Chris Mead

Assistant Research Scientist,
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Education/Employment:

2017–Present	Assistant Research Scientist Center for Education Through Exploration Arizona State University
2015–2017	Research Specialist Sr. Center for Education Through Exploration Arizona State University
2014–2015	Post-Doctoral Research Associate Advisor: Leilani Arthurs University of Nebraska
2008–2014	Ph.D. in Geological Sciences Dissertation: Biogeochemistry Science and Education Part One: Using Non-Traditional Stable Isotopes as Environmental Tracers Part Two: Identifying and Measuring Undergraduate Misconceptions in Biogeochemistry Advisors: Ariel D. Anbar, Steven Semken Arizona State University
2006–2008	M.S. in Geology Thesis: Mercury Isotope Analysis by Double Spike Advisor: Thomas M. Johnson University of Illinois
2001–2005	B.S. in Geology University of Illinois

Peer-Reviewed Publications:

Mead, C., Supriya, K., Zheng, Y., Anbar, A. D., Collins, J. P., LePore, P., & Brownell, S. E. (in review). Online biology degree program broadens access for women, first-generation to college, and low-income students, but grade disparities remain. *PLOS ONE*.

Perera, V., Mead, C., van der Hoeven Kraft, K. J., Stanley, S., Semken, S., Husman, J., Angappan, R., MacKenzie, S., Barik, A. & Buxner, S. (in revision). Considering Intergroup Emotions to Improve Diversity and Inclusion in the Geosciences. *Journal of Geoscience Education*.

Nawaz, S., Kennedy, G., Mead, C., & Bailey, J. (in review). Moments of confusion in simulation-based learning environments. *Journal of Learning Analytics*.

Mead, C., Bruce, G., Semken, S., Buxner, S., & Anbar, A. D. (2019). Immersive, interactive virtual field trips promote learning. *Journal of Geoscience Education*, 67, 131–142, doi: 10.1080/10899995.2019.1565285.

Horodyskyj, L. B., Mead, C., Belinson, Z., Buxner, S., Semken, S., & Anbar, A. D. (2018). Habitable Worlds: Delivering on the Promises of Online Education. *Astrobiology*, 18, 86–99, doi: 10.1089/ast.2016.1550.

Perera, V., Mead, C., Buxner, S., Horodyskyj, L., Semken, S., Lopatto, D., & Anbar, A. D. (2017). Students in fully online programs report more positive attitudes toward science than students in traditional, in-person programs. *CBE–Life Sciences Education*, 16, ar60, doi: 10.1187/cbe.16-11-0316.

Mead, C., Herckes, P., Majestic, B. J., & Anbar, A. D. (2013). Source apportionment of aerosol iron in the marine environment using iron isotope analysis. *Geophysical Research Letters*, 40, 5722–5727, doi: 10.1002/2013GL057713.

Mead, C., Lyons, J. R., Johnson, T. M., & Anbar, A. D. (2013). Unique Hg stable isotope signatures of compact fluorescent lamp-sourced Hg. *Environmental Science & Technology*, 47, 2542–2547, doi: 10.1021/es303940p.

Mead, C. & Johnson, T. M. (2010). Hg stable isotope analysis by the double spike method. *Analytical and Bioanalytical Chemistry*, 397, 1529–1538, doi: 10.1007/s00216-010-3701-0.

Other Publications:

Mead, C., Anbar, A. D., Horodyskyj, L., & Bratton, D. (*in press*). Education through exploration: A model for using adaptive learning to teach laboratory science online. In C. Impey & M. Wenger (Eds.), Astronomy Education Volume 2: Best Practices for Online Learning Environments (pp. xxx–xxx). Bristol, England: IOP Publishing.

Nawaz, S., Kennedy, G., Bailey, J., Mead, C., & Horodyskyj, L. (2018). Struggle town? Developing profiles of student confusion in simulation-based learning environments. In Proceedings ASCILITE2018: 35th International Conference on Innovation, Practice and Research in the Use of Educational Technologies in Tertiary Education.

First Author Conference Presentations:

Mead, C. & Anbar, A. D. (2019, December). Using computer learning analytics to support learning design, evaluation, and teaching. Oral presentation at the American Geophysical Union annual meeting in San Francisco, CA.

