.R. Spontaneous Fractal Fingering between Miscible Fluids. *2018 SUPRI-A Industrial Advisory Committee Meeting*. Stanford, CA, April 2018. [Talk]
- T25 Song, W. and Kovseck, A.R. Reactive Transport through Carbonates and Implications for CO₂ Storage Security. *Global Climate and Energy Project Research Symposium*. Stanford, CA, October 2017. [Talk]
- T26 Song, W., Ferno, M.A., and Kovseck, A.R. Pore-scale mechanics of reactive transport and phase change through calcite porous media. *Gordon Research Conference: Physics and Chemistry of Microfluidics*. Lucca, Italy, June 2017. [Poster]
- T27 Song, W., Ogunbanwo, F., Steinsbo, M., Ferno, M.A., Tchelepi, H., and Kovseck, A.R. Reactive Transport through Carbonates. *2017 SUPRI-A Industrial Advisory Committee Meeting*. Stanford, CA, April 2017. [Talk]
- T28 Song, W., Ferno, M.A., and Kovseck, A.R. Wettability in reactive transport through carbonates. *Gordon Research Conference: Flow and Transport in Permeable Media*. Girona, Spain, August 2016. [Poster]
- T29 Song, W. and Kovseck, A.R. Pore-scale visualization of carbonate dissolution mechanisms. *2016 SUPRI-A Industrial Advisory Committee Meeting*. Stanford, CA, April 2015. [Talk]
- T30 Song, W. and Kovseck, A.R. Direct visualization of pore-scale wettability alteration due to clays and impact on low salinity waterflooding. *2016 SUPRI-A Industrial Advisory Committee Meeting*. Stanford, CA, April 2016. [Talk]
- T31 Song, W. and Kovseck, A.R. Direct visualization of pore-scale wettability alteration due to clays. *12th International Symposium on Reservoir Wettability and its Effects on Oil Recovery*. Lawrence, KS, October 2015. [Talk]
- T32 Harrison, A.L., Dipple, G.M., Song, W., Power, I.M., Mayer, K.U., Beinlich, A., and Sinton, D. Pore Scale Visualization of Multiphase Reactions in the Unsaturated Zone. *Goldschmidt Abstracts*. Prague, Czech Republic, August 2015.

- T33 Song, W. and Kovscek, A.R. Pore-scale visualization of clay particle release in response to changes in brine composition. *2015 SUPRI-A Industrial Advisory Committee Meeting*. Stanford, CA. [Talk]
Also presented at the *12th SEEES Annual Research Review* in Stanford, CA, April 2015.
- T34 Harrison, A.L., Dipple, G.M., Song, W., Power, I.M., Mayer, K.U., Beinlich, A., and Sinton, D. Pore scale visualization of multiphase reactions in the vadose zone. *The Geological Society of America Annual Meeting*. Vancouver, Canada, October 2014.
- T35 Harrison, A.L., Power, I.M., Dipple, G.M., Mayer, K.U., Wilson, S., Song, W., Sinton, D., and Su, D. Controls on carbon mineralization in mine wastes. *4th Annual Carbon Management Canada Conference*. Banff, Canada, June 2014.
- T36 Song, W., Fadaei, H., and Sinton, D. Reservoir engineering on a chip: enhanced oil recovery (EOR) studies using microfluidics. *4th World Petroleum Council Youth Forum*. Calgary, Canada, October 2013. [Talk]
- T37 Song, W., Fadaei, H., and Sinton, D. Micro/nanofluidics for hydraulic fracturing of shale gas. *Institute of Sustainable Energy Industrial Advisory Board Meeting*. Toronto, Canada, October 2013. [Poster]
- T38 Song, W., Fadaei, H., and Sinton, D. Dew point determination for impure CO₂ mixtures at high pressures and high temperatures using microfluidics. *3rd Annual Carbon Management Canada Conference*. Calgary, Canada. [Poster]
Also presented at the *8th Annual Ontario-on-a-Chip conference* in Toronto, Canada, and the *4th MIE Research Symposium*. Toronto, Canada, June 2013.
- T39 Song, W. and Xia, K. Effect of notch thickness on the determination of fracture toughness using dynamic semi-circular bend technique. *University of Toronto Undergraduate Engineering Research Day*. Toronto, Canada, August 2009. [Talk]

PATENTS

- P1 Song, W. and Davletshin, A. *Operando* scanning electron microscopy platform. U.S. Provisional Patent (November 2022).
- P2 Song, W. and Gerardo, S. Metals extraction from ash. U.S. Provisional Patent, 63/400,459 (August 2022).
- P3 Song, W. and Underwood, T. Multifunctional soft diode for artificial systems. U.S. Provisional Patent No. 63/326,489 (April 2022).
- P4 Song, W., Underwood, T., and Gerardo, S. Electrodeposition of metals from liquid media. U.S. Patent No. 17/729,268 (April 2022).

