

Adam Joshua Cawood

Assistant Professor, Syracuse University

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RESEARCH INTERESTS

My research integrates structural geology, geomechanics, and remote sensing to understand how deformation governs fluid flow, mineralization, and geohazards in the Earth's upper crust. I combine field observations, digital outcrop analysis, numerical simulations, and laboratory analog modeling to quantify fault and fracture processes across scales, with applications to critical minerals, geothermal systems, CO₂ sequestration, landslide hazard, and induced seismicity. Current work emphasizes structural architecture and mechanical layering as controls on permeability and resource distribution, and the use of digital and analog models to advance geoscience education and sustainability in the energy transition, including development of the open-access repository [eRock](#).

EDUCATION

2019: PhD Structural Geology, University of Aberdeen & NERC CDT in Oil & Gas.

Dissertation: Quantifying strain partitioning in multi-layers using virtual outcrop analysis. Advisor: Clare Bond

2015: BSc Hons (1st class) Geology & Petroleum Geology, University of Aberdeen.

PROFESSIONAL EXPERIENCE

2026-present: Assistant Professor, Syracuse University, Syracuse, New York

2020-2026: Senior Research Scientist, Southwest Research Institute, San Antonio, Texas

2015-2019: Demonstrator and Student Mentor, University of Aberdeen, UK

2018: Summer Intern, Equinor ASA, Stavanger, Norway

2015: LiDAR Field Technician, Universities of Aberdeen and Bergen

PEER-REVIEWED JOURNAL ARTICLES

Google Scholar metrics (August 2026): Citations = 752 | H-index = 12

27. **Cawood, A.J.**, Ferrill, D.A., Rangel-Landeros, I., Butler, K., Sickmann, Z., Blake, M., Ibarra, D., Swanson, B., Munk, L., Boutt, D., Stockli, L., Stockli, D., and Gagnon, C., 2026. Structural controls on lithium-bearing fluid flow in Clayton Valley, Nevada, *Solid Earth*, 17, 991–1010.
27. Smart, K.J., Ferrill, D.A. and **Cawood, A.J.**, 2026. Geomechanical Modeling and Slip and Dilation Tendency Analysis Track Stress Evolution During Geothermal Energy Extraction. *Journal of Structural Geology*, 105765.
26. Smart, K.J., **Cawood, A.J.**, and Ferrill, D.A., 2026. Mechanical stratigraphy, bedding-plane slip, and casing deformation. *Frontiers in Earth Science*, 14, 1810939.
25. Ferrill, D.A., Smart, K.J., Lehrmann, D.J., Bryce, B.R. and **Cawood, A.J.**, 2026. Mineralogic sensitivity of opening-mode fracturing in limestone and shale. *Geological Magazine*, 163, e33.
24. Ferrill, D.A., **Cawood, A.J.**, Smart, K.J., Lehrmann, D.J., Bryce, B.R., Evans, M.A., Stockli, L.D. and Stockli, D.F., 2026. Fault and fracture response to Neogene extension in the western Delaware Basin, Texas. *Journal of Structural Geology*, 105675.
23. **Cawood, A.J.**, Ferrill, D.A., Smart, K.J. and Hartnett, M.J., 2026. Mineralogic controls on fault displacement-height relationships. *Solid Earth* 17(2), 225-247.
22. Ferrill, D.A., Johnson, S.B., McGinnis, R.N., Bertetti, F.P., Walter, G.R., Smart, K.J. and **Cawood, A.J.**, 2025. Fault Zone Control on Rapid Groundwater Flow in Cretaceous Carbonates of the Hidden Valley Fault Zone, Texas. *Lithosphere* 2024 (28)
21. Ferrill, D.A., **Cawood, A.J.**, Smart, K.J., Lehrmann, D. J., Evans, M. A., Stockli, L. D., Stockli, D. F. Fault zone deformation and fracture intensity in chalk-dominated carbonates. *Journal of Structural Geology*, 199, 105469.

