Grayson L Chadwick

chadwick@berkeley.edu
+1-805-451-4696
https://gchadwick.github.io/

Assistant Researcher, Molecular and Cell Biology Department, University of California at Berkeley

Education

California Institute of Technology — Pasadena, CA
PhD, Geobiology — 2015 – 2020
University of Southern California — Los Angeles, CA
Graduate student, Marine Biology and Biological Oceanography — 2013 – 2014
California Institute of Technology — Pasadena, CA
BS with Honors, Biology — 2007 – 2011

Research Experience

UC Berkeley Department of Molecular and Cell Biology — Berkeley, CA
Assistant Researcher, genetics/biochemistry — 2024 – present
Miller Institute Postdoctoral Fellow, genetics/biochemistry — 2020 – 2024
Caltech Division of Geological and Planetary Sciences — Pasadena, CA
Graduate research, geobiology — 2015 – 2020
Research technician, geobiology — 2010 – 2013, 2014 – 2015
USC Department of Biological Sciences — Los Angeles, CA
Graduate research, environmental microbiology — 2013 – 2014
Caltech Division of Biology and Biological Engineering — Pasadena, CA
Undergraduate research, virology — 2008 – 2011
MIT Research Science Institute — Cambridge, MA
Summer research program, statistical mechanics — 2006
UCSC Santa Cruz Institute for Particle Physics — Santa Cruz, CA
Summer internship, particle physics — 2005
COSMOS program, particle physics — 2004

Teaching and Professional Service

Lead Instructor at Mount Tamalpais College, San Quentin State Prison — 2024 – present
Introductory Algebra (5 semesters), The History of Earth and Life (1 semester), Geology (2 semesters)
Discussion Leader for Gordon Research Seminar on Microbial One-Carbon metabolism — 2024
Lead panel discussion on mentorship
Organizer/Presenter for Miller Institute's Science Outreach Initiative at El Cerrito High School — 2020 – 2022
Biology, Physics, AP Environmental Science
Mentor for NIH Bridges to Baccalaureate Program (UC Berkeley MCB department) — 2021 – 2022
Remote mentorship summer 2021, in-person 2022
Co-chair for Gordon Research Seminar on Microbial One-Carbon Metabolism — 2022
Mentor for Research Summer Institute (MIT) — 2020 – 2021
Remote mentorship summer 2020 and 2021
Teaching assistant for Caltech courses
Microbial Ecology, Evolution, Microbial Metabolic Diversity, Bioengineering
Bootcamp, The Great Ideas of Biology, Principles of Biology — 2010 – 2019
Teaching assistant for summer professional training courses
International Geobiology Course, Caltech — 2017, 2018, 2019, 2022
Microbial Diversity Course, Marine Biological Laboratory at Woods Hole — 2016
Organizer
Southern California Geobiology Symposium — 2016, 2019
Caltech Geoclub Seminar Series — 2017 – 2018

Awards

2026 Full Member Sigma Xi, The Scientific Research Honor Society
2020 – 2023 Miller Research Fellowship (UC Berkeley)
2017 – 2019 NIH Predoctoral Training Grant in Molecular and Cell Biology (Caltech)
2015 Gordon P. and Virginia G. Eaton Graduate Fellowship (Caltech)
2015 CEMI Fellowship (Caltech)
2013 Rose Hills Fellowship (USC)
2010 NCAA Men's Soccer Captain, First-Team All-Conference, Brine Award of Distinction
2009, 2010 Caltech Upperclass Merit Scholarship
2009 NCAA Men's Soccer Captain, Second-Team All-Conference, Brine Award of Distinction
2009 Amgen Scholars Program (Caltech)
2009 George W. and Bernice E. Green Memorial Prize (Caltech)
2008, 2010 Summer Undergraduate Research Fellowship (Caltech)
2008 Richard G. Brewer Prize in Physics (Caltech)

