

Susan Q. Lang

EDUCATION

- Ph.D. 2006. Chemical Oceanography, University of Washington, USA
M.S. 2003. Chemical Oceanography, University of Washington, USA
B.S. 1999. Chemistry, Massachusetts Institute of Technology, USA

APPOINTMENTS

- 2022 – present **Director**, National Ocean Sciences Accelerator Mass Spectrometry facility, Woods Hole Oceanographic Inst.
2022 – present **Associate Scientist w/ Tenure**, Department of Geology and Geophysics, Woods Hole Oceanographic Institution
2020 – 2022 **Associate Professor**, School of the Earth, Ocean, and Environment, Univ. of South Carolina
2014 – 2019 **Assistant Professor**, School of the Earth, Ocean, and Environment, Univ. of South Carolina
2009 – 2014 **Research Staff** (Wissenschaftliche Mitarbeiter), ETH Zürich, Switzerland
2007 – 2009 **Postdoctoral Researcher**, Scripps Institution of Oceanography

AWARDS, FELLOWSHIPS AND HONORS

2018. Breakthrough Star Award, University of South Carolina
2016. Kavli Frontiers of Science Fellow, bestowed by National Academy of Sciences and Alexander von Humboldt Foundation
2013. Web of science highly cited paper, for Schrenk, Brazelton, and Lang (2013)
2012. Top 25 most cited articles, *Geochimica et Cosmochimica Acta*, Elsevier, for Lang et al., 2010
2009. InterRidge Postdoctoral Fellowship (\$5,000)
2000 – 2003. National Defense Science and Engineering Graduate Student Fellowship
1999 – 2002. Achievement Rewards for College Scientists Graduate Student Fellowship
1999. Undergraduate Research Award, MIT Chemistry Department

PUBLICATIONS

Graduate student (†) or research technician (¥) under my supervision; corresponding author (*)

Published, in press

50. Hu, S.K., Smith, A., Anderson, R., Sylva, S., Setzer, M., Steadmon, M., Frank, K., Chan, E., Lim, D., German, C., Breier, J.A., **Lang, S.Q.**, Butterfield, D.A., Fortunato, C.S., Seewald, J.A., Huber, J.A. (in press) Globally-distributed microbial eukaryotes exhibit endemism at deep-sea hydrothermal vents. *Molecular Ecology*.
49. Brazelton, W.E., 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., Anderson, R.E., Thomas, E., Butterfield, D.A., Aquino, K.A., Früh-Green, G.L., Schrenk, M.O., and **Lang, S.Q.** (2022) Metabolic strategies shared by basement residents of the Lost City hydrothermal field. *Appl. Environ. Microbiol.* 88(17): 1-17
48. Aquino, K.A., Früh-Green, G., Rickli, J., Bernasconi, S.M., **Lang, S.Q.**, Lilley, M.D., Butterfield, D.A. (2022) Multi-stage evolution of Lost City hydrothermal vent fluids. *Geochim. Cosmochim. Acta.* 332: 239-262
47. Voss, B.M., Eglinton, T.I., Peucker-Ehrenbrink, B., Galy, V., **Lang, S.Q.**, McIntyre, C., Spencer, R.G.M., Bulygina, E., Wang, Z.A., Guay, K.A. (2022) Isotopic evidence for sources of dissolved carbon and the role of respiration in the Fraser River basin, Canada. *Biogeochemistry*, doi: 10.1007/s10533-022-00945-5
46. Pinckney, J.L., Zaunbrecher, S., **Lang, S.Q.**, Wilson, A., Knapp, A. (2022) Seasonality of benthic microalgal community abundance in shallow shelf waters. *Continental Shelf Research* 244: 104797
45. Moore, W.S., Frankle, J. † Benitez-Nelson, C., Früh-Green, G., **Lang, S.Q.** (2021) Activities of ²²³Ra and ²²⁶Ra in fluids from the Lost City Hydrothermal Field require short fluid residence times. *JGR-Oceans*, 126. E2021JC017886