FUNDED GRANTS AND CONTRACTS

9. CAREER: Rare Earth Elements Recovery from Nanoporous Ion-Adsorption Clays using Seawater (PI)
Source of Support: National Science Foundation
Award Number: 2145374
Total Award Period: 09/01/2022 - 08/31/2027
Total Award Amount: \$ 513,469
8. Assessment of Rare Earth Elements and Critical Minerals in Coal and Coal Ash in the U.S. Gulf Coast (co-PI)
Source of Support: U.S. Department of Energy, Office of Fossil Energy and Carbon Management
Award Number: DE-FE0032053
Total Award Period: 09/15/2021 - 09/14/2023

Total Award Amount: \$ 1,879,190

7. Direct Conversion of Li-Ions to Li-Metal from Domestic Brines or Produced Water through Electromagnetically-Controlled Dendritic Electrodeposition (PI)
 - Source of Support: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy
 - Award Number: DE-EE0009440
 - Total Award Period: 06/01/2021 - 02/28/2025
 - Total Award Amount: \$ 625,038
6. On the Fluid-Solid Evolution of Nanoporous Materials: Mechanistic Delineation of Artificial Shale Maturation (PI)
 - Source of Support: American Chemical Society (ACS) Petroleum Research Fund (PRF) Doctoral New Investigator (DNI) Award
 - Award Number: PRF 61218-DNI9
 - Total Award Period: 09/01/2020 - 08/31/2022
 - Total Award Amount: \$ 110,000
5. Enabling the Sustainable Energy Transition: Economic Recovery of Rare Earth Elements (PI)
 - Source of Support: UT Austin Energy Institute
 - Total Award Period: 01/01/2020 - 05/31/2022
 - Total Award Amount: \$ 320,973
4. Assuring Long-term Storage of Captured CO₂: Technical-Legal-Policy-Business Models (co-PI)
 - Source of Support: UT Austin Energy Institute
 - Total Award Period: 01/01/2020 - 05/31/2022
 - Total Award Amount: \$ 318,723
3. Engineered Water for Improved Oil Recovery from Fractured Reservoirs (co-PI)
 - Source of Support: U.S. Department of Energy, Office of Fossil Energy
 - Award Number: FE0031791
 - Total Award Period: 09/01/2019 - 08/31/2023
 - Total Award Amount: \$ 7,919,227
2. Targeted Enhanced Oil Recovery using Nanoparticle-Stabilized Solvent Capsules (PI)
 - Source of Support: Chemical Enhanced Oil Recovery Consortium
 - Total Award Period: 06/01/2019 - 05/31/2023
 - Total Award Amount: \$ 50,000
1. CO₂ foams stabilized only with surface-modified silica nanoparticles for enhanced oil recovery (co-PI)
 - Source of Support: ConTex
 - Total Award Period: 09/01/2019 - 08/31/2020
 - Total Award Amount: \$ 100,000

COURSES TAUGHT

Undergraduate Courses

- PGE 323K (Unique Number: 18730), Reservoir Engineering I: Primary Recovery (Fall 2020 semester, online instruction due to COVID-19)
Evaluated as *"Dr. Song is an amazing individual. She genuinely cares for her students, not only for our academic success, but also for our personal well-being. She's very approachable and is always available to address any type of concerns. Her thorough lectures are engaging, entertaining, and well-organized. She goes through everything step by step, so we can have a complete understanding of the material. She's very passionate about the subject and makes a tough course seem simple with her analogies, deep explanations, and her reiterating of the material. Being a student who is aspiring to become a professor, I consider her a role model."*
and *"I enjoyed this class and feel that Dr. Song was the factor that made it bearable. We had some disruptive students in class this semester, but she handled it very well and exhibited more patience than I could. For people with genuine concerns and who truly want to learn and improve, she is extremely kind, understanding, and goes above and beyond to ensure her students are learning and healthy. I felt the course was well organized, although it was extremely challenging at times. I appreciated that she reviewed previous days material in order to align us on the right ideas for the current days materials."*
- PGE 323K (Unique Number: 18650), Reservoir Engineering I: Primary Recovery (Fall 2019 semester)
Evaluated as *extraordinary professor!* and *Made me genuinely excited to come to class. Before I took your class I was unsure whether I was interested in having a career as a Reservoir Engineer but your class helped realize that I would enjoy it.*

