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EDUCATION

PhD	Rensselaer Polytechnic Institute, Geology	1991
	Dissertation: "Experimental studies of the chemistry of aqueous fluid-accessory mineral systems at high P-T conditions with implications for fluid-rock interactions".	
	Advisor: E. Bruce Watson	
MS	The Pennsylvania State Univ, Geochemistry and Mineralogy	1988
	Thesis: "Partitioning of elements between silicate melt and salt water at mantle conditions". Advisor: David Eggler	
BS	SUNY College at Fredonia, Geochemistry & Geology	1985

ACADEMIC POSITIONS

Interim Chair, Vanderbilt University Dept. of Earth and Environmental Sciences	2022-2023
Professor, Vanderbilt University Dept. of Earth and Environmental Sciences	2006-
Professor, Vanderbilt University Dept. of Civil and Environmental Engineering (courtesy appointment)	2006-
Chair, Vanderbilt University Dept. of Earth and Environmental Sciences	2011-2014
Associate professor, Vanderbilt University	1998-2006
Assistant Professor	1991-1998

PROFESSIONAL EXPERIENCE

Board certified environmental scientist, AAEEES	2016-2020
Registered Professional Geologist, State of Tennessee	1999-2014
GIS consultant, ERS Group	2006-2011
Student aid, NY Dept. of Law, Environmental Protection Bureau	1989-1990

HONORS AND AWARDS

Fellow, Geological Society of America	2017
Fellow, Mineralogical Society of America	2014
Mineralogical Society of America Biennial Research Grant	1990
SUNY Fredonia MacDiarmid Award (Outstanding Student)	1984
SUNY Fredonia Fahnestock Scholarship (Field School)	1984
New York State Regents Scholarship	1981

RESEARCH

Early career: experimental petrology and high-temperature geochemistry

Mid-career: metamorphic petrology field work in China and the western US, low-temperature geochemistry in Bangladesh

Late career: low-temperature geochemistry, water and soil quality, greenhouse gas emissions from volcanic calderas, geochemical modeling, high-temperature mineral recrystallization and replacement

Publications

Books

Ayers JC (2017) Sustainability: An Environmental Science Perspective. Taylor & Francis Group, CRC Press, 322 pages, ISBN 9781498752657, <https://www.amazon.com/Sustainability-Environmental-Perspective-John-Ayers/dp/1498752659>

Book chapters

Ayers, JC (2014) Why I Chose to Work in the Field of Environmental Geology. Chpt. 5 in [*Environmental Science and Studies for the Curious: Top Professors' Perspectives on College/University Major, Scholarships, Research Issues, and Career Options*](#), ed. Vaidya K..

Ayers JC, Watson EB (1991) Solubility of apatite, monazite, zircon and rutile in supercritical aqueous fluids with implications for subduction zone geochemistry. In *Fluids in Subduction Zones*, eds. Tarney J., Pickering K.T., Knipe R.J., Dewey J.F., pp. 139-150, The Royal Society, University Press, Cambridge.

Meen JK, **Ayers JC**, Fregeau EJ (1989) A model of mantle metasomatism by carbonated alkaline melts: trace-element and isotopic composition of mantle source regions of carbonatite and other continental igneous rocks. In *Carbonatites: Origin and Evolution* (K. Bell, ed.), pp. 464-499, George Allen and Unwin, London.

Journal Publications

45. **Ayers JC**, Zhu C. (2025) Zircon solubility, metamict zircon replacement, and hydrothermal zircon formation at upper crustal pressures. *Geochemistry, Geophysics, Geosystems*. <https://doi.org/10.1029/2024GC011925>
44. Chen M, **Ayers JC** (2024) Environmental drivers of stream metabolism in a Middle TN headwater stream. *PLOS ONE* 19(12): e0315978. <https://doi.org/10.1371/journal.pone.0315978>
43. Fan M, Liu X, Sun S, Dong Y, **Ayers JC**, Santosh M (2023) Effect of chemical composition on zircon radiation damage dating: Implications for low-temperature thermochronology. *Geoscience Frontiers*, <https://doi.org/10.1016/j.gsf.2023.101675>
42. Raff J, Pickering J, Gilligan J, **Ayers JC**, Goodbred S (2023) Sediment delivery to the Bengal delta under anthropogenic climate change. *Nature Climate Change*. <https://doi.org/10.1038/s41467-023-38057-9>
41. Gruber C, Steen M, Brown KG, Delapp R, Matteo E, Klein-BenDavid O, Bar-Nes G, Meeussen H, **Ayers JC**, Kosson DS (2022) Cement-carbonate rock interaction under saturated conditions: from laboratory to modelling. *Cement and Concrete Research* 160:106899. <https://doi.org/10.1016/j.cemconres.2022.106899>