20. Ferrill, D.A., Smart, K.J., **Cawood, A.J.**, Lehrmann, D.J., Zandoni, G. and King, R.R., 2025. Fracturing in basinal siliciclastic deposits of the Wolfcampian Alta Formation, Marfa Basin, west Texas. *Marine and Petroleum Geology*, 177, 107391.
19. **Cawood, A.J.**, Ferrill, D.A. and Smart, K.J., 2024. Failure Modes and Fault Morphology. *Lithosphere*, Special 15, lithosphere_2024_162.
18. Smart, K.J., Smye, K.M., **Cawood, A.J.**, Ferrill, Hennings, P.H. and Horne, E.A., 2024. Geomechanical Modeling of Reservoir Dynamics Associated with Shallow Injection and Production in the Delaware Basin. *Interpretation* 13(1), T33-T47.
17. **Cawood, A.J.**, Wyrick, D.Y., 2024. Effects of analog modeling materials on topographic photogrammetry (SfM) reconstructions. *Earth and Space Science*, 11, e2024EA003607.
16. Ferrill, D.A., **Cawood, A.J.**, Evans, M.A., Smart, K.J., King, R.R. and Zandoni, G., 2024. Thrust v. stylolite. *Journal of Structural Geology*, 182, p.105113.
15. **Cawood, A.J.**, Watkins, H., Bond, C.E., Warren, M.J. and Cooper, M.A., 2023. Natural fracture patterns at Swift Reservoir anticline, NW Montana: the influence of structural position and lithology from multiple observation scales. *EGU Solid Earth*, 14(9), 1005-1030.
14. Ferrill, D.A., Smart, K.J., Evans, M.A., **Cawood, A.J.**, Bellow, H.B., Morris, A.P., Lehrmann, D.J. and McGinnis, R.N., 2022. Laramide contractional folding in the Devils River Uplift, west Texas, U.S.A. *Journal of Structural Geology*, 163, 104707.
13. Bowness, N.P., **Cawood, A.J.**, Ferrill, D.A., Smart, K.J. and Bellow, H.B., 2022. Mineralogy controls fracture containment in mechanically layered carbonates. *Geological Magazine*, 1855-1873.
12. **Cawood, A.J.**, Ferrill, D.A., Norris, D., Bowness, N.P., Glass, E.J., Smart, K.J., Morris, A.P. and Gillis, E., 2022. Crustal structure and tectonic evolution of the Newfoundland Ridge, Fogo Basin, and southern Newfoundland transform margin. *Marine and Petroleum Geology*, 143, 105764.
11. Ferrill, D.A., Smart, K.J., Evans, M.A., Cawood, A.J., Morris, A.P., Lehrmann, D.J. and McGinnis, R.N., 2022. Contractional fold amplification through bed-parallel gypsum vein ("beef") formation. *Journal of Structural Geology*, 156, 104532.
10. **Cawood, A.J.**, Corradetti, A., Granado, P., Tavani, S., 2022. Detailed structural analysis of digital outcrops: A learning example from the Kermanshah-Qulqula radiolarite basin, Zagros Belt, Iran. *Journal of Structural Geology*, 154, 104489.
9. **Cawood, A.J.**, Ferrill, D.A., Morris, A.P., Norris, D., McCallum, D., Gillis, E., Smart, K.J., 2021b. Tectonostratigraphic evolution of the Orphan Basin and Flemish Pass region–Part 2: Regional structural development and lateral variations in rifting style. *Marine and Petroleum Geology*, 128, 105219.
8. Ferrill, D.A., Smart, K.J., **Cawood, A.J.**, Morris, A.P., 2021. The fold-thrust belt stress cycle: Superposition of normal, strike-slip, and thrust faulting deformation regimes. *Journal of Structural Geology*, 148, 104362.
7. **Cawood, A.J.**, Ferrill, D.A., Morris, A.P., Norris, D., McCallum, D., Gillis, E., Smart, K.J., 2021a. Tectonostratigraphic evolution of the Orphan Basin and Flemish Pass region–Part 1: Results from coupled kinematic restoration and crustal area balancing. *Marine and Petroleum Geology*, 128, 105042.
6. Bond, C.E., **Cawood, A.J.**, 2020. A role for Virtual Outcrop Models in Blended Learning: improved 3D thinking, positive perceptions of learning and the potential for greater equality, diversity and inclusivity in geoscience. *Geoscience Communication Discussions*, 4(2), 233-244.
5. Watkins, H., Bond, C.E., **Cawood, A.J.**, Cooper, M.A., Warren, M.J., 2020. Fracture distribution on the Swift Reservoir Anticline, Montana: Implications for structural and lithological controls on fracture intensity. *Geological Society of London Special Publications*, 487, 209-228.