Graduate Courses and Combined Undergraduate/Graduate Courses

- PGE 383 (Unique Number: 19910), Small-Scale Fluid Flow (Spring 2022 semester)
- PGE 379/383 (Unique Number: 19844/19949), Geothermal and Sustainable Energy Resources (Spring 2022 semester)
- PGE 379/383 (Unique Number: 20034/20149), Geothermal and Sustainable Energy Resources (Spring 2021 semester, online instruction due to COVID-19)
- PGE 379/383 (Unique Number: 19208/19285), Small-Scale Fluid Flow (Spring 2020 semester, online instruction due to COVID-19)
Evaluated as *"Lectures were very helpful and explained concepts starting from simple roots, and the number of examples and analogies was helpful in picturing the phenomena."* and *"I loved everything Dr. Song taught, she always knew how to answer our questions and how to teach a hard topic in simpler ways. I wish I could have taken more classes with her!"*
- PGE 383 (Unique Number: 19130), Small-Scale Fluid Flow (Spring 2019 semester)
- ENERGY 251, Thermodynamics of Equilibria (Fall 2018, Stanford University)

Teaching Assistant

- ENERGY 301/ CEE 301/ MS&E 494: The Energy Seminar (Winter 2018, Stanford University)
- ENERGY/EE 293B: Fundamentals of Energy Processes (Winter 2017, Stanford University)
- ENERGY/EE 293B: Fundamentals of Energy Processes (Winter 2016, Stanford University)
- CHE 260: Thermodynamics and Heat Transfer (Fall 2013, University of Toronto)

ACADEMIC SUPERVISION

Ph.D. Supervisions Completed

2. David Erik Fukuyama, June 2022, Petroleum and Geosystems Engineering, University of Texas at Austin (co-advised with Hugh Daigle)
Dissertation: *Gas Transport and Hydrate Formation in Porous Media*.
Note: David is working at Sandia National Labs now.
1. Daniel Hatchell, August 2022, Petroleum and Geosystems Engineering, University of Texas at Austin (co-advised with Hugh Daigle)
Dissertation: *Understanding the stability of Pickering emulsions and foams by manipulating particle-particle and particle-interfacial forces with surface modification*.

M.S. Supervisions Completed

1. Sheila Gerardo, June 2021, Petroleum and Geosystems Engineering, University of Texas at Austin
Thesis: *Characterization and Recovery of Rare Earth Elements from Coal Fly Ash*.
Note: Sheila continued onto Ph.D. studies in my group.

Ph.D. Students in Progress

A. Students Entered into Ph.D. Candidacy

3. Artur Davletshin, University of Texas at Austin (January 2019–)
Dissertation: *In-Situ Visualization of Fluid Dynamics in Nanoporous Materials*.
2. Shunxiang Xia, University of Texas at Austin (January 2020–)
Dissertation: *Multiphase Fluid Dynamics in Carbonate Porous Materials*.
1. Malin Hagen, University of Bergen, Norway (January 2019–)
Dissertation: *CO₂ Storage in Carbonate Reservoirs*.
Note: Malin is co-advised by Martin Ferno.

B. Students Not Yet Entered into Ph.D. Candidacy

2. Sheila Gerardo, University of Texas at Austin (January 2019–)
Dissertation: *Geochemical Mechanisms Dictating the Recovery of Critical Materials and Rare Earth Elements*.
Note: Sheila is an M.S./Ph.D. student.
1. Qianjun Liu, University of Texas at Austin (September 2020–)
Dissertation: *Li recovery from aqueous resources*.
Note: Qianjun was unable to enter the U.S. for her first year of study.

M.S. Students in Progress

1. Jack Strawson, University of Texas at Austin (September 2021–)
Thesis: *Nanoparticle-stabilized targeted solvent delivery*.

Undergraduate Students Mentored

11. John (Jay) Roberts, University of Texas at Austin (September 2022–)
10. Brayden Popica, University of Texas at Austin (January 2022–)
9. Daniel Moran, University of Texas at Austin (Summer 2022)
Note: Daniel was a SURI student.

8. Jason Fan, University of Texas at Austin (Summer 2020)
Topic: *Particle Image Velocimetry in Microfluidic Flows*.
Note: Jason was a SURI student.
7. Hunter Harmuth, University of Texas at Austin (Summer 2020)
Topic: *Automated Segmentation of Pore-Scale Micrographs*.
6. Jack Strawson, University of Texas at Austin (Summer 2020)
Topic: *Nanoparticle-Stabilized Solvent Delivery for Enhanced Oil Recovery*.
Note: Jack was a SURI student and has since continued onto an M.S./Ph.D. in my group.
5. Jaehun (Eric) Yoon, University of Texas at Austin (Summer 2019)
Topic: *Direct Microvisual Chemical Analysis of Reactive Transport Dynamics*.
4. Xuefei (Sophie) Zhao, University of Texas at Austin (Spring 2019)
Topic: *Self-Folding Origami Structures for Compression-Resistance*.
3. Emma Li, Stanford University (Summer 2018)
Topic: *Fractal dimensions of fluid fingering in Hele-Shaw cells*.
Note: Emma was a high school student.
2. Natarajan (Raja) Ramesh, Stanford University (Summer 2017)
Topic: *Nanofabrication of micromodels for fluid-mineral interactions visualization*.
1. Donnique Sherman, Stanford University (Summer 2015)
Topic: *Low salinity brine-clay interactions in kaolinite-functionalized micromodels*.
Note: Donnique was a SURGE Diversity Program undergraduate research student.

