

Cole A. McCormick, Ph.D.

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<https://scholar.google.com/citations?user=5Ftp8IAAAAJ&hl=en>

RESEARCH INTERESTS

Carbonate Mineralogy, Sedimentology, and Geochemistry

- Integration of mineralogy, sedimentology, geochemistry, and structural geology.
- Experimental precipitation and replacement of carbonate minerals.
- Advanced techniques in carbonate geochemistry (e.g., rare earth element analyses, $\delta^{34}\text{S}$ and $\delta^{238}\text{U}$ isotopic analyses, carbonate clumped isotope analyses, and U-Pb geochronology).

EDUCATION & APPOINTMENTS

Postdoctoral Scholar (2023 to present) – The Pennsylvania State University

- Experimental constraints on carbonate geochemical proxies as archives of the redox evolution of ancient seawater.
- Research advisor: Dr. Kimberly V. Lau

Ph.D. Earth and Environmental Sciences (2023) – The University of Manchester

- Diagnostic rock textures in fault-controlled dolomite bodies: insights from hyperspectral imaging and the integration of petrographical, geochemical, and geomechanical analyses.
- Research advisors: Dr. Cathy Hollis and Dr. Ernest H. Rutter

M.Sc. Earth and Atmospheric Sciences (2019) – University of Alberta

- Eustatic and tectonic controls on the development of the stratigraphic architecture of the Cayman Islands, British West Indies.
- Research advisor: Dr. Brian Jones

B.Sc. (Honours) Geology (2017) – University of Alberta

RESEARCH GRANTS & AWARDS

2024 – International Association of Sedimentologists Postdoctoral Grant	(€2,500 EUR)
2022 – Natural Environment Research Council Isotope Facility Grant	(£32,550 GBP)
2022 – The Geological Society of London Postgraduate Research Grant	(£1600 GBP)
2020 – Natural Environment Research Council Isotope Facility Grant	(£20,862 GBP)
2020 – International Association of Sedimentologists Postgraduate Grant	(€1,000 EUR)
2020 – Society for Sedimentary Geology Student Research Grant	(\$1,000 USD)
2020 – AAPG Foundation Classen Family Named Grant	(\$3,000 USD)
2020 – British Sedimentological Research Group Trevor Elliot Memorial Grant	(£500 GBP)
2019 to 2022 – The University of Manchester President's Doctoral Scholar	(£16,000 GBP/yr)
https://www.presidentsaward.manchester.ac.uk/	
2019 – AAPG Foundation Harold J. Funkhouser Memorial Grant	(\$3,000 USD)
2017 to 2019 – University of Alberta Teaching and Research Assistantship	(\$22,250 CAD/yr)
2015 – University of Alberta Student Leadership/Professional Development Grant	(\$1,500 CAD)

PUBLICATIONS

McCormick, C.A., Hardisty, D., Pederson, C., Dietrich, W.L., Bondzie-Selby, I., Hashim, M., Lau, K.V. (2026). Experimental constraints on the partitioning behavior of uranium (VI) in dolomite. *Geochimica et Cosmochimica Acta*, 420, 228-245. <https://doi.org/10.1016/j.gca.2026.04.002>

McCormick, C.A., Rutter, E.H., Corlett, H., Steele-MacInnis, M., Block Vagle, E., Whitaker, F., Hollis, C. (2025). Zebra textures in fault-controlled, hydrothermal dolomite bodies: coupled mechanisms of replacement, deformation, and cementation. *Earth and Planetary Science Letters*, 658, 119274. <https://doi.org/10.1016/j.epsl.2025.119274>

Awarded the Ramsey Medal for the most outstanding publication in structural geology & tectonics.

