Grayson L Chadwick

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Miller Postdoctoral Fellow, University of California at Berkeley

Education

California Institute of Technology 2015 – 2020
PhD in Geobiology

University of Southern California 2013 – 2014
Graduate student, Marine Biology and Biological Oceanography

California Institute of Technology 2007 – 2011
BS with Honors in Biology

Research Positions

UC Berkeley Department of Molecular and Cell Biology. Berkeley, CA
Miller Institute Postdoctoral Fellow 2020 – present

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

UCSC Santa Cruz Institute for Particle Physics Santa Cruz, CA
COSMOS program, particle physics 2004

Teaching and Professional Service

Co-chair Gordon Research Seminar on Microbial One-Carbon Conversion from the Microscale to the Global Scale 2022

Teaching assistant for Caltech courses 2010 – 2019

Microbial Ecology, Evolution, Microbial Metabolic Diversity, Bioengineering Bootcamp, The Great Ideas of Biology, Principles of Biology

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

Reviewer
Nature Microbiology, Frontiers in Microbiology, Environmental Microbiology, Limnology and Oceanography: Methods, Elementa, Biogeosciences

Awards

2020 – 2023 Miller Research Fellowship
2017 – 2019 NIH Predoctoral Training Grant in Molecular and Cell Biology (Caltech)
2016 Gordon P. and Virginia G. Eaton Graduate Fellowship
2015 Caltech CEMI Fellowship
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 Caltech Summer Undergraduate Research Fellowship
2008 Richard G. Brewer Prize in Physics (Caltech)

Publications

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. *Authors contributed equally to this work.

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.

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.

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.

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.
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. bioRxiv. Note: in final revision at Applied and Environmental Microbiology.

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. Applied and environmental microbiology, 87(17), e00706-21.

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. Proceedings of the National Academy of Sciences, 118(25), p.e2025188118.

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.

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.

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.

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.

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.

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.

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.

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***.

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.

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.

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.

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.

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.

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.

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.

Tavormina, P. L., Hatzenpichler, R., McGlynn, S., **Chadwick, G.**, 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.

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.

Levin, L. A., Orphan, V. J., Rouse, G. W., Rathburn, A. E., Ussler III, W., Cook, G. S., ... & **Chadwick, G.** (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), 2580.

Presentations

Chadwick, G.L. (2022). Using nanoSIMS to answer interesting spatial questions. (Talk) **International Geobiology Course 2022**. Mammoth Lakes, CA

Chadwick, G.L. (2021). Genomic determinants of reverse methanogenesis in archaea. (Talk) **Integrative Genomics Institute Seminar Series**. Virtual.

Chadwick, G.L. (2021). Physiological and transcriptional response to the repression of methanogenesis in a methanogen. (Talk) **West Coast Bacterial Physiologists**. Virtual.

Chadwick, G.L. (2020). Genomic determinants of reverse methanogenesis in archaea. (Talk) **Molecular and Cell Biology Department - Genetics, Genomics & Development retreat**. Virtual.

Chadwick, G.L. (2020). How to anaerobically oxidize hydrocarbons: lessons from hydrothermal (and cold) marine sediments. (Invited Talk) **Thermal Biology Institute Seminar Series, MSU**. Virtual.

Chadwick, G.L. (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.

Chadwick, G.L. (2019). Ultrafast swimming in a novel genus of purple sulfur bacteria. (Talk) **West Coast Bacterial Physiologists**. Pacific Palisades, California

Chadwick, G. L. (2019). Methanotrophy: looking backward. (Invited Talk) **COST Action CA17120 Chemobrionics 30/80 Meeting**. Granada, Spain.

Chadwick, G. L., Jiménez-Otero, F., Deerinck, T., He, X., Skennerton, C. T., Meile, C., Ellisman, M., Bond, D. R., Orphan, V. J. (2018). Implications of spatial structure in methanotrophic ANME-SRB consortia. (Poster) **Molecular Basis of Microbial One-Carbon Metabolism, Gordon Research Conference**. Sunday River, Maine.

Chadwick, G. L., Hemp, J., Fischer, W. W., & Orphan, V. J. (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.

Chadwick, G. L., Jiménez-Otero, F., Gralnick, J. A., Bond, D. R., Orphan, V. J. (2017). Geobacter activity in electrode biofilms is spatially dependent. (Poster) **ISMET6 International Society for Microbial Electrochemistry and Technology Meeting**. Lisbon, Portugal.

Chadwick, G. L., Hemp, J., Fischer, W. W., & Orphan, V. J. (2017). Convergent evolution of respiratory complex I homologs with additional proton pumping capacity. (Seminar series talk) **MicroMorning**, Caltech.

Chadwick, G. L. and Orphan, V. J. (2015). Genomic insights into the biochemistry and bioenergetics of anaerobic methanotrophic archaea. (Poster) **Archaea: Ecology, Metabolism & Molecular Biology, Gordon Research Conference**. Sunday River, Maine.

Chadwick, G. L., Dekas, A. E., Connon, S. A., and Orphan, V. J. (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

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