40. Dietrich M, **Ayers JC** (2022) Element transport and partitioning along tidal channels in Southwest Bangladesh. *Estuaries and Coasts*.
<https://link.springer.com/article/10.1007/s12237-022-01082-w>
39. **Ayers JC**, Flanagan D, Ackerson M, Wallrich B, Miller CF, Watson EB, Ryerson FJ (2022) The solubility of titanite in silicate melt determined from growth and dissolution experiments. *Contributions to Mineralogy and Petrology* 177:37. 15 pp.
<https://doi.org/10.1007/s00410-022-01902-z>
38. Dietrich M, **Ayers JC** (2021) Influences on tidal channel and aquaculture shrimp pond water in Southwest Bangladesh. *Geochemical Transactions* 22:2.
<https://doi.org/10.1186/s12932-021-00074-2>
37. Dietrich M, **Ayers JC** (2021) Geochemical cycling, partitioning, and possible heavy metal(loid) bioaccumulation within aquaculture shrimp ponds. *Science of the Total Environment* 788, 147777. <https://doi.org/10.1016/j.scitotenv.2021.147777>
36. Ajayi M, **Ayers JC** (2021) CH₄ and CO₂ diffuse gas emissions before, during, and after a Steamboat Geyser eruption. *Journal of Volcanology and Geothermal Research* 414, 107233. <https://www.sciencedirect.com/science/article/pii/S0377027321000627>
35. **Ayers JC**, Patton B, Dietrich M (2020) Preliminary Evidence of Transport-Limited Chemical Weathering and Element Immobility in the Ganges Tidal Delta Plain of Bangladesh. *Geochemistry, Geophys Geosystems* 21:e2020GC009029.
<https://doi.org/10.1029/2020GC009029>
34. Wang X, Katsiaficas N, Nam JH, Lasley C, Liu X, **Ayers JC** (2020) Evaluation of zircon U-Pb geochronology as a tool to determine soil provenance in a limestone terrane, Middle TN, USA. *Chemical Geology* V. 536, 20 March 2020, 119465.
<https://doi.org/10.1016/j.chemgeo.2020.119465>
33. Zhang F, Wang Y-B, Dua L-L, Yang C-H, **Ayers JC**, Yuan H-Q (2019) The Neoproterozoic-Paleoproterozoic volcanic-sedimentary rocks in the Zanhuang Complex, North China Craton: Petrogenesis and implications for tectonic evolution. *Precambrian Research*, v. 328, pp. 64-80. <https://doi.org/10.1016/j.precamres.2019.03.015>
32. **Ayers JC**, Peters T (2018) Zircon/fluid trace element partition coefficients measured by recrystallization of Mud Tank zircon at 1.5 GPa and 800-1000°C. *Geochim. Cosmochim. Acta* V. 23, pp. 60-74. <http://dx.doi.org/10.1016/j.gca.2017.11.025>
31. Pickering JL, Beam JC, Covey AK, **Ayers JC**, Goodbred SL (2018) Landform evolution of Late Pleistocene to recent terraces of the Brahmaputra-Jamuna River in the upper Bengal Basin. *Basin Research*, V. 30, Issue S1, pp. 550-567, DOI: [10.1111/bre.12236](https://doi.org/10.1111/bre.12236)
30. **Ayers JC**, George G, Fry D, Benneyworth L, Wilson C, Wallace Auerbach L, Roy K, Karim MR, Akter F, Goodbred SL (2017) Salinization and Arsenic Contamination of Surface Water in Southwest Bangladesh. *Geochemical Transactions*, 18:4, 23 pages, <https://doi.org/10.1186/s12932-017-0042-3>
29. **Ayers JC**, Goodbred SL, George G, Fry D, Benneyworth L, Hornberger G, Roy K, Karim MR, Akter F (2016) Sources of Salinity and Arsenic in groundwater in Southwest Bangladesh. *Geochemical Transactions*, doi:10.1186/s12932-016-0036-6, <http://www.geochemicaltransactions.com/content/17/1/4>
28. Benneyworth L, Gilligan J, **Ayers JC**, Carrico A, George G, Karim MD, Akter F, Fry D, Goodbred S, Donato K, Piya B (2016) Drinking water insecurity: water quality and access in coastal Southwestern Bangladesh. *International Journal of Environmental Health Research*, DOI: [10.1080/09603123.2016.1194383](https://doi.org/10.1080/09603123.2016.1194383)

27. Ayers JC, Bryant DL, Giles K (2015) Effect of fluid composition on monazite growth rate at 1.0 GPa and 1000°C. *American Mineralogist*, v. 100, no. 11-12, pp. 2579-2589. <http://dx.doi.org/10.2138/am-2015-5345>
26. Goudie DJ, Fisher CM, Hanchar JM, Davis WJ, Crowley JL, Ayers JC (2014) Simultaneous in situ determination of U-Th-Pb and Sm-Nd isotopes in monazite by laser ablation ICP-MS. *Geochemistry, Geophysics, Geosystems (G-cubed)*, 26 pp., DOI 10.1002/2014GC005431, <http://onlinelibrary.wiley.com/doi/10.1002/2014GC005431/abstract>
25. Ayers JC, Crombie S, Loflin M, Miller CF, Luo Y (2013) Country rock monazite response to intrusion of the Searchlight pluton, southern Nevada. *Amer. Jour. Science*, v. 313, pp. 345-394. DOI 10.2475/04.2013.04, <http://www.ajsonline.org/cgi/content/abstract/313/4/345?etoc>
24. Peters T, Ayers JC, Gao S, Liu X (2013) The response of zircon in eclogite to metamorphism during the multi-stage evolution of the Huwan Shear Zone, China: Insights from Lu-Hf-U-Pb isotopic and trace-element geochemistry. *Gondwana Research*, v. 23, Issue 2, March 2013, pp. 726–747 <http://dx.doi.org/10.1016/j.gr.2012.05.008>.
23. Ayers JC, Zhang L, Luo Y, Peters T (2012) Solubility of zircon in neutral to alkaline aqueous fluids at upper crustal conditions. *Geochim. Cosmochim. Acta*. v. 96, 18-28. <http://dx.doi.org/10.1016/j.gca.2012.08.027>.
22. Rabbia OM, Hernández LB, French DH, King RW and Ayers JC (2009) The El Teniente porphyry Cu-Mo deposit from a hydrothermal rutile perspective. *Mineralium Deposita*, v. 44, pp. 849-866. <http://dx.doi.org/10.1007/s00126-009-0252-4>
21. Luo Y, Ayers JC (2009) Experimental measurements of zircon/melt trace element partition coefficients. *Geochim. Cosmochim. Acta* v. 73, 3656-3679. <http://dx.doi.org/10.1016/j.gca.2009.03.027>
20. Luo Y, Sun M, Zhao G, Li S, Ayers JC, Xia X, Zhang J (2008) A comparison of U-Pb and Hf isotopic compositions of detrital zircons from the North and South Liaohe Groups: Constraints on the evolution of the Jiao-Liao-Ji Belt, North China Craton. *Precambrian Research* v. 163, 279-306.
19. Ayers JC, Loflin M, Miller CF, Barton MD, Coath C (2006) In situ oxygen isotope analysis of monazite as a monitor of fluid infiltration during contact metamorphism: Birch Creek Pluton aureole, White Mountains, eastern California. *Geology* v. 34(8), 653-656. doi: [10.1130/g22185.1](https://doi.org/10.1130/g22185.1)
18. Lehner SW, Savage K, Ayers JC (2006) Vapor growth and characterization of pyrite (FeS₂) doped with Co, Ni, and As: Variations in semiconducting properties. *Journal of Crystal Growth*, v. 286, 306-317. doi: [10.1016/j.jcrysgro.2005.09.062](https://doi.org/10.1016/j.jcrysgro.2005.09.062)
17. Gao S, Rudnick RL, Yuan H-L, Liu X-M, Liu Y-S, Ling W-L, Ayers JC, Wang X-C (2004) Recycling lower continental crust. *Nature* **432**, 892-897. doi: [10.1038/nature03162](https://doi.org/10.1038/nature03162)
16. Bryant DL, Ayers JC, Gao S, Zhang H, Miller C (2004) Geochemical, age, and isotopic constraints on the location of the Sino-Korean/Yangtze suture and Evolution of the northern Dabie Shan, China. *GSA Bulletin* **116** (5/6), 698-717. doi: [2610.1130/B25302.2](https://doi.org/10.1130/B25302.2)
15. Ayers JC, DeLaCruz K, Miller CF, Switzer O (2003) Experimental study of the growth kinetics of zircon in quartzite ± H₂O at 1.0 GPa and 1000°C, with implications for