- Jiang, H., Liang, J., Azmy, K., **McCormick, C.A.**, Fan, T., Li, X., Huo, F., Wen, H. (2025). Rock-buffered versus fluid-buffered geochemistry of structurally controlled, hydrothermal dolomite: Insights from the Sichuan Basin, China. *Sedimentology*. <https://doi.org/10.1111/sed.70031>
- McCormick, C.A.**, Corlett, H., Roberts, N.M.W., Johnston, P.A., Collom, C.J., Stacey, J., Koeshidayatullah, A., Hollis, C. (2024). U-Pb geochronology reveals that hydrothermal dolomitization was coeval to the deposition of the Burgess Shale lagerstätte. *Communications Earth & Environment*, 5, 318. <https://doi.org/10.1038/s43247-024-01429-0>
- Shen, R., Shen, A., Yu, K., **McCormick, C.A.**, Jiang, W., Xiao, Y., Wu, L., Wang, R. (2023). Properties of dolomitizing fluids indicated by rare earth elements: A case study of the Upper Miocene to Pliocene dolostone on the Xisha Islands, South China Sea. *Sedimentary Geology*, 455, 106475. <https://doi.org/10.1016/j.sedgeo.2023.106475>
- McCormick, C.A.**, Corlett, H., Clog, M., Boyce, A.J., Tartèse, R., Steele-MacInnis, M., Hollis, C. (2023). Basin scale evolution of zebra textures in fault-controlled, hydrothermal dolomite bodies: Insights from the Western Canadian Sedimentary Basin. *Basin Research*, 35, 2010-2039. <https://doi.org/10.1111/bre.12789>
- Awarded the Harold Reading Medal for the most outstanding publication by a graduate student.*
- McCormick, C.A.**, Rutter, E.H. (2022). An experimental study of the transition from tensile failure to shear failure in Carrara marble and Solnhofen limestone: Does “hybrid failure” exist? *Tectonophysics*, 844, 229623. <https://doi.org/10.1016/j.tecto.2022.229623>
- McCormick, C.A.**, Corlett, H., Stacey, J., Hollis, C., Feng, J., Rivard, B., Omma, J.E. (2021). Shortwave infrared hyperspectral imaging as a novel method to elucidate multi-phase dolomitization, recrystallization, and cementation in carbonate sedimentary rocks. *Scientific Reports*, 11, 1-16. <https://doi.org/10.1038/s41598-021-01118-4>
- McCormick, C.A.**, Jones, B. (2021). On the efficacy and limitations of isolated carbonate platforms as “oceanic dipsticks” to reconstruct subsidence histories, a case study from the Paleogene to Neogene strata on Grand Cayman and Cayman Brac, BWI. *Marine Geology*, 436, 106470. <https://doi.org/10.1016/j.margeo.2021.106470>
- McCormick, C.A.**, Jones, B., Olsen, E., Ingalls, M. (*In Press; Geochemistry, Geophysics, Geosystems*). Carbonate clumped isotopes (Δ_{47}) in Cenozoic ‘island dolostones’: Dolomitization driven by modified seawater at Earth surface conditions.
- McCormick, C.A.**, Jones, B., Hardisty, D., Lau, K.V. (*In Prep; Geology*). Decoupled behaviour of cerium anomalies and uranium isotopes during dolomitization.
- Foster, K., **McCormick, C.A.**, Strauss, J.V., Lau, K.V. (*In Prep*). A Tale of Two Fluids: Burial Diagenetic Overprinting of the Shuram Carbon Isotope Excursion (Windermere Supergroup, Mackenzie Mountains, Canada). *Undergraduate Thesis, The Pennsylvania State University*.
- Dietrich, W.L., **McCormick, C.A.**, Lau, K.V., Pederson, C., Bondzie-Selby, I., Hardisty, D. (*In Prep*). Experimental constraints on dolomite as an archive of seawater sulfate.
- Bondzie-Selby, I., **McCormick, C.A.**, Swart, P.K., Lau, K.V., Hardisty, D., Dietrich, W.L., Pederson, C. (*In Prep*). An experimental calibration between dual carbonate clumped isotopes (Δ_{47} and Δ_{48}) in dolomite and temperature.
- Roberts, N.M.W., Emmings, J., Drake, H., Walker, R.J., Beaudoin, N., **McCormick, C.A.** (*In Prep*). Natural variability of metal uptake in vein calcite: A focus on uranium and implications for redox and geochronology.