44. Lang, S.Q., Lilley, M.D., Baumberger, T., Früh-Green, G., Walker, S., Brazelton, W., Kelley, D.S., Elend, M., Mau, A.J.[†] (2021) Extensive decentralized hydrogen export from the Atlantis Massif. *Geology* 49(7): 851-856. doi: 10.1130/G48322.1
43. Lang, S.Q. and Benitez-Nelson, B.[‡] (2021) Hydrothermal Organic Geochemistry (HOG) sampler for deployment on deep-sea submersibles. *Deep-Sea Research Part I* 173: 103529
42. McCabe, K., Smith, E., Lang, S.Q., Osburn, C., Benitez-Nelson, C. (2021) Particulate and dissolved organic matter in stormwater runoff influences oxygen demand in urbanized headwater catchments. *Environ. Sci. Technol.* 55:952-961. <https://dx.doi.org/10.1021/acs.est.0c04502>
41. Liu, L., Zou, Y., Bhattacharya, A., Zhang, D., Lang, S.Q., Houk, K.N., and Devaraj, N.K. (2020) Enzyme-free aqueous phospholipid synthesis promotes self-assembly of minimal cell membranes. *Nature Chemistry*. 12:1029-1034. doi.org/10.1038/s41557-020-00559-0
40. Lang, S.Q. and Brazelton, W.J. (2020) Habitability of the oceanic alkaline serpentinite subsurface: a case study of the Lost City hydrothermal field. *Phil. Trans. R. Soc. A* 378:20180429
39. Nguyen, T.B.[†], Topçuoğlu, B.D., Holden, J.F., Lang, S.Q.* (2020) Lower hydrogen flux leads to larger carbon isotopic fractionation of methane and biomarkers during hydrogenotrophic methanogenesis. *Geochim. Cosmochim. Acta* 271: 212-226
38. Xiao, K., Wilson, A.M., Li, H., Santos, I.R., Tamborski, J., Smith, E., Lang, S.Q., Zheng, C., Luo, X., Correa, R.E. (2020) Reduced blue carbon sequestration through CO₂ release and tidal flushing in salt marsh crab burrows. *Limnol. Oceanogr.* doi: 10.1002/lno.11582
37. McGonigle, J.M., Lang, S.Q., and Brazelton, W.J. (2020) Genomic evidence for formate metabolism by Chloroflexi as the key to unlocking deep carbon in Lost City microbial ecosystems. *Appl. Environ. Microbiol.* 86(8):02583-19
36. LaRowe, D., Arndt, S., Bradley, J., Estes, E., Hoarfrost, A., Lang, S.Q., Lloyd, K., Mahmoudi, N., Orsi, W., Walter, S., Steen, A., and Zhao, R. (2020) The fate of organic carbon in marine sediments – new insights from recent data and analysis. *Earth-Science Reviews* 204:103146