geochronological studies of high-grade metamorphism. *American Mineralogist* **88**, 365-376.

14. Ayers JC, Dunkle S, Gao S, Miller C (2002) Constraints on timing of peak and retrograde metamorphism in the Dabie Shan Ultrahigh-Pressure Metamorphic Belt, east-central China, using U–Th–Pb dating of zircon and monazite. *Chemical Geology* **186**, 315-331. doi: [10.1016/S0009-2541\(02\)00008-6](https://doi.org/10.1016/S0009-2541(02)00008-6)
13. Townsend KJ, Miller CF, D'Andrea JL, Ayers JC, Harrison TM, Coath CD (2001) Low temperature replacement of monazite in the Ireteba granite, Southern Nevada: geochronological implications. *Chemical Geology* **172**, 95-112. doi: [10.1016/S0009-2541\(00\)00238-2](https://doi.org/10.1016/S0009-2541(00)00238-2)
12. Miller CF, Hatcher RD Jr., Ayers JC, Coath CD, Harrison TM (2000) Age and zircon inheritance of eastern blue ridge plutons, southwestern North Carolina and northeastern Georgia, with implications for magma history and evolution of the southern appalachian orogen, *American Journal of Science* **300**, 142-172.
11. Ayers JC, Miller CF, Gorisch EB, Milleman J (1999) Textural development of monazite during high-grade metamorphism: Implications for U,Th-Pb age dating. *American Mineralogist* **84**, 1766-1780. <http://ammin.geoscienceworld.org/cgi/reprint/84/11-12/1766>
10. Ayers JC (1998) Trace element modeling of aqueous fluid – peridotite interaction in the mantle wedge of subduction zones. *Contributions to Mineralogy and Petrology* **132**, 390-404. doi: [10.1007/s004100050431](https://doi.org/10.1007/s004100050431)
09. Ayers JC, Dittmer SK, Layne GD (1997) Partitioning of elements between peridotite and H₂O at 2.0-3.0 GPa and 900-1100°C, and application to models of subduction zone processes. *Earth and Planetary Science Letters* **150**, 381-398. doi: [10.1016/S0012-821X\(97\)00096-4](https://doi.org/10.1016/S0012-821X(97)00096-4)
08. Larrieu TL, Ayers JC (1997) Measurements of the pressure-volume-temperature properties of fluids to 20 kbars and 1000°C: A new approach demonstrated on water. *Geochimica et Cosmochimica Acta* **61**, 3121-3134. doi: [10.1016/S0016-7037\(97\)00155-5](https://doi.org/10.1016/S0016-7037(97)00155-5)
07. Ayers JC, Eggler DH (1995) Partitioning of elements between silicate melt and H₂O-NaCl fluids at 1.5 and 2.0 GPa pressure: Implications for mantle metasomatism. *Geochimica et Cosmochimica Acta* **59**, 4237-4246. doi: [10.1016/0016-7037\(95\)00244-T](https://doi.org/10.1016/0016-7037(95)00244-T)
06. Ayers JC, Watson EB (1993) Apatite/fluid partitioning of rare earth elements and strontium: experimental results at 1.0 GPa and 1000°C and application to models of fluid/rock interaction. *Chemical Geology* **110**, 299-314. doi: [10.1016/0009-2541\(93\)90259-L](https://doi.org/10.1016/0009-2541(93)90259-L)
05. Ayers JC (1993) Partitioning and mass balance relations in lherzolites. *Chemical Geology* **107**, 19-27. doi: [10.1016/0009-2541\(93\)90099-5](https://doi.org/10.1016/0009-2541(93)90099-5)
04. Ayers JC, Watson EB (1993) Rutile solubility and mobility in supercritical aqueous fluids. *Contributions to Mineralogy and Petrology* **114**, 321-330. doi: [10.1007/BF01046535](https://doi.org/10.1007/BF01046535)
03. Ayers JC, Brenan JB, Watson EB, Wark DA, Minarik WG (1992) A new capsule technique for hydrothermal experiments using the piston cylinder apparatus. *American Mineralogist* **77**, 1080-1086.
02. Ayers JC, Watson EB (1991) Solubility of apatite, monazite, zircon and rutile in supercritical aqueous fluids with implications for subduction zone geochemistry. *Philosophical Transactions Royal Society of London A*, **335**, pp.365-75.

<http://links.jstor.org/sici?sici=0962-8428%2819910515%29335%3A1638%3C365%3ASOAMZA%3E2.0.CO%3B2-%23>

01. Meen JK, Eggler DH, Ayers JC (1989) Evidence for very low solubility of REE in CO₂-rich fluids at mantle conditions. *Nature* **340**, 301-303.