Publications

1. **Chadwick, G. L.**, Williams, M. C., Shalvarjian, K. E., & Nayak, D. D. (2025). Methanogenesis marker 16 metalloprotein is the primary coenzyme M synthase in Methanosarcina acetivorans. ***PLoS genetics***, 21(5), e1011695.
2. Shalvarjian, K. E., **Chadwick, G. L.**, Pérez, P. I., Woods, P. H., Orphan, V. J., & Nayak, D. D. (2025). Methanogenic archaea encoding Pyrrolysine maintain ambiguous amber codon usage. ***PNAS***, *122*(45), e2517473122.
3. Adler, S. A., **Chadwick, G. L.**, & Nayak, D. D. (2025). Assembly and maturation of methyl-coenzyme M reductase in methanogenic archaea. ***Current Opinion in Microbiology***, 87, 102637.
4. **Chadwick, G. L.**, Dury, G. A., & Nayak, D. D., (2024). Physiological and transcriptomic response to methyl-coenzyme M reductase limitation in Methanosarcina acetivorans. ***Appl Environ Microbiol*** 0:e02220-23.
5. **Chadwick, G. L.**, Nayak, D. D., Rother, M., & Metcalf, W. W. (2024). No evidence for methanotrophic growth of diverse marine methanogens. ***PNAS***, 121(20), e2404143121.
6. Garcia, A. A., **Chadwick, G. L.**, Liu, X. L., & Welander, P. V. (2024). Identification of two archaeal GDGT lipid–modifying proteins reveals diverse microbes capable of GMGT biosynthesis and modification. ***PNAS***, 121(26), e2318761121.
7. Suzuki, S., Ishii, S. I., **Chadwick, G. L**., Tanaka, Y., Kouzuma, A., Watanabe, K., ... & Nealson, K. H. (2024). A non-methanogenic archaeon within the order Methanocellales. ***Nature Communications***, 15(1), 4858.
8. **Chadwick, G. L.***, Joiner, A. M.*, Ramesh, S., Mitchell, D. A., & Nayak, D. D. (2023). McrD binds asymmetrically to methyl-coenzyme M reductase improving active-site accessibility during assembly. ***PNAS***, *120*(25), e2302815120.
9. Buessecker, S., **Chadwick, G. L.**, Quan, M. E., Hedlund, B. P., Dodsworth, J. A., & Dekas, A. E. (2023). Mcr-dependent methanogenesis in Archaeoglobaceae enriched from a terrestrial hot spring. ***The ISME Journal***, 1-11.
10. Candry, P., **Chadwick, G.L.**, Caravajal-Arroyo, J.M., Lacoere, T., Winkler, M.K.H., Ganigué, R., Orphan, V.J. and Rabaey, K., (2023). Trophic interactions shape the spatial organization of medium-chain carboxylic acid producing granular biofilm communities. ***The ISME Journal***, 2014-2022.
11. Trutschel, L. R., Kruger, B. R., Sackett, J. D., **Chadwick, G. L.**, & Rowe, A. R. (2023). Determining resident microbial community members and their correlations with geochemistry in a serpentinizing spring. ***Frontiers in Microbiology***, *14*, 1182497.
12. Murali, R., Yu, H., Speth, D.R., Wu, F., Metcalfe, K.S., Crémière, A., Laso-Pèrez, R., Malmstrom, R.R., Goudeau, D., Woyke, T., Hatzenpichler, R., **Chadwick, G.L.**, Connon, S.A., & Orphan, V. J. (2023). Physiological potential and evolutionary trajectories of syntrophic sulfate-reducing bacterial partners of anaerobic methanotrophic archaea. ***PLoS Biology***, *21*(9), p.e3002292.
13. **Chadwick, G. L.***, Skennerton, C. T.*, Laso-Pérez, R., Leu, A. O., Speth, D. R., Yu, H., ... & Orphan, V. J. (2022). Comparative genomics reveals electron transfer and syntrophic mechanisms differentiating methanotrophic and methanogenic archaea. ***PLoS biology***, 20(1), e3001508. *Equal contribution.