Committees Served

A. Ph.D. Committees

7. J. Brandon Adamo, Materials Science and Engineering, University of Texas at Austin, June 2022–present.
Dissertation:
Advisor: Arumugam Manthiram
6. Motaz Taha, Petroleum and Geosystems Engineering, University of Texas at Austin, June 2022–present.
Dissertation: *Advances in foam conformance control in carbonate reservoirs*.
Advisor: Quoc Nguyen
5. Kevin C. Matthews, Materials Science and Engineering, University of Texas at Austin, January 2022–present
Dissertation: *Interfacial Chemistry of Beyond Li Energy Storage Materials and Devices*.
Advisor: Jamie Warner
4. Sabyasachi Dash, Petroleum and Geosystems Engineering, University of Texas at Austin, December 2021–present
Dissertation: *Development of New Methods for the Assessment of Fluid Content and Mobility in Organic-Rich Mudrocks*.
Advisor: Zoya Heidari
3. Yue Shi, Petroleum and Geosystems Engineering, University of Texas at Austin, 2022
Dissertation: *Enhanced Oil Recovery from Heterogenous Oil-wet Tight Carbonate Reservoirs*.
Advisor: Kishore K. Mohanty
2. Jianping Xu, Petroleum and Geosystems Engineering, University of Texas at Austin, 2021–present
Dissertation: *Microfluidic Study of Pore-Scale Dissolution and Precipitation Patterns in Geological Carbon Storage*.
Advisor: Matthew Balhoff

1. Lucas Mejia, Petroleum and Geosystems Engineering, University of Texas at Austin, 2021
Dissertation: *Multiscale Visualization of Chemical Enhanced Oil Recovery*.
Advisor: Matthew Balhoff

B. M.S. Committees

3. Mohammed A. Almansouri, Petroleum and Geosystems Engineering, University of Texas at Austin, 2021.
Thesis: *Surfactant-Aided Wettability Alteration in Low-Temperature Low-Salinity Carbonate Reservoirs*
Advisor: Kishore K. Mohanty
2. Motaz Taha, Petroleum and Geosystems Engineering, University of Texas at Austin, 2020.
Thesis: *Experimental Evaluation of Foam for Mobility Control in WAG EOR in a Middle Eastern Carbonate Reservoir*
Advisor: Quoc Nguyen
1. Faisal Alammari, Petroleum and Geosystems Engineering, University of Texas at Austin, 2020.
Thesis: *Wettability Altering Surfactants for High-Temperature Tight Carbonate Reservoirs*
Advisor: Kishore K. Mohanty

STUDENT AWARDS

14. Sheila Gerardo: Best Poster Award, DOE Clean Energy Education and Empowerment (C3E) Symposium, 2022
13. Daniel Moran: SURI Undergraduate Fellowship, 2022
12. Sheila Gerardo: TEX-E Fellow (Greentown/MIT), Class of 2022
11. David Fukuyama: Outstanding Student Presentation Award (OSPA), 2021 AGU Fall Meeting, 2022
10. Qianjun Liu: John and Kelli Weinzierl Endowed Presidential Fellowship in Petroleum and Geosystems Engineering, 2021
9. Sheila Gerardo: Student Travel Award, 2021 AGU Fall Meeting, 2021
8. Artur Davletshin: Third Place, GTX 2021 Datathon, 2021
7. Sheila Gerardo: Best Poster Award, UT Energy Institute Student Research Competition, UT Austin, 2021
6. Jack Strawson: Hildebrand Excellence Graduate Fellowship, 2021–2022
5. Artur Davletshin: Best Poster Award, Graduate and Industry Networking Conference, UT Austin, 2021
4. Jack Strawson: SURI Undergraduate Fellowship, 2020
3. Jason Fan: SURI Undergraduate Fellowship, 2020
2. Shunxiang Xia: Hildebrand Excellence Graduate Fellowship, 2020
1. Sheila Gerardo: DOE Research Experience in Carbon Sequestration Tuition and Travel Grant, 2019