4. **Cawood, A.J.**, Bond, C.E., 2020. Broadhaven revisited: a new look at models of fault-propagation folding. Geological Society of London Special Publications, 487, 105-126.
3. **Cawood, A.J.**, Bond, C.E., 2019. eRock: An open-access repository of virtual outcrops for geoscience education. GSA Today, 29(2), 36-37.
2. **Cawood, A.J.**, Bond, C.E., 2018. 3D mechanical stratigraphy of a deformed multi-layer: Linking sedimentary architecture and strain partitioning. Journal of Structural Geology, 106, 54-69. **Journal of Structural Geology Student Author of the Year Award 2018.**
1. **Cawood, A.J.**, Bond, C.E., Howell, J.A., Butler, R.W. and Totake, Y., 2017. LiDAR, UAV or compass-clinometer? Accuracy, coverage and the effects on structural models. Journal of Structural Geology, 98, 67-82.

SELECTED CONFERENCE ABSTRACTS AND PRESENTATIONS (LEAD AUTHOR)

- Cawood, A.J.**, Stamatakis, J.A., Wyrick, D.Y., Ferrill, D.A., Ulmer, K., and Woodworth, D., 2025, Quantifying off-fault deformation in analog models of strike-slip systems: Geological Society of America Abstracts with Programs, 57(6), 272-10.
- Cawood, A.J.**, Ferrill, D.A., Rangel-Landeros, I., Butler, K., Sickmann, Z., Blake, M., Ibarra, D., Swanson, B., Munk, L., Boutt, D., Stockli, L., Stockli, D., and Gagnon, C., 2025, Geochemical constraints on lithium transport in fault and fracture systems: Geological Society of America Abstracts with Programs, 57(6), 272-9.
- Cawood, A.J.**, Ferrill, D.A., and Smart, K.J., 2025, Fault displacement gradients in mechanically layered rock: American Association of Petroleum Geologists Distinguished Lecture Program (invited).
- Cawood, A.J.**, Ferrill, D.A., and Smart, K.J., 2024, Fault displacement gradients in mechanically layered rock: International Meeting for Applied Geoscience & Energy (IMAGE). Best Oral Paper Award – Geological Technologies.
- Cawood, A.J.**, Ferrill, D.A., and Smart, K.J., 2024, Mineralogy controls normal fault displacement and height in mechanically layered rocks at Hoover Point, central Texas: GeoGulf 2024, Gulf Coast Association of Geological Societies (GCAGS) Convention, San Antonio, Texas.
- Cawood, A.J.**, and Wyrick, D.Y., 2023, Optimized photogrammetric analysis of geologic deformation: a laboratory-based approach: AGU Fall Meeting.
- Cawood, A.J.**, Ferrill, D.A., and Smart, K.J., 2023, Fault morphology, failure modes, and slip- vs. dilation-tendency: International Meeting for Applied Geoscience & Energy (IMAGE).
- Cawood, A.J.**, Bowness, N.P., Bond, C.E., Ferrill, D.A., Smart, K.J., and Burnham, B., 2023, Geologic interrogation of 3D outcrop reconstructions: sources of uncertainty and mitigation strategies: AGU Fall Meeting.
- Cawood, A.J.**, Ferrill, D.A., Morris, A.P., Norris, D., McCallum, D., Gillis, E., and Smart, K.J., 2022, Newfoundland Ridge and southern Newfoundland transform margin: thinned continental crust within a wide zone of distributed displacement: AGU Fall Meeting.
- Cawood, A.J.**, Ferrill, D.A., Norris, D., Bowness, N.P., Glass, E.J., Smart, K.J., Morris, A.P., and Gillis, E., 2022, Crustal structure and tectonic evolution of the Newfoundland Ridge, Fogo Basin, and southern Newfoundland transform margin: International Meeting for Applied Geoscience & Energy (IMAGE).
- Cawood, A.J.**, Bowness, N.P., Ferrill, D.A., Smart, K.J., and Bellow, H.B., 2022, Mineralogy controls fracture containment in mechanically layered carbonates: a case study from Canyon Lake Gorge, Texas: AAPG Structure & Geomechanics Division Webinar (invited).