Reports

Gruber C, Steen M, Brown KG, Delapp R, Taylor A, Ayers JC, Kosson DS, Matteo M, Klein-BenDavid O, Bar-Nes G, Meeussen JCL (2020) “Cement-Carbonate Rock Interaction Under Saturated Conditions: From Laboratory to Modeling. Nuclear Research Center of the Negev, Israel”.

Ayers JC, Rubin P (1990) “Geochemistry and Hydrogeology of Sand Volcano Effluents in Tully Valley, New York”. Environmental Protection Bureau, New York State, 112 pp.

Encyclopedia Entries

Ayers JC, Goodbred SL (2017) Arsenic Contamination in South and Southeast Asia. *Oxford Bibliographies in Environmental Science*. Ed. Ellen Wohl. New York: Oxford University Press, 2017/10/25. <https://doi.org/10.1093/obo/9780199363445-0087>

Hornberger GM, Ayers JC, Ajayi M (2016) Hydraulic Fracturing in the Development of Unconventional Hydrocarbon Resources. In *Oxford Bibliography Online, Environmental Science*. New York: Oxford University Press.

<http://dx.doi.org/10.1093/obo/9780199363445-0006>

Ayers, J C (2012) Sands and Silica. In: Vasey, D. E., Fredericks, S. E., Lei, S., and Thompson, S. Eds., *Berkshire Encyclopedia of Sustainability*, 1st ed. Berkshire, Great Barrington, MA.

Publications with high school students

Daugherty E, Perez G, Gomez-Velez J, Ayers JC, Jing W, Chen M (2022) [An Assessment of Diel Patterns in the East Fork Creek, Franklin, TN | Young Scientist Journal | VU](#)

Nam J, Katsiaficas N, Wang X, Morgan D, Ayers JC (2015) Evaluation of Bigby Cannon Limestone’s Contributions to Pedogenesis Using Element Mass Flux Calculations. *Young Scientist* v. 5. <https://www.youngscientistjournal.org/article/evaluation-of-bigby-cannon-limestones-contributions-to-pedogenesis-using-element-mass-flux-calculations>

Lasley C, Katsiaficas N, Ayers JC (2014) Provenance of a soil atop a terrace along the Harpeth River in Tennessee using immobile trace element concentration ratios. *Young Scientist* v. 4, pp. 21-22, <https://www.youngscientistjournal.org/article/provenance-of-a-soil-atop-a-terrace-along-the-harpeth-river-in-tennessee-using-immobile-trace-element-concentration-ratios>

Tidwell, Brittainy S, Ayers JC (2011) Phytoremediation of Arsenic and Lead Using *Brassica rapa*. *Young Scientist*, v. 1, pp. 19-21.

<http://www.youngscientistjournal.org/2011/article/phytoremediation-arsenic-and-lead-using-brassica-rapa>.

Published Datasets and Code

Github repositories: <https://github.com/johncayers>

Chen M and Ayers JC (2024). EFC_Stream_Metabolism. figshare. Collection.

<https://doi.org/10.6084/m9.figshare.c.7525866.v3>

- Ayers JC** and Zhu C (2024) Zircon modeling - thermodynamic databases. Mendeley Data, V1, <https://doi.org/10.17632/zh6db92p26.1>
- Ayers JC** and Chen M (2024) Stream metabolism study of East Fork Creek, Franklin, TN in years 2022-2023 ver 1. Environmental Data Initiative. <https://doi.org/10.6073/pasta/4a7e714cd0395e1dafecfe49c7fdf84b>.
- Ayers JC** (2022) Titanite solubility in silicate melt supporting data. figshare. Collection. <https://doi.org/10.6084/m9.figshare.c.5936143.v1>
- Ayers JC** (2019) Compositions of Soil, Sediment, and Water in SW Bangladesh, Mendeley Data, v1 <http://dx.doi.org/10.17632/6z6bdxrkbb.1>
- Ayers JC**, Wang X, Katsiaficas N, Nam JH, Lasley C, Liu, X (2017) U-Pb Zircon Geochronology for Determining Soil Provenance in a Limestone Terrane, Middle Tennessee, United States. EarthChem Library. <http://dx.doi.org/10.1594/IEDA/100733>
- Ayers JC**, Goodbred SL, George G, Fry D, Benneyworth L, Hornberger G, Roy K, Karim MR, Akter F (2017) Compositions of groundwater samples from shallow aquifer in southwest Bangladesh Dataset #874440. <https://doi.pangaea.de/10.1594/PANGAEA.874440>
- Ayers JC**, George G, Fry D, Benneyworth L, Wilson C, Wallace Auerbach L, Roy K, Karim MR, Akter F, Goodbred S (2017) Surface water chemistry and tidal channel time series in southwest Bangladesh. Dataset #875120. <https://doi.pangaea.de/10.1594/PANGAEA.875120>

Outreach: Wikis, Blogs, Podcasts, and Essays

- Koepnick L (2025) Interviewed for Art of Interference podcast, season 3, ep. 1 “Lithium extraction”.
- Ayers JC** (2020) My last drop. Science (80-) 370:374 LP – 374. <https://doi.org/10.1126/science.370.6514.374>
- Ayers JC** (2020) Gassy precursors for geyser eruptions? https://volcanoes.usgs.gov/volcanoes/yellowstone/article_home.html?vaid=255
- Ayers Research Group Wiki**: doi 10.17605/OSF.IO/F89KW https://osf.io/f89kw/?view_only=839808ef03a54cff834be3647818f521
- Ayers JC** (2009-2013) Sustainability blog: <https://sustainability-ayersj.blogspot.com/>
- Ayers JC** (2010) A message to science educators and students about global climate change <https://blogs.agu.org/sciencecommunication/2010/04/19/message-to-science-educators/>

Conference Papers

Peer-Reviewed

- Bitting K, **Ayers JC**, Savage K (2005) Fact or fiction: The truth about water contamination in Manchester and Tullahoma, TN. In Proceedings of the Fifteenth Tennessee Water Resources Symposium, pp. 3C-20 to 3C-23, American Water Resources Association.
- Ayers, JC**, Loflin, M, Miller, CF, Barton, MD, and Coath, C (2004) Dating fluid infiltration using monazite. In R.B. Wanty, and R.R. Seal II, Eds. *Proceedings of the Eleventh International Symposium on Water-Rock Interaction*, **Vol. 1**, p. 247-251. A.A. Balkema Publishers.
- Ayers JC** (2000) Source Processes: Slab dehydration, fluid-wedge interaction, and partial melting to form primitive arc lavas. In State of the Arc 2000: Processes and Timescales, extended abstracts, eds. I.E.M. Smith et al., pp. 13-16.