14. Schwartzman, J. A., Ebrahimi, A., **Chadwick, G. L.**, Sato, Y., Roller, B. R., Orphan, V. J., & Cordero, O. X. (2022). Bacterial growth in multicellular aggregates leads to the emergence of complex life cycles. ***Current Biology***. 32.14: 3059-3069.
15. Trutschel, L. R., **Chadwick, G. L.**, Kruger, B., Blank, J. G., Brazelton, W. J., Dart, E. R., & Rowe, A. R. (2022). Investigation of microbial metabolisms in an extremely high pH marine-like terrestrial serpentinizing system: Ney Springs. ***Science of The Total Environment***, 836, 155492.
16. Yu, H., **Chadwick, G. L.**, Lingappa, U. F., & Leadbetter, J. R. (2022). Comparative Genomics on Cultivated and Uncultivated Freshwater and Marine "Candidatus Manganitrophaceae" Species Implies Their Worldwide Reach in Manganese Chemolithoautotrophy. ***Mbio***, 13(2), e03421-21.
17. Yu, H., Skennerton, C. T., **Chadwick, G. L.**, Leu, A. O., Aoki, M., Tyson, G. W., & Orphan, V. J. (2022). Sulfate differentially stimulates but is not respired by diverse anaerobic methanotrophic archaea. ***The ISME Journal***, 16(1), 168-177.
18. Brazelton, W. J., McGonigle, J. M., Motamedi, S., Pendleton, H. L., Twing, K. I., Miller, B. C., Lowe, W. J., Hoffman, A. M., Prator, C. A., **Chadwick, G. L.** ... & Lang, S. Q., (2022). Metabolic strategies shared by basement residents of the Lost City hydrothermal field. ***Appl Environ Microbiol***, *88*(17), e00929-22.
19. Jiménez Otero, F., **Chadwick, G. L.**, ... & Bond, D. R. (2021). Evidence of a streamlined extracellular electron transfer pathway from biofilm structure, metabolic stratification, and long-range electron transfer parameters. ***Appl Environ Microbiol***, 87(17), e00706-21.
20. Lingappa, U.F., Yeager, C.M., Sharma, A., Lanza, N.L., Morales, D.P., Xie, G., Atencio, A.D., **Chadwick, G.L.**, ... & Fischer, W. W. (2021). An ecophysiological explanation for manganese enrichment in rock varnish. ***PNAS***, 118(25), p.e2025188118.
21. He, X., **Chadwick, G. L.**, Kempes, C. P., Orphan, V. J., & Meile, C. (2021). Controls on interspecies electron transport and size limitation of anaerobically methane-oxidizing microbial consortia. ***Mbio***, 12(3), e03620-20.
22. He, X., **Chadwick, G. L.**, Jiménez Otero, F., Orphan, V., & Meile, C. (2021). Spatially Resolved Electron Transport through Anode-Respiring Geobacter sulfurreducens Biofilms: Controls and Constraints. ***ChemElectroChem***, 8(10), 1747-1758.
23. Mickol, R.L., Louyakis, A.S., Kee, H.L., Johnson, L.K., Dawson, S.C., Hargreaves, K.R., **Chadwick, G.L.**, Newman, D.K., Leadbetter, J.R. and Brown, C.T., (2021). Draft Genome Sequence of the Free-Living, Iridescent Bacterium Tenacibaculum mesophilum Strain ECR. ***Microbiology resource announcements***, 10(1), pp.e01302-20.
24. **Chadwick, G. L.*,** Otero, F. J.*, Gralnick, J. A., Bond, D. R., & Orphan, V. J. (2019). NanoSIMS imaging reveals metabolic stratification within current-producing biofilms. ***PNAS*****,** 201912498**.** *Authors contributed equally to this work.
25. Bublitz, D. C., **Chadwick, G. L.**, Magyar, J. S., Sandoz, K. M., Brooks, D., Mesnage, S., Ladinsky, M. S., Garber, A. I., Bjorkman, P. J., Orphan, V. J., McCutcheon, J. P. (2019). Peptidoglycan production by an insect-bacterial mosaic. ***Cell***, 179:j.cell.2019.08.054.
26. He, X., **Chadwick, G.**, Kempes, C., Shi, Y., McGlynn, S., Orphan, V., & Meile, C. (2019). Microbial interactions in the anaerobic oxidation of methane: model simulations constrained by process rates and activity patterns. ***Environmental microbiology***, *21*(2), 631-647.
27. Boyd, J.A., Jungbluth, S.P., Leu, A.O., Evans, P.N., Woodcroft, B.J., **Chadwick, G.L.**, Orphan, V.J., Amend, J.P., Rappé, M.S. and Tyson, G.W. (2019). Divergent methyl-coenzyme M reductase genes in a deep-subseafloor Archaeoglobi. ***The ISME journal***, *13*(5), 1269.
28. Bird, L. R., Dawson, K. S., **Chadwick, G. L.**, Fulton, J. M., Orphan, V. J., & Freeman, K. H. (2019). Carbon isotopic heterogeneity of coenzyme F430 and membrane lipids in methane-oxidizing archaea. ***Geobiology***.
29. **Chadwick, G. L.**, Hemp, J., Fischer, W. W., & Orphan, V. J. (2018). Convergent evolution of unusual complex I homologs with increased proton pumping capacity: energetic and ecological implications. ***The ISME journal***, *12*(11), 2668.
30. Dekas, A.E., Fike, D.A., **Chadwick, G.L.**, Green-Saxena, A., Fortney, J., Connon, S.A., Dawson, K.S. and Orphan, V.J. (2018). Widespread nitrogen fixation in sediments from diverse deep-sea sites of elevated carbon loading. ***Environmental microbiology***, *20*(12), 4281-4296.
31. McGlynn, S.E., **Chadwick, G.L.**, O'Neill, A., Mackey, M., Thor, A., Deerinck, T.J., Ellisman, M.H. and Orphan, V.J. (2018). Subgroup characteristics of marine methane-oxidizing ANME-2 archaea and their syntrophic partners as revealed by integrated multimodal analytical microscopy. ***Appl. Environ. Microbiol***., *84*(11), e00399-18.