Mead, C., Brownell, S. E., Collins, J. P., LePore, P., & Anbar, A. D. (2019, December). Using Institutional Analysis of Grades to Assess Equity of Outcomes in Online and In-Person

Science Courses. Poster presented at the American Geophysical Union annual meeting in San Francisco, CA.

Mead, C., Brownell, S. E., Collins, J. P., LePore, P., & Anbar, A. D. (2019, September). Using institutional analysis of grades to assess equity of outcomes in online and in-person science courses. Oral presentation at the Geological Society of America Annual Meeting in Phoenix, AZ.

Mead, C., Landrum, A., Kahan, D., & Anbar, A. D. (2018, December). Science curiosity can predict success in science courses. Poster presented at the American Geophysical Union annual meeting in Washington, DC.

Mead, C., Davis, H. B., Swann, J. L., & Anbar, A. D. (2018, December). What kinds of digital learning experiences do educators want? Poster presented at the American Geophysical Union annual meeting in Washington, DC.

Mead, C., Horodyskyj, L., Buxner, S., Semken, S., & Anbar, A. (2017, April). Advances in Assessments of Astrobiology Learning Outcomes and Data-Driven Student Support. Oral presentation at the Astrobiology Science Conference in Mesa, AZ.

Mead, C., Horodyskyj, L., Buxner, S., Semken, S., & Anbar, A. D. (2016, December). Measuring scientific reasoning through behavioral analysis in a computer-based problem solving exercise. Poster presented at the American Geophysical Union annual meeting in San Francisco, CA.

Mead, C., Horodyskyj, L., Buxner, S., Semken, S., & Anbar, A. D. (2016, December). Different behavioral patterns of success for men and women in an online introductory science course: Addressing the course grade gender gap. Oral presentation at the American Geophysical Union annual meeting in San Francisco, CA.

Mead, C. & Arthurs, L. (2014, October). Learning Strategies and Attitudes in Introductory-Level Geoscience Courses: Preliminary Findings of a Departmental Self-Study. Oral presentation at the Geological Society of America annual meeting in Vancouver, Canada.

Mead, C., Semken, S., & Anbar, A. D. (2014, October). The Development of a Valid and Reliable Biogeochemistry Concept Inventory. Poster presentation at the Geological Society of America annual meeting in Vancouver, Canada.

Mead, C., Herckes, P., Majestic, B. J., & Anbar, A. D. (2012, December). Quantifying anthropogenic Fe in marine aerosols using Fe stable isotope analysis. Poster presented at the American Geophysical Union annual meeting in San Francisco, CA.

Mead, C., Gordon, G. W., & Anbar, A. D. (2012, September). Non-traditional stable isotopes: Ecological and environmental applications. Invited talk at the Long Term Ecological Research Network All Scientists Meeting in Estes Park, CO.

Mead, C., Semken, S., & Anbar, A. D. (2011, October). Identifying misconceptions about biogeochemistry among undergraduates. Oral presentation at the Geological Society of America annual meeting in Minneapolis, MN.

Mead, C., Anbar, A. D., Lyons, J. R., & Johnson, T. M. (2010, December). Mass-independent fractionation of mercury isotopes in compact fluorescent light bulbs. Poster presented at the American Geophysical Union annual meeting in San Francisco, CA.

Mead, C., Anbar, A., & Johnson, T. (2010, June). Mass-independent fractionation of Hg isotopes resulting from photochemical self-shielding. Oral presentation at the Goldschmidt conference in Knoxville, TN.

Other Conference Presentations:
[2020]

Bratton, D., Anbar, A. D., Renfrey, M., Bodin, M., Swann, J., & Mead, C. (2020, December). Using an Interactive, 3D Visualization to Teach Phases of the Moon. Presentation at the American Geophysical Union annual meeting in San Francisco, CA [held virtually].

Bruce, G., Mead, C., Taylor, W., & Anbar, A. D. (2020, December). Gamifying virtual exploration of the past 350 million years of vertebrate evolution. Presentation at the American Geophysical Union annual meeting in San Francisco, CA [held virtually].

Ruberto, T., Mead, C., Aggarwal, R., Semken, S., Tamer, A. J., & Anbar, A. D. (2020, December). Democratizing Virtual Field Trips: Teaching Learners to Create Their Own Virtual Field Trips for Earth and Space Science and Sustainability. Presentation at the American Geophysical Union annual meeting in San Francisco, CA [held virtually].