INVITED TALKS & SEMINARS

- McCormick, C.A.** (04/2026; *Invited Seminar*). From the seafloor to shallow-burial: Carbonate minerals as geochemical proxies for marine and diagenetic fluids. Oral Presentation at: King Abdullah University of Science and Technology (KAUST).

McCormick, C.A. (03/2025; *Invited Seminar*). From the seafloor to shallow-burial: Carbonate minerals as geochemical proxies for marine and diagenetic fluids. Oral Presentation at: Michigan State University.

McCormick, C.A. (11/2024; *Invited Seminar*). Recent advancements in the characterization of dolomite. Oral Presentation at: The University of Southern Mississippi.

McCormick, C.A. (08/2024; *Keynote Speaker*). Coupled dissolution-precipitation mechanisms during structurally-controlled, hydrothermal dolomitization. Oral Presentation at: SEPM Carbonate Research Group Meeting, Houston, USA.

McCormick, C.A. (06/2024; *Invited Seminar*). Recent advancements in the characterization of dolomite. SEDSONLINE Webinar, International Association of Sedimentologists.

MENTORSHIP & TRAINING

Isaac Bondzie-Selby – Ph.D. student, The University of Southern Mississippi

- Constraints on the behaviour of carbonate clumped isotopes (i.e., Δ_{47} and Δ_{48}) during high-temperature, replacement dolomitization experiments.
- Direct training, mentorship, and method development for the high-temperature, replacement dolomitization experiments and X-ray diffraction (XRD). Member of Ph.D. thesis committee.
- Co-supervised with Dr. Chelsea Pedersen (project initiated 09/2023).

Watts Dietrich – Ph.D. student, Michigan State University

- A high-resolution study of paleoredox conditions ($\delta^{34}\text{S}$, $\delta^{238}\text{U}$, I/Ca) and dolomitization of the Permian reef complex (Guadalupe Mountains, west Texas).
- Constraints on the partitioning behaviour of sulfate and the fractionation of sulfur isotopes during high-temperature, replacement dolomitization experiments.
- Co-supervised with Dr. Dalton Hardisty (project initiated 09/2023).

Kayla Foster – 4th year undergraduate student, The Pennsylvania State University

- Direct supervision and mentorship for senior undergraduate thesis.
- Sample preparation, thin-sectioning, and micro-drilling powders for geochemical analyses.
- Provide training conducting and interpreting the results from powder X-ray diffraction.
- Carbonate sample digestion, dilutions, and preparation for ICP-AES and ICP-MS analyses.

Sam Hallett – 2nd year undergraduate student, Bates College

- Provide training to conduct high-temperature, replacement dolomitization experiments.
- Prepared samples for powder X-ray diffraction and quantified results by Rietveld refinement.
- Application of the Avrami (JMAK) equation to evaluate dolomitization reaction rates.

TEACHING EXPERIENCE

Fall 2023/2024: Co-lecturer – Isotopes in Oceans and Climate (with M. Ingalls and K.V. Lau)

- Isotopes of the major molecules in Earth's oceans and atmospheres, including the evaluation atmospheric chemistry, ocean chemistry, climate states in Earth's past, and the carbon cycle.

Winter 2021/22: Teaching Assistant – Carbonate Sedimentology

- Identification of allochems in hand-sample and thin-section. Describing and naming carbonate sedimentary rocks. Facies models and interpreting depositional environments.

Fall 2020/21: Teaching Assistant – Sedimentary Rocks and Fossils

- Fundamentals of paleontology. Description and classification of sedimentary rocks.

Fall 2018: Teaching Assistant – Engineering Earth Science

- Mineral and rock identification. Interpretation of geological maps and aerial photography. Fundamentals of structural geology for engineering students.

Winter 2018/19: Teaching Assistant – Regional and Petroleum Hydrogeology

- Regional groundwater flow, hydrochemistry, and the hydrodynamics of petroleum reservoirs.

Fall 2017: Teaching Assistant – Sedimentary Systems

- Petrography of sedimentary rocks and the interpretation of depositional environments.

