Anna R. Waldeck, Ph.D.

Penn State University | Department of Geosciences
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Research Interests

Low-temperature stable isotope geochemistry; geobiology; paleoclimate; novel isotope proxies

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Education

Ph.D. in Earth & Planetary Sciences, Harvard University 2021 Thesis: *Stable oxygen isotopes in sulfate: Implications for Phanerozoic pO_2* Advisor: David T. Johnston

B.S. Chemistry with General Honors, University of Chicago 2014 B.S. Geophysical Sciences with Honors, University of Chicago 2014 Thesis: *Analysis of phosphate oxygen isotopes in microfossils from the Cambrian Period* Advisor: Albert S. Colman

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Research appointments

Agouron Postdoctoral Research Fellow, Penn State University 2024-*present* Advisors: Miquela Ingalls, Andrew D. Jacobson

Research Associate, Brown University 2023-2024 Advisor: Kim Cobb

Ubben Postdoctoral Research Fellow, Northwestern University 2021-2023 Advisors: Andrew D. Jacobson, Brad B. Sageman, Matt T. Hurtgen

Graduate Student Research Fellow, Harvard University 2015-2021 Undergraduate Researcher, University of Chicago 2011-2015

Awards

Agouron Geobiology Postdoctoral Fellowship 2023
NSF EAR Postdoctoral Fellowship Finalist 2023
Harvard University Distinction in Teaching Award 2020
NSF Graduate Research Fellowship Semi-Finalist 2016
University of Chicago Dean's List 2011-2013

Proposals and Funding

National Science Foundation – Postdoctoral Fellowship: EAR-PF [$180,000] EAR 2305613 "Testing the calcium isotope proxy in foraminifera microfossils from the Cretaceous hothouse"
Awarded to Anna Waldeck, however it was declined to accept the AGI Fellowship

Agouron Institute – Postdoctoral Fellowship in Geobiology [$167,000] Sept. 2023-Aug. 2025 AI-F-GB75.24.2 "A new look at an ancient analogue – pairing stable strontium, stable calcium, and dual-clumped isotope measurements in carbonates from Green Lake, NY" Awarded to Anna Waldeck

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PEER-REVIEWED PUBLICATIONS

Waldeck, A. R., et al. “Calcium and strontium isotopes record Ocean Anoxic Event 2 response to volcanism in a Southern Mexico carbonate platform” ***in preparation*** *for Geochimica et Cosmochimica Acta*

Waldeck, A. R., et al. "Marine sulfate captures Earth’s final rise to modern pO_2." ***in review*** *at Nature*.

2023

Hughes, E. R., **Waldeck, A. R.**, Moriarty, S. N., Jamieson, J. W., Martin, A. J., Scheuermann, P. P., Syverson, D. D., Seyfried, W. E., Reeves, E. P. & Johnston, D. T. (2023). The influence of submarine hydrothermal systems on seawater sulfate. *Geochimica et Cosmochimica Acta*, *344*, 73-89.

2022

Bloom, B. P., **Waldeck, A. R.**, & Waldeck, D. H. "Homochirality and chiral-induced spin selectivity: A new spin on the origin of life." *Proceedings of the National Academy of Sciences* 119, no. 34 (2022): e2210505119.

Waldeck, A. R., Hemingway, J.D., Yao, W., Paytan, A., and Johnston, D.T. "The triple oxygen isotope composition of marine sulfate and 130 million years of microbial control." *Proceedings of the National Academy of Sciences* 119, no. 31 (2022): e2202018119.

Waldeck, A. R.*, Olson, H. C.*, Weiqi, Y., Blättler, C., Paytan, A., Hodell, D., & Johnston, D.T. "Calibrating the triple oxygen isotope composition of evaporite minerals as a proxy for marine sulfate." *Earth and Planetary Science Letters*, 578 (2022): 117320.

2020

Laakso, T., **Waldeck, A. R.**, Johnston, D.T., & Macdonald, F. "Volcanic controls on seawater sulfate over the last 120 Ma." *PNAS* 117, no. 35 (2020): 21118-21124.

Bertran, E., **Waldeck, A.R.**, Wing, B.A., Halevy, I., Leavitt, W.D., Bradley, A.S., & Johnston, D.T. "Oxygen isotope effects during microbial sulfate reduction: applications to sediment cell abundances." *The ISME Journal* 14 (2020): 1508–1519.

2019

Waldeck, A. R., Cowie, B. R., Bertran, E., Wing, B. A., Halevy, I., & Johnston, D. T. "Deciphering the atmospheric signal in marine sulfate oxygen isotope composition." *Earth and Planetary Science Letters* 522 (2019): 12-19.

2018

B. W. Stamps, Nunn, H. S., Petryshyn V. A., Oremland R. S., Miller L. G., Rosen M. R., Bauer K. W., Thompson K. J., Tookmanian E. M., **Waldeck A. R.**, et al. "Metabolic capability and phylogenetic diversity of Mono Lake during a bloom of the eukaryotic phototroph Picocystis sp. strain ML." *Applied and environmental microbiology* 84 no.21 (2018): e01171-18.

2017

Mine, A. H., **Waldeck, A.,** Olack, G., Hoerner, M. E., Alex, S. & Colman, A. S. "Microprecipitation and δ18O analysis of phosphate for paleoclimate and biogeochemistry research." *Chemical Geology* 460 (2017): 1-14.