32. Scheller, S., Yu, H., **Chadwick, G. L.**, McGlynn, S. E., & Orphan, V. J. (2016). Artificial electron acceptors decouple archaeal methane oxidation from sulfate reduction. ***Science***, *351*(6274), 703-707.
33. Dekas, A. E., Connon, S. A., **Chadwick, G. L.**, Trembath-Reichert, E., & Orphan, V. J. (2016). Activity and interactions of methane seep microorganisms assessed by parallel transcription and FISH-NanoSIMS analyses. ***The ISME journal***, *10*(3), 678-692.
34. McGlynn, S. E.*, **Chadwick, G. L.***, Kempes, C. P., & Orphan, V. J. (2015). Single cell activity reveals direct electron transfer in methanotrophic consortia. ***Nature***, *526*(7574), 531-535. *Authors contributed equally to this work.
35. Evans, P. N., Parks, D. H., **Chadwick, G. L.**, Robbins, S. J., Orphan, V. J., Golding, S. D., & Tyson, G. W. (2015). Methane metabolism in the archaeal phylum Bathyarchaeota revealed by genome-centric metagenomics. ***Science***, *350*(6259), 434-438.
36. Tavormina, P. L., Hatzenpichler, R., McGlynn, S., **Chadwick, G. L.**, Dawson, K. S., Connon, S. A., & Orphan, V. J. (2015). Methyloprofundus sedimenti gen. nov., sp. nov., an obligate methanotroph from ocean sediment belonging to the 'deep sea-1'clade of marine methanotrophs. ***International journal of systematic and evolutionary microbiology***, *65*(1), 251-259.
37. Dekas, A. E., **Chadwick, G. L.**, Bowles, M. W., Joye, S. B., & Orphan, V. J. (2014). Spatial distribution of nitrogen fixation in methane seep sediment and the role of the ANME archaea. ***Environmental microbiology***, *16*(10), 3012-3029.
38. Levin, L. A., *et al.* (2012) A hydrothermal seep on the Costa Rica margin: middle ground in a continuum of reducing ecosystems. ***Proceedings of the Royal Society B: Biological Sciences*** 279.1738 (2012): 2580-2588.