CONTRIBUTIONS TO THE SCIENTIFIC COMMUNITY

2026 – Member of the scientific committee for the American Geophysical Union Annual Meeting.

2025 – Member of the scientific committee for the Mountjoy IV Carbonate Research Conference.

2023 – Member of the scientific committee for the 36th IAS Meeting of Sedimentology.

2022 to present – Active peer reviewer for *Earth and Planetary Science Letters*, *Geochimica et Cosmochimica Acta*, *Chemical Geology*, *Geology*, *Sedimentology*, *Sedimentary Geology*, *Journal of Sedimentary Research*, *American Association of Petroleum Geologists Bulletin*, *Marine Geoscience and Energy Resources*, and *Communications Earth & Environment*.

SELECTED CONFERENCE PRESENTATIONS & FIELD TRIPS

Dietrich, W.L., **McCormick, C.A.**, Present, T., Andrews, E.M., Lau, K.V., Hardisty, D. (2026). Characterizing Permian Ocean Oxygenation Through a Fossil Reef. Poster Presentation at: Goldschmidt Conference, Montreal, Canada.

Bondzie-Selby, I., Swart, P.K., **McCormick, C.A.**, Lu, C., Lau, K.V., Hardisty, D., Dietrich, W.L., Pederson, C.L. Time-Resolved Dual Carbonate Clumped Isotope (Δ_{47} and Δ_{48}) and Non-Linear Mixing Investigation of Dolomite. Poster Presentation at: Goldschmidt Conference, Montreal, Canada.

McCormick, C.A., Hardisty, D., Andrews, E.M., Lau, K.V. (2026). Evaluating the effects of dolomitization on the uranium isotope paleoredox proxy. Oral Presentation at: Goldschmidt Conference, Montreal, Canada.

Foster, K., Lau, K.V., Strauss, J.V., Harding, R.L., **McCormick, C.A.** A Tale of Two Fluids: Burial Diagenetic Overprinting of the Shuram Carbon Isotope Excursion (Windermere Supergroup, Mackenzie Mountains, northwest Canada). Poster Presentation at: Mid-Atlantic Geobiology Symposium.

McCormick, C.A., Hardisty, D., Pederson, C., Dietrich, W., Bondzie-Selby, I., Hashim, M., Lau, K. (2025). The role of recrystallization in shaping the geochemical signature of dolomite: an experimental study. Oral Presentation at: Goldschmidt Conference, Prague, Czech Republic.

Roberts, N.M.W., Drake, H., Emmings, J., Walker, R., **McCormick, C.A.** (2025). U incorporation in calcite: Empirical observations and speculations from a laser ablation perspective. Decade-long lessons from laser ablation geochronology of carbonates. Oral Presentation at: Goldschmidt Conference, Prague, Czech Republic.

McCormick, C.A. (2025). Experimental constraints on U incorporation: The ‘goldilocks model’ for the partitioning of trace elements in carbonate minerals. Decade-long lessons from laser ablation geochronology of carbonates. Oral Presentation at: Goldschmidt Conference, Prague, Czech Republic.

Bondzie-Selby, I., **McCormick, C.A.**, Swart, P.K., Lau, K.V., Hardisty, D., Dietrich, W.L., Pederson, C. (2025). Dual clumped isotope (Δ_{47} and Δ_{48}) calibration between dolomite and temperature. Poster Presentation at: 38th IAS Meeting of Sedimentology, Huelva, Spain.

McCormick, C.A., Rutter, E.H., Corlett, H., Steele-MacInnis, M., Block Vagle, E., Whitaker, F., Hollis, C. (2024). Zebra textures in fault-controlled, hydrothermal dolomite bodies: coupled mechanisms of replacement, deformation, and cementation. Poster Presentation at: AGU24, Washington, USA.