35. Cannizzo, Z.J., Lang, S.Q., Benitez-Nelson, B.[‡], Griffen, B.D. (2020) An artificial habitat increases the reproductive fitness of a range-shifting species within a newly colonized ecosystem. *Scientific Reports* 10(554) 1-13
34. Lang, S.Q., Steen, A. D., Osburn, M.R. (2019) Carbon in deep biosphere: forms, biogeochemical cycling, and fates. Reviews in Mineralogy and Geochemistry. In B. Orcutt, I. Daniel, R. Dasgupta (Eds.), *Deep Carbon: Past to present* (pp. 480 – 523). Cambridge: Cambridge University Press. Doi: 10.1017/ 9781108677950.016
33. Topçuoğlu, B.D., Meydan, C., Nguyen, T.B.[†], Lang, S.Q., Holden J.F. (2019) Growth Kinetics, Carbon Isotope Fractionation, and Gene Expression in the Hyperthermophile *Methanocaldococcus jannaschii* during Hydrogen-Limited Growth and Interspecies Hydrogen Transfer. *Applied and Environmental Microbiology* 85:e00180-19.
32. Lechleitner, F.A., Lang, S.Q., Haghypour, N., McIntyre, C., Baldini, J.U.L., Pruffer, K., and Eglinton, T.I. (2019) Towards organic carbon isotope records from stalagmites: coupled 13C and 14C analysis using WCO. *Radiocarbon* 61(3):749-764
31. Früh-Green, G.L., Orcutt, B.N., Rourméjon, S., Lilley, M.D. Morono, Y., Cotterill, C., Green, S., Escartin, J., John, B.E., McCaig, A.M., Cannat, M., Ménez, B., Schwarzenbach, E.M., Williams, M.J., Morgan, S., Lang, S.Q., Schrenk, M.O., Brazelton, W.J., Akizawa, N., Boschi, C., Dunkel, K.G., Quéméneur, M., Whattman, S.A., Mayhew, L., Harris, M., Bayrakci, G., Behrmann, J.-H., Herrero-Bervera, E., Hesse, K., Liu, H.-Q., Ratnayake, A.S., Twing, K., Weis, D., Zhao, R., Bilinker, L., Magmatism, serpentization and life: Insights through drilling the Atlantis Massif (IODP Expedition 357). (2018) *Lithos* DOI: 10.1016/j.lithos.2018.09.012
30. Preiner, M., Xavier, J.C., Sousa, F.L., Zimorski, V., Neubeck, A., Lang, S.Q., Greenwell, H.C., Kleinermanns, k., Tuysuz, H., McCollom, T.M., Holm, N.G., Martin, W.F. (2018) Serpentinization: Connecting Geochemistry, Ancient Metabolism and Industrial Hydrogenation. *Life*, 8 (41) DOI: 10.3390/life8040041
29. Emmons, A.M., Bizimis, M., Lang, S.Q., Stangler, W., Geidel, G., Baalousha, M., Wanamaker, E.[‡], and Rothenberg, S.E. (2018) Enrichments of Metals, including Methylmercury, in Sewage Spills in South Carolina, USA. *Journal of Environmental Quality*. 1-9. DOI: 10.2134/jeq2018.02.0067