Presentations

1. **Chadwick, G.L**. and Nayak, D.D. (2026) Spontaneous Mutations in Methanogenesis Marker 9 Rescue Coenzyme M Auxotrophy in *Methanosarcina acetivorans*. (Poster) **Molecular Basis of One Carbon Metabolism Gordon Research Conference**. Waterville Valley, NH.
2. **Chadwick, G.L**., *et al* (2024). Three stories about methane metabolism. (Invited Talk) **Organic Geochemistry Gordon Research Conference**. Holderness, NH.
3. **Chadwick, G.L.,** *et al* (2024). Isolation and characterization the first methanogenic Archaeoglobi: Methanoglobus nevadensis XG-1. (Poster) **Molecular Basis of One Carbon Metabolism Gordon Research Conference**. Waterville Valley, NH.
4. **Chadwick, G.L.,** *et al* (2023). Isolation and characterization the first methanogenic Archaeoglobi: *Methanoglobus nevadensis* XG-1. (Talk) **New Lineages of Life Symposium, Joint Genome Institute.** Berkeley, CA
5. **Chadwick, G.L.,** *et al* (2023). Isolation and characterization of a methanogenic Archaea within the Archaeoglobaceae. (Talk) **Archaea: Ecology, Metabolism and Molecular Biology Gordon Research Seminar.** Mount Snow, VT
6. **Chadwick, G.L.,** *et al* (2022). Investigations into the role of McrD in the assembly of Methyl-coenzyme M reductase. (Poster) **Molecular Basis of Microbial One-Carbon Metabolism Gordon Research Conference** Southbridge, MA
7. **Chadwick, G.L.,** *et al* (2022). Developing Archaeoglobus as a model system for understanding methanogenesis evolution. (Poster) **Geobiology Gordon Research Conference**. Ventura, CA
8. **Chadwick, G.L.,** *et al* (2022). Using nanoSIMS to answer interesting spatial questions. (Talk) **International Geobiology Course 2022**. Mammoth Lakes, CA
9. **Chadwick, G.L.,** *et al* (2021). Genomic determinants of reverse methanogenesis in archaea. (Talk) **Integrative Genomics Institute Seminar Series**. Virtual.
10. **Chadwick, G.L.,** *et al* (2021). Physiological and transcriptional response to the repression of methanogenesis in a methanogen. (Talk) **West Coast Bacterial Physiologists**. Virtual.
11. **Chadwick, G.L.,** *et al* (2020). Genomic determinants of reverse methanogenesis in archaea. (Talk) **Molecular and Cell Biology Department - Genetics, Genomics & Development retreat**. Virtual.
12. **Chadwick, G.L.,** *et al* (2020). How to anaerobically oxidize hydrocarbons: lessons from hydrothermal (and cold) marine sediments. (Invited Talk) **Thermal Biology Institute Seminar Series, MSU**. Virtual.

13. **Chadwick, G.L.,** *et al* (2020). Cell to Ecosystem: Understanding methane and associated nutrient cycling by sediment-hosted syntrophic consortia and their viral predators. (Invited Talk) **DOE-BER 2020 Genomic Sciences Program Annual PI Meeting**. Arlington, Virginia.
14. **Chadwick, G.L.,** *et al* (2019). Ultrafast swimming in a novel genus of purple sulfur bacteria. (Talk) **West Coast Bacterial Physiologists**. Pacific Palisades, California
15. **Chadwick, G. L.,** *et al* (2019). Methanotrophy: looking backward. (Invited Talk) **COST Action CA17120 Chemobrionics 30/80 Meeting**. Granada, Spain.
16. **Chadwick, G. L.**, *et al* (2018). Implications of spatial structure in methanotrophic ANME-SRB consortia. (Poster) **Molecular Basis of Microbial One-Carbon Metabolism, Gordon Research Conference**. Sunday River, Maine.
17. **Chadwick, G. L.**, *et al* (2017). Predicting the function of novel of complex I homologs from poorly studied and uncultured organisms: hints from primary sequences, crystal structures and phylogenies. (Poster) **NeLLi 2017: From New Lineages of Life To New Functions**. Walnut Creek, California.
18. **Chadwick, G. L.**, *et al* (2017). Geobacter activity in electrode biofilms is spatially dependent. (Poster) **ISMET6 International Society for Microbial Electrochemistry and Technology Meeting**. Lisbon, Portugal.
19. **Chadwick, G. L.**, *et al* (2017). Convergent evolution of respiratory complex I homologs with additional proton pumping capacity. (Seminar series talk) **MicroMorning**, Caltech.
20. **Chadwick, G. L.**, *et al* (2015). Genomic insights into the biochemistry and bioenergetics of anaerobic methanotrophic archaea. (Poster) **Archaea: Ecology, Metabolism & Molecular Biology, Gordon Research Conference**. Sunday River, Maine.
21. **Chadwick, G. L.**, *et al* (2011). Investigations into ammonium dependent shut off of nitrogen fixation in methane seep sediments from Hydrate Ridge North. (Poster) **Southern California Geobiology Symposium**, USC.

References

Dipti D. Nayak – Assistant Professor of Genetics, Genomics and Development (UC Berkeley)
+1-510-664-5267 dnayak@berkeley.edu
Victoria J Orphan – Professor of Environmental Science and Geobiology (Caltech)
+1-626-395-1786 vorphan@gps.caltech.edu
Dianne K Newman – Professor of Biology and Geobiology (Caltech)
+1-626-395-3543 dkn@caltech.edu
Woodward W Fischer – Professor of Geobiology (Caltech)
+1-626-395-6790 wfischer@caltech.edu
Jared R Leadbetter – Professor of Environmental Microbiology (Caltech)
+1-626-395-4182 jleadbetter@caltech.edu