- Ayers JC**, DeLaCruz KJ (1997) Hydrothermal growth kinetics of zircon (ZrSiO₄). *Proceedings of the Fifth International Symposium on Hydrothermal Reactions*, pp. 227-231.
- Rubin PA, **Ayers JC**, Grady KA (1992) Solution mining and resultant evaporite karst development in Tully Valley, New York, pp. 313-328, *Proc. Third Conference on Hydrogeology, Ecology, Monitoring, and Management of Ground Water in Karst Terranes*, Water Well Journal Pub. Co., 793 pp.

Abstracts (Recent only)

- Ayers JC**, Hu P, Wallrich BM, Zhu C (2025) Stable isotope dilution approach to measuring mineral replacement rates at high P-T conditions: Replacement of metamict zircon by hydrothermal zircon. Fall AGU meeting, oral presentation V51A-05.
- Tajwar M, **Ayers JC** (2025) Understanding Seasonal and Diel Carbon and Oxygen Dynamics in an Oligotrophic Freshwater Lake. Poster 4, [TN Water Resources Symposium](#).
- Hu P, **Ayers JC**, Zhu C, Wallrich B (2025) Quantifying the replacement of metamict zircon by hydrothermal zircon using isotope doping at mid-crust P-T conditions. Goldschmidt Conference of the Geochemical Society, Abstract #27291.
- Ayers JC**, Zhu C, Wallrich B, Hu P (2025) Controls on the aqueous solubility of zircon and formation of hydrothermal zircon at upper crustal conditions. Goldschmidt Conference of the Geochemical Society, Abstract #27040.
- Tajwar M, **Ayers JC** (2024) Biogeochemical dynamics and diel cycles in Stephens Lake: a model of an unpolluted freshwater system. Geological Society of America Abstracts with Programs. 190-5.
- Ayers JC**, Wallrich B, Zhu C (2024) Formation of hydrothermal zircon by replacement of metamict ZrSiO₄. Goldschmidt Conference of the Geochemical Society. <https://doi.org/10.46427/gold2024.22977>
- Ayers JC**, Chen M, Wei J (2024) Stephens Lake: a model unpolluted pond in middle TN. Talk 2A-6, [TN Water Resources Symposium](#).
- Chen M, **Ayers JC** (2024) Seasonal and diurnal variations of stream metabolism in a Middle TN headwater stream. Talk 1B-6, [TN Water Resources Symposium](#).
- Gruber C, **Ayers JC**, Bar-Nes G, Brown K, Brown L, Delapp R, Klein-BenDavid O, Kosson D, Matteo E, Meeussen JCL, Mitchell C, Pyrak-Nolte L, Taylor A (2023) Simulation and characterization of long-term performance for cement–rock interfaces. Joint 6th International Workshop on Mechanisms and Modelling of Waste/Cement Interactions.
- Gruber C et al. (2023) Characterization and Simulation of Cement-Rock Interface Long-Term Performance. Waste Management conference.
- Wallrich B., **Ayers JC** (2023) The Quartz Kerfuffle: A closed system test of the multiple proposed Ti-in-quartz diffusivities. International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI).
- Ayers JC**, Jing W, Chen M, Daugherty E, Perez G, Gomez-Velez J (2023) Effects of Nutrient Pollution and Urbanization on Diel Cycles and Stream Metabolism in Two Middle TN Streams. Talk 2B-9, [TN Water Resources Symposium](#).
- Jing W, Chen M, **Ayers JC** (2022) Stream Metabolism Characterized Using Dissolved Oxygen Measurements in Two Middle TN Streams. Fall AGU meeting. <https://agu.confex.com/agu/fm22/meetingapp.cgi/Paper/1094930>

- Ayers JC**, Jing W, Chen M, Daugherty E, Perez G, Gomez-Velez JD (2022) Effects of Nutrient Pollution and Urbanization on Diel Cycles and CO₂ Emissions in Two Middle TN Streams. Fall AGU meeting.
<https://agu.confex.com/agu/fm22/meetingapp.cgi/Paper/1072244>
- Gruber C et al. (2022) Interactions across interfaces between Ordinary Portland Cement (OPC) paste and oil shale. Goldschmidt Conference of the Geochemical Society.
<https://conf.goldschmidt.info/goldschmidt/2022/meetingapp.cgi/Paper/10180>
- Zanibi H, **Ayers JC** (2021) Are nutrients affected by diel cycles in streams? Study of a low-discharge stream in middle TN. Geological Society of America Abstracts with Programs. Vol 53, No. 6, 2021. <https://doi.org/10.1130/abs/2021AM-367326>.
- Zanibi H, **Ayers JC** (2021) Diurnal changes in stream water quality parameters, East Fork Creek, Franklin, TN. Talk 2B-2, [TN Water Resources Symposium](#).
- Ayers JC, Patton BL, Dietrich M (2021) Rice paddy soil water salinization, acidification, and arsenic concentration. International Conference on Water and Flood Management, Bangladesh (ICWFM-8 abstracts at <https://iwfm.buet.ac.bd/site/iwfm/icwfm2021>)
- Dietrich M, **Ayers JC** (2021) Estuarine trace metal(loid) cycling and possible environmental health risks. International Conference on Water and Flood Management, Bangladesh. (ICWFM-8 abstracts at <https://iwfm.buet.ac.bd/site/iwfm/icwfm2021>)
- Dietrich M, **Ayers JC** (2020) Element Transport and Partitioning Along Tidal Channels in Southwest Bangladesh. Invited Presentation, GSA Annual Meeting.
<https://gsa.confex.com/gsa/2020AM/meetingapp.cgi/Paper/352040>
- Ayers JC**, Peters C (2020) Conversion of Tidal Channel Water to Shallow As-Rich Groundwater Through Reduction of Ferric Oxides in the Tidal Deltaplain of SW Bangladesh. Goldschmidt Conference of the Geochemical Society.
<https://doi.org/10.46427/gold2020.96>
- Ajayi M, **Ayers JC**, Rahilly K (2019) Investigations into Diffuse CH₄ and CO₂ Measurements in N. American Calderas. Fall AGU meeting. V31H-0092
- Ayers JC**, Ajayi M, Rahilly K (2019) Carbon Dioxide Emissions Near Geysers, Fumaroles, Mudpots, Travertine Terraces, and Hot Springs in Yellowstone National Park. Fall AGU meeting, V33D-0212
- Dietrich M, **Ayers JC** (2019) Possible Factors Affecting Trace Element Concentrations in Southwest Bangladesh Surface Waters: The Role of Seasonality, Evaporation, and Irrigation Source. Fall AGU meeting. H33D-05