- Cawood, A.J.**, Ferrill, D.A., Norris, D., Glass, E., Bowness, N.P., Smart, K.J., Morris, A.P., and Gillis, E., 2022, Crustal structure and tectonic evolution of the Newfoundland Ridge, Fogo Basin, and southern Newfoundland transform margin: SEG/AAPG Annual Convention & Exhibition (IMAGE), Houston, Texas.
- Cawood, A.J.**, Ferrill, D.A., Morris, A.P., Norris, D., McCallum, D., Gillis, E., and Smart, K.J., 2021, Tectonostratigraphic development of the Orphan Basin and Flemish Pass: results from regional structural interpretation and restoration: First EAGE Workshop on East Canada Offshore Exploration.
- Cawood, A.J.**, Ferrill, D.A., Morris, A.P., Norris, D., McCallum, D., Gillis, E., and Smart, K.J., 2021, Tectonostratigraphic evolution of the Orphan Basin, offshore Newfoundland: results from coupled structural restoration and crustal area balancing: AAPG Annual Convention & Exhibition, Denver, Colorado, Abstract #2021-A-6422-AAPG.
- Cawood, A.J.**, Ferrill, D.A., Morris, A.P., Norris, D., McCallum, D., Gillis, E., and Smart, K.J., 2021, Rift evolution and structural style in the Orphan Basin: results from regional structural restorations and crustal area balancing: EGU General Assembly.
- Cawood, A.J.**, and Bond, C.E., 2019, Structural style through the stratigraphy of Variscan Pembrokeshire: a virtual field trip: Geological Society of London, Janet Watson Meeting.
- Cawood, A.J.**, Bond, C.E., Watkins, H., Cooper, M., and Warren, M., 2018, Fracture attributes from two frontal anticlines, NW Montana: contrasting patterns and inferred structural development: Tectonic Studies Group (TSG) Annual Meeting.
- Cawood, A.J.**, and Bond, C.E., 2018, eRock: an online, open-access repository of virtual outcrops and geological samples in 3D: Tectonic Studies Group (TSG) Annual Meeting. BP Prize for Best Student Contribution.
- Cawood, A.J.**, and Bond, C.E., 2018, eRock: an online, open-access repository of virtual outcrops and geological samples in 3D: EGU General Assembly Conference Abstracts, Abstract 18248.
- Cawood, A.J.**, and Bond, C.E., 2017, Deformation of a stacked fluvio-deltaic succession – linking strain partitioning and fracture damage: Deformation, Rheology & Tectonics (DRT) Meeting.
- Cawood, A.J.**, Bond, C.E., Howell, J., and Totake, Y., 2016, UAV, LiDAR, and ground-based surveying from Stackpole Quay: best practice for accuracy of virtual outcrops and structural models: AGU Fall Meeting.