- Dietrich, W.L., McCormick, C.A., Hashim, M.S., Lau, K.V., Pederson, C., Bondzie-Selby, I., Hardisty, D.S. (2024). Constraints on dolomite as an archive of seawater sulfate from dolomitization experiments. Poster Presentation at: Goldschmidt Conference, Chicago, USA.
- McCormick, C.A.,** Hashim, M.S., Pederson, C., Hardisty, D.S., Lau, K.V. (2024). Partitioning of uranium in high-temperature, replacement dolomitization experiments: implications for isotopic studies of carbonate sedimentary rocks. Poster Presentation at: SEPM International Sedimentary Geosciences Congress, Flagstaff, USA.
- Hollis, C., Corlett, H., **McCormick, C.A.,** Stacey, J., Whitaker, F. (2024) Predicting reservoir properties: Why carbonate diagenesis is the key to understanding pore systems and fluid flow. Oral Presentation at: GeoConvention 2024, Calgary, Canada.
- McCormick, C.A.,** Corlett, H., Roberts, N.M.W., Johnston, P.A., Collom, C.J., Stacey, J., Koeshidayatullah, A., Hollis, C. (2023). U-Pb geochronology of Mg-rich brine seeps in the Burgess Shale lagerstätte: Geochemical evidence that invertebrate communities were supported by hydrothermal brine seeps during the Cambrian Explosion. Poster Presentation at: GSA Connects, Pittsburgh, USA.
- Hollis, C., Corlett, H., Whitaker, F., Koeshidayatullah, A., Stacey, J., **McCormick, C.A.** (2023). Hydrothermal dolomitization: New techniques shed light on an old paradigm. Oral Presentation at: GSA Connects, Pittsburgh, USA.
- McCormick, C.A.,** Corlett, H., Roberts, N.M.W., Johnston, P.A., Collom, C.J., Stacey, J., Koeshidayatullah, A., Hollis, C. (2023). Mg-rich brine seeps in the Burgess Shale lagerstätte constrained by dolomite U-Pb geochronology. Poster Presentation at: 36th IAS Meeting of Sedimentology, Dubrovnik, Croatia.
- McCormick, C.A.,** Corlett, H., Hollis, C., Rutter, E.H. (2022). Strain-localization during fault-controlled dolomitization; insights from integrated petrographical, geochemical, and geomechanical analyses. Oral Presentation at: Mountjoy Carbonate Research Conference III. Banff, Canada.
- McCormick, C.A.,** Corlett, H., Koeshidayatullah, A., Stacey, J., Hollis, C. (2022). Fault- controlled dolomitization of the Middle Cambrian strata in the southern Rocky Mountains, western Canada. Field Trip at: Mountjoy Carbonate Research Conference III. Banff, Canada.
- McCormick, C.A.,** Rutter, E.H. (2022). An experimental study of the transition from tensile failure to shear failure in Solnhofen Limestone: Does “hybrid failure” exist? Oral Presentation at: Tectonic Studies Group Annual General Meeting, Geological Society of London. Online.
Awarded the BP Prize for best overall presentation.
- McCormick, C.A.,** Corlett, H., Stacey, J., Hollis, C., Feng, J., Rivard, B. (2021). Hyperspectral imaging as a novel technique to elucidate multi-phase dolomitization, recrystallization, and cementation in carbonate sedimentary rocks. Oral Presentation at: AAPG & SEG International Meeting for Applied Geoscience and Energy. Online.
- McCormick, C.A.,** Jones, B. (2019). Stratigraphic controls on diagenesis in the Paleogene – Neogene strata on Grand Cayman, B.W.I. Oral Presentation at: 34th IAS Meeting of Sedimentology, Rome, Italy.
- McCormick, C.A.,** Jones, B. (2017). Unconformity derived controls on the development of porosity and permeability in the Cayman Formation (Miocene), Grand Cayman, B.W.I. Poster Presentation at: Mountjoy Carbonate Research Conference II. Austin, USA.

PROFESSIONAL EXPERIENCE

- 2018 – Petronas Canada Ltd. (4-month student geologist)
- 2017 – Suncor Energy (4-month student geologist)
- 2016 – CNOOC International (12-month student geologist)

REFERENCES

Dr. Kimberly Lau

Assistant Professor, The Pennsylvania State University, United States of America

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Dr. Cathy Hollis

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Dr. Hilary Corlett

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