Grants

External

- National Science Foundation**, PI, EAR-2221906, \$412,943, 2022-2025, Collaborative Research: Probing zircon reactivity in aqueous solutions at solubility equilibrium using isotope tracers.
- National Science Foundation**, co-PI (Steve Goodbred PI), OCE-1600319, \$810,211, 2016-2020, Coastal SEES Collaborative Research: Multi-scale modeling and observations of landscape dynamics, mass balance, and network connectivity for a sustainable Ganges-Brahmaputra delta.
- Department of Defense**, Multidisciplinary University Research Initiative, Office of Naval Research, co-PI (Steve Goodbred PI), Total: \$7,496,577, Vanderbilt \$5,722,451, 2011-2017, Environmental stress and human migration in a low-lying developing nation: A

comparison of co-evolving natural and human landscapes in the physically and culturally diverse context of Bangladesh.

National Science Foundation, co-PI (Calvin Miller PI), EAR-0911726, \$347,475, 6/09-6/13, Supereruptions, Magma Chambers, & Plutonic Residue: Insights from Peach Spring Tuff, Significance of Sphene.

National Science Foundation, PI, EAR-0838391, \$261,031, 6/09-6/12, Trace element partitioning between zircon, aqueous fluids and silicate melt at high and ultrahigh pressures.

National Science Foundation, PI (Calvin Miller co-PI), EAR-0510092, \$285,000, 6/1/05-6/1/09, Zr mineral aqueous solubilities and zircon/(fluid-melt) partitioning.

National Science Foundation, PI (Calvin Miller co-PI), EAR-0126020, \$195,459, 1/02-1/06, Monazite as a sensitive indicator of the timing and type of fluid activity during metamorphism.

National Science Foundation, PI (Calvin Miller co-PI), EAR-9873626, \$170,929, 1/99-1/02, Laboratory and field investigations of monazite petrogenesis, growth kinetics, textural development, and U-Th-Pb chronometry in igneous and high-grade metamorphic rocks.

National Science Foundation, co-PI (Calvin Miller PI), EAR-9506551, \$145,551, 7/95-7/99, Evaluating the potential of zircon and monazite in thermochronometry of high temperature crustal processes.

National Science Foundation, EAR-931705, \$88,000, 4/94-10/96, Experimental investigation of the stability and aqueous solubility of Ti- and Zr-rich minerals: Implications for HFSE mobilities in subduction zones.

Internal – most recent

Discovery Grant, “Purchase of a Picarro G2201-I Cavity Ring-Down Spectroscopy Analyzer and Concentrations and Carbon Isotope Compositions of CO₂ and CH₄ Gases” 6/2015-6/2017, \$145,714.

TIPS, "Sterling Ranch – A Unique Vanderbilt Sustainability and Education Research Center," co-PI (David Kosson PI), 09/2015-08/2018, \$1,044,261.

TEACHING

Courses taught at Vanderbilt University

Geochemistry	1998, 2000-2, 2004, 2006-9, 2011-13, 2015-18, 2020, 2025
Aqueous Geochemistry	1991, 1994-2002, 2005, 2009
Geochemical Modeling	2003-4, 2007, 2020, 2024
Natural Resources	2019, 2022-2023
Introduction to Environmental Science and Sustainability	2024
Sustainability Science	2010, 2013, 2015, 2017-2020, 2021, 2023
Environmental Geology	1999-2006
Physical Geology	1992-1994
Freshman Seminar: Controversies in the Geosciences	1994-1998
Freshman Writing Seminar: Sustainability	2009, 2012

Petrology	2006-2008
Environmental Geochemistry	2003
Geochemistry Lab	2006-2008
Computer Methods in Geology	1992-1997
The Commons: History, Sustainability, Activism (co-taught with English Professor Dana Nelson)	2012
Advanced Geochemistry (seminar)	2005
Geochemistry of the Early Earth	2008
Senior Honors seminar	2020-2022
Senior Seminar	2023-2024
Special Topics and Advanced Techniques: Mineralogy and Geochemistry	2016

External Contributions

Contributed the following lesson plans to the Science Education Resource Center at Carleton College:

- [Mineral Solubility Calculations](#)
- [Writing chemical reactions](#)
- [Crystallization of Magmas](#)

MENTORING

Post-doctoral fellows

Pan Hu	2024-2025
Blake Wallrich	2023-2024
Yan Luo	2006-2007

Visiting Professors

Xiaomei Wang, China University of Geosciences, Wuhan, China	2014-2015
Xiaoming Liu, Northwest University, Xi'an, China	2007, 2013
Osvaldo Rabbia, Universidad de Concepcion, Chile	2000