Swann, J., Kirk, S., Mead, C., & Anbar, A. D. (2020, December). Teacher Professional Development to Support Transition to Online. Presentation at the American Geophysical Union annual meeting in San Francisco, CA [held virtually].

[2019]

Bratton, D., Renfry, M., Fogelson, K., Mead, C., & Anbar, A. D. (2019, December). Combining Eyes on the Solar System, a rich narrative, and adaptive feedback to teach Solar and Lunar eclipses. Poster presented at the American Geophysical Union annual meeting in San Francisco, CA.

Bruce, G., Oliver, C., Taylor, W. L., Mead, C., Semken, S., Summons, R. E., Buxner, S., & Anbar, A. D. (2019, September). Advancing 25 years of digital innovation - exploring the evolution of 360° virtual field trips from apple's human interface group to modern gamification and beyond. Oral presentation at the Geological Society of America Annual Meeting in Phoenix, AZ.

Bruce, G., Taylor, W. L., Mead, C., Buxner, S., & Anbar, A. D. (2019, September). Digital innovations in gamification, adaptivity, and rich learning design to virtually explore the

past 350 million years. Oral presentation at the Geological Society of America Annual Meeting in Phoenix, AZ.

Bruce, G., Taylor, W., Mead, C., Buxner, S., Semken, S., & Anbar, A. D. (2019, December). Gamifying Virtual Exploration of the Past 350 Million Years of Vertebrate Evolution. Poster presented at the American Geophysical Union annual meeting in San Francisco, CA.

Horodyskyj, L., Mead, C., Oliver, C., & Anbar, A. D. (2019, September). Teaching real science: a novel approach to teaching students the scientific process. Oral presentation at the Geological Society of America Annual Meeting in Phoenix, AZ.

Ruberto, T., Semken, S., Mead, C., Bruce, G., Buxner, S., & Anbar, A. D. (2019, September). Mixed-methods research on the implications of learning outcomes for in-situ and virtual geological field trips. Oral presentation at the Geological Society of America Annual Meeting in Phoenix, AZ.

Semken, S., Bruce, G., Ruberto, T., Mead, C., Buxner, S., Anbar, A. D., Crossey, L. J., & Karlstrom, K. E. (2019, September). The future of geoscience education at grand canyon: more—and more diverse—learners will experience it by place-based and digital means. Oral presentation at the Geological Society of America Annual Meeting in Phoenix, AZ.

Swann, J. L., Mead, C., & Anbar, A. D. (2019, December). Consumers to creators: Reducing the barrier of entry for educators to customize digital learning experiences. Poster presented at the American Geophysical Union annual meeting in San Francisco, CA.

Tamer, A. J. J., Ruberto, T., Mead, C., Bruce, G., Semken, S., Anbar, A. D., & Aggarwal, R. (2019, December). Teaching and learning about Earth science and sustainability with student-created virtual field trips. Oral presentation at the American Geophysical Union annual meeting in San Francisco, CA.

[2018]

Horodyskyj, L., Bruce, G., Bratton III, D., Mead, C., Ruberto, T., Semken, S., & Anbar, A. D. (2018, November). Education Through Exploration: Lessons from Active Learning at Scale. Poster presented at the Geological Society of America meeting in Indianapolis, IN.

Horodyskyj, L., Mead, C., & Lennon, T. (2018, November). Build a Catastrophe: Using Digital World and Policy Models to Engage Political Science Students with Climate Change. Oral presentation at the Geological Society of America meeting in Indianapolis, IN.

Horodyskyj, L., Mead, C., Pardos, Z., & Anbar, A. D. (2018, December). Improving Student Outcomes Through Informed Use of Learning Analytics. Poster presented at the American Geophysical Union annual meeting in Washington, DC.

Swann J. L., Mead, C., Hunsley, D., & Anbar, A. D. (2018, December). Training educators to build and modify adaptive digital learning experiences. Poster presented at the American Geophysical Union annual meeting in Washington, DC.