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TALKS AND SEMINARS

Selected Conference Presentations

Waldeck, A.R., Jacobson, A.D., Sageman, B.B., & Hurtgen, M.T. “Ca and Sr isotopes in a Southern Mexico carbonate platform during Ocean Anoxic Event 2.” AGU (2022). Talk.

Waldeck, A.R. & Johnston, D.T. “The triple oxygen isotope (Δ’17O) record of Phanerozoic marine sulfate captures the rise of land plants.” Gordon Research Seminar – Geobiology (2022). Talk.

Waldeck, A.R., Hemingway, J., Yao, W., Paytan, A., & Johnston, D.T. "Microbial control on the triple oxygen isotope composition of Cenozoic marine sulfate." Goldschmidt Conference (2022). Invited talk.

Waldeck, A.R., Yao, W., Hemingway, J., Paytan, A., & Johnston, D.T. "The Cenozoic Cretaceous marine sulfate triple oxygen isotope (Δ’17O) record as a proxy for climate." Northeast Geobiology Conference (2021). Talk.

Waldeck, A.R., Yao, W., Hemingway, J., Paytan, A., & Johnston, D.T. "Rethinking the sulfate triple oxygen isotope (Δ’17O) proxy in the Cenozoic-Cretaceous." Geological Society Conference: Sulfur in the Earth System (2020). Talk.

Waldeck, A. R., Paytan, A., Laakso, T., Macdonald, F., & Johnston, D. T. "Using triple oxygen isotopes to test Cretaceous/Cenozoic LIP activity as a driver of the marine sulfur cycle." *AGUFM* 2019 (2019): V24A-07. Talk.

University/Institute Research Seminars

Brown University, Department of Earth, Environmental, and Planetary Sciences
Climate and Environment Seminar, September 2023

Woods Hole Oceanographic Institution, Department of Marine Chemistry & Geochemistry
Department Seminar, August 2023

Western Michigan University, Department of Geological and Environmental Sciences
Department Seminar, April 2023

Northwestern University, Department of Earth and Planetary Sciences
Department Seminar, January 2022

TEACHING AND MENTORING

Brown University, train and supervise postdocs, graduate students, and undergraduates in carbonate & water stable isotope measurements and data interpretation.

Northwestern University, mentor for two undergraduates in the *Summer Undergraduate Research Grant* program, Summer 2022. Students presented at *GLSP* (*Great Lakes Student Paleoconference*) and *AGU* Fall 2022.

Harvard University, teaching fellow for two classes (E-PSCI 53: Marine Geochemistry and E-PSCI 56: Geobiology and the History of Life)

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TECHNICAL SKILLS

Isotope ratio mass spectrometry Continuous flow isotope ratio mass spectrometers (IRMS; Delta V, Delta V Plus) with High Temperature Conversion Elemental Analyzer (TC/EA), Elemental Analyzer (EA), and Gas Bench II; Dual Inlet IRMS (MAT 253 Plus) with Kiel II Device and Custom Fluorination line; Isodat Software

Thermal ionization mass spectrometry Triton Series Multicollector Thermal Ionization Mass Spectrometer (TIMS) with adjustable faraday cups; Tune Software

Cavity ringdown mass spectroscopy Picarro L2140-i isotopic water analyzer with Autosampler, Vaporizer, and Micro-Combustion Module; Picarro Software; $\delta^{18}O$, $\delta^{17}O$, and $\delta^{2}H$ of rainwater, ground water and seawater

Elemental analysis Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES; Thermo iCAP 7600 ICP-OES with radial & axial modes and QTEGRA Software); Scanning Electron Microscope with Energy Dispersive Spectroscopy (SEM-EDS; Hitachi S-3400N-II with Back-scattered Electron Detector)

Analytical techniques MATLAB, isotope and elemental data correction methods, fluorination line for O_2 extraction, wet chemistry sample prep, X-ray Diffraction

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FIELD EXPERIENCE

E-PSCI 182: Stratigraphy and Sedimentology, *Northeast Spain* (April 2017)
E-PSCI 274: Field Geology, *Silurian Hills, California* (Jan 2017)
International Agouron Geobiology Course, *Southern California* (Jun-July 2016)
E-PSCI 74: Field Geology, *Kingston Range, California* (Jan 2015)
Field Work in *Pioche-Caliente region, Nevada* (April 2015)
GEOS 29002: Field Course in Modern and Ancient Environments, *Bahamas* (Jan 2013)
Melville RV Scientific Cruise, *Southern California Coast* (Sept 2012)

LEADERSHIP AND SERVICE

Reviewer for *EPSL*, *ACS Earth & Space Chemistry*, *Nature Geoscience, Science, Geobiology, GCA, & NSF EAR*
Geobiology Journal Club Co-organizer, 2019-2021
Graduate Student Mental Health Survey Committee, 2017-2021
EPS Diversity Committee on Graduate Student Recruitment and Retention, 2020
Harvard Graduate Women in Science Executive Board, 2018-2020
Graduate Field Trip Co-Organizer 2019; Graduate Field Trip Cook, 2017
Graduate Student Lunch Seminar Series Organizer, 2016-2017