Doctoral Students Advised (No EES PhD program until 2015)

Mahir Tajwar, Earth & Environmental Sciences	2023-
Moyo Ajayi, Environmental Engineering, "Investigations into methane and carbon dioxide emissions, sources, and pathways in Quaternary volcanic calderas in the western United States"	2016-2024
Matthew Dietrich, Earth & Environmental Sciences, "Heavy metal soil-water partitioning and bioavailability in Southwest Bangladesh"	2017-2021
Tim Peters, Environmental Engineering, "Experimental and Field Based Investigations into the Behavior of Zircon in Hydrothermal and Deep-Tectonic Environments during Mountain-Building and Crustal-Evolution Events"	2006-2012

Masters Students Advised

Ken Rahman, "Continuous monitoring of particulate matter pollution"	2021
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- Brooke Patton, "The Effect of Irrigation Source on Arsenic and Salt Concentrations in Soil in Southwest Bangladesh" 2018
- Moyo Ajayi, "Geochemical and Isotopic Analysis of Escaped Natural Gases in Hydraulically Fractured and non-Fractured sites in UT Cumberland Forest, Tennessee" 2016
- David Fry, "Characterizing temporal and spatial trends in soil geochemistry on Polder 32, Southwest Bangladesh" 2015
- Nathan Katsiaficas, "Using accessory mineral geochronology to identify soil provenance in middle Tennessee" 2014
- Greg George, "Characterization of salinity sources in southwestern Bangladesh evaluated through surface water and groundwater geochemical analyses" 2013
- Scott Crombie, "Monazite alteration in the Searchlight Contact Metamorphic Aureole, Southern Nevada" 2006
- Lichun Zhang, "Zircon solubility in alkaline aqueous solutions and trace element partitioning between zircon and fluids" 2006
- Stephen Lehner, "Synthesis and experimental study of oxidation rate of arsenian pyrite", co-advised with Kaye Savage 2004
- Miranda Loflin, "Monazite as a tracer of fluid infiltration associated with contact metamorphism" 2002
- Betsy Gorisch, "Paragenetic and geochronological characteristics of monazite, based on experimental investigations with applications to naturally occurring metamorphic rocks", co-advised with Calvin Miller 1999
- Delores Robinson, "Investigating magma chamber dynamics through the examination of accessory minerals: The Aztec Wash pluton, Southern Nevada", co-advised with Calvin Miller 1997
- Carol Davis, "Geologic controls on contaminant movement in a carbonate aquifer system: Arnold Air Force Base, South-Central Tennessee" 1996
- Sondra Dittmer, "Element partitioning between peridotite assemblage minerals and H₂O at 2.0-3.0 GPa and 900-1100°C" 1995
- Theodore Larrieu, "Experimental determination of the pressure-volume-temperature properties of water to 20 kbars and 1000°C" 1995

Undergraduate Students: Senior Honors Thesis Advisor

- Ming (Kevin) Chen 2022-4
- Hannah Zanibi, "Assessing Diel Variations in Stream Hydrochemistry within the Harpeth River Watershed, TN" 2021
- Anica Sunshine, "Water quality impacts of a sustainable development at Sterling Ranch, CO" 2016
- Sarah Walker, "Life cycle impacts of conventional and organic beef in the U.S." 2012
- Kelsey Bitting, "Drinking water and reservoir water quality in the area of Coffee and Franklin Counties, TN" (VUSRP) 2004
- Katy Huntze, "Fluid-assisted monazite recrystallization: effects on internal zoning and implications for Th-Pb age dating" 2001
- Stacie Dunkle, "Imaging and Age Dating of Zircons from the Ultra-High Pressure Terrane of Dabie Shan, China" 2000
- Kevin Giles, "The Effect of Fluid Interconnectivity on Monazite Growth in Fluid-bearing Quartzite" 2000

John Milleman, “Hydrothermal growth kinetics of monazite; with application to age determination” 1998
 Also advised Hyen Sung, Daric Georgiades, Katie DeLaCruz, Weizhuo Jing, and Jialei Wei on projects.

High School Students: Research Advisor

Elise Russ, Research Experience for High School Students	2019
Jeong Hyun (Jenna Nam), Research Experience for High School Students	2014
Camille Lasley, Research Experience for High School Students	2013
Brittainy Tidwell, Vanderbilt School for Science and Math	2010
Culley Sharp, VCSO Research Internship Program	2009
Annalyse Moncrief, Hume Fogg, VCSO Research Internship Program	2007
Jason Cox, Hunters Lane, VCSO Research Internship Program	2006
Kathleen Goetz, Harpeth Hall (Won 1 st prize in Middle Tenn. Science Fair)	2004-2005
Oran Switzer, Martin Luther King Science Magnet	1994-1995

High School Students: Senior Thesis Mentor

Lawson Ransburgh, Central Magnet High School	2018-2019
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PhD Committees

Jenny Dodd, Environmental Engineering	2024-
Aida Zyba, Earth and Environmental Sciences	2024-
Erica Scarpitti, Earth and Environmental Sciences	2023-
Laira Kelley, Environmental Engineering	2023-2024
Siyuan Yu, Environmental Engineering	2022-2024
Autumn Taylor, Environmental Engineering	2021-2022
Xinyue Wang, Environmental Engineering	2020-2022
Peng Zhang, Environmental Engineering	2020-2021
Maria Rosa Schicchitano, ANU Research School of Earth Sciences	2018
Matthew Dietrich (Advisor), Earth and Environmental Sciences	2017-2021
Jessica Raff, Earth and Environmental Sciences	2017-2023
John Boren, Environmental Engineering	2017-
Moyo Ajayi (Advisor), Environmental Engineering	2016-2023
Nathan Barnes, Environmental Engineering	2016-2020
Chelsea Peters, Environmental Engineering	2014-2019
Tenley Banik, Environmental Science option of Environmental Engineering	2013-2015
Laura Benneyworth, VCEMS	2011-2016
Susanne McDowell, Environmental Science option of Environmental Engineering	2010-2014
Josh Arnold, Environmental Engineering	2008-2014
Tim Peters (Advisor), E.S. option of Environmental Engineering	2006-2012
Lily Claiborne, Environmental Science option of Environmental Engineering	2008-2011
Sonali Shukla, Physics	2006-2009
Stephen Lehner, Environmental Science option of Environmental Engineering	2005-2007
Sarynna Lopez, Environmental Engineering	2004-2006