[2017]

Anbar, A., Ben-Naim, D., & Mead, C. (2017, April). Digital Teaching Networks Inspired by Astrobiology: Adaptive Scaling of High-Quality Learning Resources. Presentation at the Astrobiology Science Conference in Mesa, AZ.

Anbar, A. D., Mead, C., Bratton III, D., Horodyskyj, L., Hayes, J., Schonstein, D., Watt, S., Watt, K., Ben-Naim, D., & Leon, A. (2017, December). Demonstrating the Value of Education Through Exploration as a Theory of Digital Design. Poster presented at the American Geophysical Union annual meeting in New Orleans, LA.

Bratton III, D., Hayes, J., Sarno, D., Bruce, G., Horodyskyj, L., Mead, C., Ben-Naim, D., & Anbar, A. D. (2017, April). Bringing Active Field-Based Learning to Scale in Astrobiology: Virtual Field Trips and Adaptive Courseware. Presentation at the Astrobiology Science Conference in Mesa, AZ.

Horodyskyj, L., Lennon, T., Mead, C., & Anbar, A. D. (2017, December). Build a Catastrophe: Using Digital World and Policy Models to Engage Political Science Students with Climate Change. Poster presented at the American Geophysical Union annual meeting in New Orleans, LA.

Horodyskyj, L., Mead, C., & Anbar, A. (2017, April). Teaching Assumptions: The Missing Component of the Scientific Process. Presentation at the Astrobiology Science Conference in Mesa, AZ.

Horodykyj, L., Mead, C., & Anbar, A. D. (2017, December). Finding actionable data to support student success in introductory science courses. Oral presentation at the American Geophysical Union annual meeting in New Orleans, LA.

Perera, V., Mead, C., Buxner, S., Horodyskyj, L., Semken, S., Lopatto, D., & Anbar, A. (2017, April). Gauging Students' Attitudes Towards Science to Improve Science Pedagogy. Presentation at the Astrobiology Science Conference in Mesa, AZ.

Semken, S., Ruberto, T., Bruce, G., Buxner, S., & Anbar, A. D. (2017, December). Learning outcomes of in-person and virtual field-based geoscience instruction at Grand Canyon National Park: complementary mixed-methods analyses. Oral presentation at the American Geophysical Union annual meeting in New Orleans, LA.

Swann, J. L., Elkins-Tanton, L. T., Anbar, A. D., Boonstra, S. K., Tamer, A. J., Mead, C., & Hunsley, D. (2017, December). Exploring the story, science, and adventure of small worlds. Oral presentation at the American Geophysical Union annual meeting in New Orleans, LA.

Tamer, A. J. J., Anbar, A. D., Elkins-Tanton, L. T., Boonstra, S. K., Mead, C., Swann, J. L., & Hunsley, D. (2017, December). Building effective learning experiences around visualizations: NASA Eyes on the Solar System and Infiniscope. Oral presentation at the American Geophysical Union annual meeting in New Orleans, LA.

[2016]

Bratton III., D., Mead, C., Horodyskyj, L., & Anbar, A. D. (2016, December). Development and Evaluation of a Fully-Online Introductory Biology Course With an Emphasis on the Possibility of Life Beyond Earth. Poster presented at the American Geophysical Union annual meeting in San Francisco, CA.

Bruce, G., Mead, C., Buxner, S., Taylor, W., Semken, S., Anbar, A. D., & Sundstrom, J. (2016, December). Immersive, interactive virtual field trips promote learning. Poster presented at the American Geophysical Union annual meeting in San Francisco, CA.

Bruce, G., Taylor, W., Anbar, A. D., Semken, S., Buxner, S., Mead, C., El-Moujaber, E., Summons, R. E., & Oliver, C. (2016, December). Linking Immersive Virtual Field Trips with an Adaptive Learning Platform. Poster presented at the American Geophysical Union annual meeting in San Francisco, CA.

Horodyskyj, L., Mead, C., & Anbar, A. D. (2016, December). I Assumed You Knew: Teaching Assumptions as Co-Equal to Observations in Scientific Work. Poster presented at the American Geophysical Union annual meeting in San Francisco, CA.

Horodyskyj, L., Mead, C., Buxner, S., Semken, S., & Anbar, A. D. (2016, December). Assessing Complex Learning Objectives through Analytics. Oral presentation at the American Geophysical Union annual meeting in San Francisco, CA.