RESEARCH GRANTS

Total Amount Awarded to Date as Lead PI: ~\$3.98 million

Active

10/2026 - 09/2029: Collaborative Research: Innovative Resources: eRock – An Open Platform and Community Pipeline for Digital Outcrops, NSF EAR \$599,966 (**Adam J. Cawood, Syracuse University [PI]** \$299,387, Joey Mukherjee and Gopika Ajaykumar [co-PIs]; Amanda N. Hughes University of Arizona [co-PI] \$124,711; Alan G. Whittington UT San Antonio [co-PI] \$175,868, Vanessa A. Sansone and John M. Cannon [co-PIs])

09/2026 - 08/2029: Collaborative Research: GEO-CM: Tectonic Controls on Lithium Delivery and Enrichment in the Basin and Range” 2026–2029, NSF EAR \$992,573 (**Adam J. Cawood, Syracuse University [PI]** \$224,306; Kristina L. Butler, Zachary T. Sickmann, UW-Madison [co-PI] \$274,969; Tim K. Lowenstein, SUNY Binghamton [co-PI] \$219,988; Daniel E. Ibarra, Brown University [co-PI] \$225,013; David F. Boutt, UMass Amherst [co-PI] \$48,297)

07/2025 - 07/2026: Southwest Research Institute Research and Development Program (**Lead PI**, \$383,477). Quantifying Off-Fault Deformation in Analog Models of Strike-Slip Systems (Co-Is: Danielle Wyrick, Kristin Ulmer, Daniel Woodworth, David Ferrill).

05/2025 - 04/2028: NASA Earth Surface and Interior (**Lead PI**, \$546,882) Quantifying Landslide Triggering Thresholds with Time-Series Remote Sensing Data and Physics-Based Modeling (Co-PIs: Kevin Smart, Jinwoo Kim).

Completed

05/2025 - 09/2025: Southwest Research Institute Research and Development Program (**Co-PI**, \$74,581). Modeling the Rapid Response of the Lithosphere on Icy Moons (PI: Danielle Wyrick).

10/2024 - 10/2025: Southwest Research Institute Research and Development Program (**Co-PI**, \$354,824). Geologic Controls on Wellbore Casing Deformation (PI: Kevin Smart).

07/2024 - 09/2025: University of Texas at Dallas & Southwest Research Institute Seed Projects for Research, Innovation, and Technology (**Co-Lead-PI**, \$200,000) Toward domestic lithium independence: Tectonic controls on critical emerging lithium deposits (Co-Lead-PI: Kristina Butler; Co-Is: Zach Sickmann, David Ferrill, Kevin Smart).

03/2025 - 07/2025: Southwest Research Institute Research and Development Program (**Lead PI**, \$75,000). Geochemical Constraints on Lithium Transport in Fault and Fracture Systems (Co-I: David Ferrill).

03/2024 - 07/2024: Southwest Research Institute Research and Development Program (**Lead PI**, \$75,000) Improved Digital Outcrop Visualization and Data Accessibility (Co-I: Joey Mukherjee).

05/2023 - 09/2023: Southwest Research Institute Research and Development Program (**Lead PI**, \$75,000) Integrating SwRI Expertise in Physical Analog Modeling and Digital Photogrammetry for Improved Geologic Analysis (Co-I: Danielle Wyrick).

04/2022 - 10/2023: Southwest Research Institute Research and Development Program (**Lead PI**, \$299,888) Predicting Fault Height and Displacement in Mechanically Layered Rocks (Co-Is: David Ferrill, Kevin Smart).

10/2020 - 04/2022: Southwest Research Institute Research and Development Program (**Lead PI**, \$298,980) Prediction of Natural Fracture Abundance with 3D Drone Imagery, Semi-Automatic Feature Detection, and Statistical Analysis (Co-Is: David Ferrill, Kevin Smart).

TEACHING AND MENTORING

Graduate Student Mentorship

- Isaac Rangel – Ph.D. Candidate, University of Texas at Dallas (2024–present; advisor: Z. Sickmann)
- Mitchell Casazza – M.Sc. Candidate, University of Texas at Austin (2024–present; advisor: D. Stockli)
- Elizabeth Beauchamp – M.Sc. Candidate, University of Texas at San Antonio (2024–present; advisor: J. Cannon)

Undergraduate and Pre-University Mentorship

Jamie Kaplan – *Southwest Research Institute Young Engineers & Scientists Program* (2024–2025)

Field and Professional Instruction

Lead or co-lead for approximately 4-6 field and classroom courses per year for professional geoscientists and engineers in the oil and gas, geothermal, and CO₂-sequestration sectors (over 30 courses since 2020). Courses emphasize the integration of field-based structural analysis, mechanical stratigraphy, and geomechanical interpretation. Representative courses and trips include: *Mechanical Stratigraphy and Natural Deformation in the Marfa Basin, Texas*, *Extensional Tectonics and Normal Faulting* (Nevada and California), *Mechanical Stratigraphy, Stress, and Geomechanics* (West Texas).