SERVICE

Vanderbilt University

Leadership, Department of Earth and Environmental Sciences

Interim Department Chair	2022-2023
Department Chair	2011-2014
Director of Graduate Studies	1994-1998, 2005-2009
Speakers Chair	1998-2007
Chair, Faculty Search Committee	2004, 2018

Committees

EES Graduate Program working group	2025-
Civil & Environmental Engineering Faculty search committee	2024
Awards Committee, Carl E. Adams Graduate Student Best Paper Award Competition for the Environmental Engineering Graduate Program	2020
Cornelius Vanderbilt Scholarship Admissions Committee	2019-2021
EES Faculty search committee	2017, 2018, 2024
Discovery Grant Program internal-review committee	2014, 2016
Senior Advisory Review Committee (Promotion and tenure), College of A&S	2009, 2013
Junior Advisory Review Committee, College of A&S	2008
Task Force on Graduate Education	2008-2009
Environmental Science Option Program Advisory Committee	2005-2009
CPC Subcommittee on Natural Science	1997-2006
Environmental Science Ph.D. Curriculum Committee	2003–2005
Leadership Committee, Vanderbilt Institute for Environmental Risk and Resources Management	2002-2003
Search committee member for EES chair	2002-2003
Strategic Planning Committee, College of Arts and Science, Caucuses 4 and 5	2001

Other University Service

University Faculty Senate	2023-6
Chair, Strategic Planning and Academic Freedom Committee	2025-6
Chair, Faculty Senate Grievance Committee	2025-
Student Life Committee	2024-5
Faculty advisor, Earth & Environmental Science Graduate Student Association	2022-
EES undergraduate major advisor	2018-
University Faculty Marshall	2009-2010
Faculty Fellow, Sigma Phi Epsilon fraternity	2008-2009
Vanderbilt Center for Teaching Panelist, "Students as Producers: Incorporating research and design into STEM classes"	2013
Led a Center for Teaching Workshop on Teaching Sustainability	2010
Presentation at Adventure Science Museum	2005
Invited presentation to Vanderbilt Mayfield #3	2004
Graduate Faculty Assembly Delegate	1993-1994, 1999-2001, 2004-2009
Department Computer Coordinator	1991-1999

Profession

Professional Societies

American Academy of Environmental Engineers and Scientists	2016-2020
• Students and Young Professionals Committee	2018-2020
American Association for the Advancement of Science (AAAS)	2017-present
American Geophysical Union	1990-present
• Union Medals Committee	2004-2006
Geochemical Society	1990-present
Geological Society of America	1990-present
• Early Career Award committee for the MGPV Division	2015-2016
• On to the Future mentor	2021
Mineralogical Society of America	1984-present
• Roebling Medal Committee	2021-2024
• Award Committee	2015-2019
• Lecture Program Committee	2002-2006
Union of Concerned Scientists	2005-present

Symposium Co-Organizer

Geological Society of America annual meeting, “Advances in Mineralogy and Petrology” session	2012
Geochemical Society Goldschmidt Conference, co-convened two sessions	2010
International Geological Congress, "Trace element mineralogy" session	2000

Editorial

Geochemical Transactions of the American Chemical Society, Associate Editor	2006-2019
American Mineralogist, Associate Editor	2001-2006

External Referee for Promotion and Tenure Cases

Dustin Trail, University of Rochester, Assoc. Prof.	2025
Nadya Teutsch, Geological Survey of Israel, equiv. of Assoc. Prof.	2025
Drew Taylor, The University of Alabama, Assoc. Prof.	2023
Ofra Klein Ben-David, Adjunct Assoc. Prof.	2023
Ashaki Rouff, Rutgers Univ., Assoc. Prof.	2022
Saeb Al-Shereideh, Yarmouk Univ., Assoc. Prof.	2016
Andrew Quicksall, Southern Methodist Univ., Asst. Prof.	2014
Nigel Kelly, Colorado School of Mines, Asst. Prof.	2013

Select Invited talks

Roanoke College	2021
Department of Geology, The University of Memphis	2016
Univ. of Georgia Dept. of Geology	2013
Sustainable Tennessee Summit	2012
Northwest University, Xi'an, China	2011
Chinese Academy of Geological Sciences, Beijing, China	2007
China University of Geosciences, Wuhan, China	2007

Keynote speaker, Goldschmidt Conference	2006
Australian National University	2006
Invited speaker, Goldschmidt Conference	2006
Chemical Science Division, Oak Ridge National Laboratory	2002
Univ. of South Carolina	2002
Keynote speaker, Invited speaker, Goldschmidt Conference	2001
Keynote speaker, IAVCEI workshop on Magmatic Arcs, New Zealand	2000

Other

National Science Foundation Review Panel	2012, 2016
Sigma Xi Admissions Committee Chair, VU	2001

Community Outreach

Center for Sustainable Stewardship , Franklin, TN: Board of Directors	2019-present
Go Green North Nashville , Advisory Council	2012-2014
Children's House Montessori School , Nashville, TN: Board of Directors	1998-2000

PERSONAL

Languages

English: Native Language **German:** Intermediate Listener, Novice Speaker

Computer Skills

Programming: R/RStudio (advanced), Python (intermediate), Matlab (novice), Bash scripting, Git version control

Software: ArcGIS Pro, Geochemists Workbench, Phreeqci

Other

Married, two adult children, one grandchild. Enjoy reading, music, travel, hiking, backpacking, camping, cooking/baking, and woodworking.