Perera, V., Mead, C., Buxner, S., Horodyskyj, L., Semken, S., Lopatto, D., & Anbar, A. D. (2016, December). Assessing Student Attitudes Towards Science in an Adaptive Online Astrobiology Course: Comparing Online and On-Campus Undergraduates. Poster presented at the American Geophysical Union annual meeting in San Francisco, CA.

Semken, S., Ruberto, T., Mead, C., Bruce, G., Buxner, S., & Anbar, A. D. (2016, December). Complementary Research on Student Geoscience Learning at Grand Canyon by Means of In-situ and Virtual Modalities. Poster presented at the American Geophysical Union annual meeting in San Francisco, CA.

Teaching Experience:

Summer 2015	Geo 100/101	Introduction to Geology (Instructor)
Fall 2012	GLG 106	Worked with Prof. Ariel Anbar to develop an online, inquiry-driven course for non-science majors called “Habitable Worlds”
Spring 2010	GLG 106	
Fall 2009	CHM 302	Environmental Chemistry (Grader/Office hours)
Spring 2009	GLG 481	Geochemistry (Grader/Office hours)

Fall 2008	GLG 103	Introductory Geology (Lab)
Spring 2008	Geol 440	Sedimentology and Stratigraphy (Lab)
Fall 2007	Geol 143	History of Life (Lab, Head TA)
Spring 2007	Geol 100	Introductory Geology (Lab)
Spring 2007	Geol 118	Natural Disasters (Grader/Office hours)
Fall 2006	Geol 143	History of Life (Lab)

Project Evaluation Experience:

1. "Consortium for Open Active Pathways (COAP)", PI: Ariel Anbar (ASU), Department of Education ($2,495,936, 2019–2022).

2. "The NASA Exploration Connection", PI: Ariel Anbar (ASU), NASA ($10,200,000, 2016–2020). Co-evaluator with Dr. Hilarie Davis.

3. "The SDG Experience - Student Immersion in SDG Solutions Through Virtual Field Trips", PI: Rimjhim Aggarwal (ASU), Bill & Melinda Gates Foundation ($100,000, 2019–2020).

Funding Proposals:

1. PI: NSF ITEST ($1,364,890 to ASU, 2021–2023) [Pending]

   "Student-Produced Virtual Field Trips: Democratizing Development of Digital Learning"

2. Co-I: NASA ROSES ($4,984,729 to ASU, 2021–2025) [Pending]

   "NASA SMD Community of Practice for Education (SCoPE)"

3. Evaluator: NASA ($10,780,742 to ASU, 2021–2025, Renewal) [Pending]

   "NASA SMD Exploration Connection"

4. Senior Personnel: NSF ($1,747,453, 2020–2025) [Pending]

   "The Human Artificial Intelligence for Learning Institute (HAIL.I): A proposal to NSF for a Research Institute on AI applied to Education"

5. Co-I: Department of Education IES ($558,088, $39,713 to ASU, 2020–2022) [Not Funded]

   "Using Computational Linguistics to Model 21st Century Competencies in Digitally-Mediated Collaborative Interactions"

6. Co-I: NSF IUSE ($980,703 to ASU, 2020–2025) [Not Funded]

   "Collaborative Research: Polar Explorer - A Virtual Learning Environment for Polar Science Education"

Previous Funding and Awards:

2015	Selected as participant in NSF-funded ENGAGE (Encouraging Networks between Geoscience and Geoscience Education) workshop
2014	University of Nebraska Post-Doctoral Travel Grant
2011	GSA Student Travel Grant
2011	GSA Geoscience Education Division Student Travel Grant
2011	NSF Integrative Graduate Education and Research Traineeship (IGERT) Fellow
2010	Co-wrote successful NSF grant (Award #1031371) Title: Source apportionment of iron in the marine atmosphere – Application of stable iron isotopic measurements
2010	Goldschmidt Student Travel Grant
2010	SESE Graduate Student Research Award
2008 – 2010	NSF IGERT Associate
2008	Geology department outstanding TA award

Professional Service:

Reviewer for Journal of Geoscience Education

Professional Affiliations:

National Association of Geoscience Teachers
American Geophysical Union
The Geological Society of America
Society for Learning Analytics Research