Digital Geoscience Education and Outreach

Founder and lead developer of *eRock*, an open-access digital repository of virtual outcrops and 3D geologic data for research and teaching. *eRock* expands access to field-based learning by enabling quantitative analysis of real geologic structures and promoting inclusivity in geoscience education through virtual field experiences adopted by universities worldwide.

Teaching Philosophy

My teaching emphasizes active, data-driven, and inclusive learning experiences that develop students' ability to think quantitatively and spatially about the Earth. I view structural geology as a gateway to understanding how deformation governs both geologic hazards and resource systems, and I teach students to connect field observations with mechanical and computational models. Whether in the field, classroom, or digital environment, I encourage inquiry-based learning: students collect, analyze, and interpret their own data, fostering both technical competence and scientific confidence. I am committed to broadening participation in geoscience through the integration of digital tools such as photogrammetry, virtual field experiences, and open-access repositories like *eRock*, which make authentic field data accessible to all learners.

PROFESSIONAL SERVICE AND LEADERSHIP

Peer Review and Panel Participation

- Reviewer and panelist for NASA Earth Surface and Interior and NSF Geoinformatics programs (n = 5 since 2022).
- Manuscript referee for *Journal of Structural Geology*, *Solid Earth*, *JGR: Planets*, *Marine and Petroleum Geology*, *Petroleum Geoscience*, *Sedimentology*, and *Computers & Geosciences* (n = 36 since 2018).

Professional Societies and Leadership Roles

- President (2025–2027), Vice President (2023–2025), and Steering Committee Member (2020–present), AAPG Petroleum Structure & Geomechanics Division.
- Member of the European Geosciences Union, Geological Society of London, American Geophysical Union, Geological Remote Sensing Group, and South Texas Geological Society.

Conference Organization and Committees

- Lead convener, Faults, Fractures, and Geomechanics for the Energy Transition (GSA Annual Meeting, 2025).
- Lead convener, Advancing Geologic Analysis with Digital Outcrops and Close-Range Remote Sensing Data (GSA Annual Meeting, 2025).
- Lead convener (2023) and co-convener (2022), Structural Geology, Geomechanics, and Tectonics sessions, International Meeting for Applied Geoscience & Energy (IMAGE).
- Executive Committee member, International Geomechanics Symposium (2025).

INDUSTRY ENGAGEMENT AND OUTREACH

- Extensive collaboration with industry partners through field training, applied research, and consulting in structural geology, geomechanics, and resource systems.
- Active collaborations include Albemarle Corporation on lithium-system tectonic and geochemical characterization, and Ormat on geothermal resource development.
- Additional clients and partners include Apache, Chevron, ConocoPhillips, Diamondback, EOG, Hess, Marathon, Oxy, Pioneer, Repsol, Shell, and SM Energy.
- Field-trip co-leader and technical liaison, Permian Basin Consortium (2020–present).
- Co-led field meetings and sponsor workshops with the Fold-Thrust Research Group (2018–2019).

HONORS AND AWARDS

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| 2025 | American Association of Petroleum Geologists Distinguished Lecturer |
| 2024 | Best Oral Paper Award – International Meeting for Applied Geoscience & Energy |
| 2018 | BP Prize – Best Student Contribution, Tectonic Studies Group Annual Meeting |
| 2018 | <i>Journal of Structural Geology</i> Student Author of the Year |
| 2014 | Aberdeen Geological Association Fieldwork Prize |
| 2013 | Mineralogical Society Student Award |
| 2013 | Wood Melvin Prize for Palaeontology |

- 2013 BP Prize for Excellence in Geology
- 2012 BP Prize for Excellence in Geology