28. Hickok, K. A.†, Nguyen, T.B.†, **Lang, S.Q.** (2018) Assessment of apolar lipids in in subseafloor rocks and potential contaminants from the Atlantis Massif (IODP Expedition 357). *Organic Geochemistry* 122: 68-77
27. **Lang, S.Q.**, Früh-Green G.L, Bernasconi, S.M., Brazelton, W.J., Schrenk, M.O., and McGonigle, J.M. (2018) Deeply-sourced formate fuels sulfate reducers but not methanogens at Lost City hydrothermal field *Scientific Reports* 8(755) 1-10.
26. **Lang, S.Q.** (2018) News and Views: Hydrothermal Stamp on the Ocean. *Nature Geoscience* 11:6-20.
25. Pisapia, C. Gérard, E., Gérard, M., Lecourt, L., **Lang, S.Q.**, Pelletier, B., Payri, C., Monnin, C., Guentas, L., Postec, A., Quéméneur, M., Erauso, G., Ménez, B. (2017) Mineralization filamentous bacteria from the Prony Bay Hydrothermal Field give new insights to the functioning of serpentinization-based subseafloor ecosystems. *Front. Microbiol.* 8:57. DOI: 10.3389/fmicb.2017.00057
24. Brazelton, W.J., Thornton, C.N., Hyer, A., Twing, K.I., Longino, A.A., **Lang, S.Q.**, Lilley, M.D., Früh-Green, G.L., Schrenk, M.O. (2017) Metagenomic identification of active methanogens and methanotrophs in serpentinite springs of Voltri Massif, Italy. *PeerJ* 5:e2945 DOI: 10.7717/peerj.2945
23. **Lang, S.Q.**, McIntyre, C.P., Bernasconi, S.M., Früh-Green, G., Voss, B.M., Eglinton, T.I., and Wacker L. (2016) Rapid 14C Analysis of Dissolved Organic Carbon in Non-Saline Waters. *Radiocarbon.* 1-11; DOI:10.1017/RDC.2016.17
22. McIntyre, C.P., Lechleitner, F., **Lang, S.Q.**, Hagiour, N., Fahrni, S., Wacker, L., and Synal H-A. (2016) 14C Contamination testing in natural abundance laboratories: A new preparation method using wet chemical oxidation and some experiences. *Radiocarbon.* 1-7; DOI: 10.1017/RDC.2016.78
21. Wiedemeier, D.B., **Lang, S.Q.**, Gierga, M., Abiven, S., Bernasconi, S.M., Früh-Green, G.L., Hajdas, I., Hanke, U.M., Hilf, M.D., McIntyre, C.P., Scheider, M.P.W., Smittenberg, R.H., Wacker, L., Wiesenberg, G.L.B., Schmidt, M.W.I. (2016) Characterization, Quantification and Compound-Specific Isotope Analysis of Pyrogenic Carbon Using Benzene Polycarboxylic Acids (BPCA) *J. Vis. Exp.* (111) e53922, doi: 10.3791/53922
20. Kohl, L., Cumming, E., Cox, A., Rietze, A., Morrissey, L., **Lang, S.Q.**, Richter, A., Suzuki, S., Nealson, K.H., Morrill, P.L. (2016) Exploring the metabolic potential of microbial communities in ultra-basic, reducing springs at The Cedars, CA, US: Experimental evidence of microbial methanogenesis and heterotrophic acetogenesis. *J. Geophys. Res. Biogeosci.* 121: 1203-1220, doi: 10.1002/2015JG003233
19. Gomez-Saez, G.V., Niggemann, J., Dittmar, T., Pohlbeln, A.M., **Lang, S.Q.**, Noowong, A., Pichler, T., Wörmer, L., and Bühring, S.I. (2016) Molecular evidence for abiotic sulfurization of dissolved organic matter in marine shallow hydrothermal systems. *Geochim. et Cosmochim. Acta* 190: 35-52
18. Hindsaw, R.S., **Lang, S.Q.**, Bernasconi, S.M., Heaton, T.H.E., Lindsay, M.R., and Boyde, E.S. (2016) Origin and temporal variability of unusually low $\delta^{13}\text{C}$ -DOC values in two High Arctic catchments. *JGR-Biogeosciences.* DOI: 10.1002/2015JG003303.
17. Larson, B. I., **Lang, S.Q.**, Lilley, M.D., Olson, E.J., Lupton, J., Nakamura, K., Buck, N. (2015) Stealth export of hydrogen and methane from a low temperature serpentinization system. *Deep-Sea Research Part II.* 121: 233-245. DOI: 10.1016/j.dsr2.2015.05.007
16. Morrill, P.L., Brazelton W.J., Kohl, L., Rietze, A., Miles, S. Kavanagh, H., Schrenk, M.O., Ziegler, S.E., and **Lang, S.Q.** (2014) Investigations of potential microbial methanogenic and carbon monoxide utilization pathways in ultra-basic reducing springs associated with present-day continental serpentinization: the Tablelands, NL, CAN. *Frontiers in Microbiology.* 5(613) 1-13
15. Jaeschke, A., Eickmann, B., **Lang, S.Q.**, Bernasconi, S.M., Strauss, H., Früh-Green, G.L. (2014) Biosignatures in chimney structures and sediment from the Loki's Castle low-temperature hydrothermal vent field at the Arctic Mid-Ocean Ridge. *Extremeophiles.* 18(3): 545-560.
14. Gierga, M., Schneider, M.P.W., Widemeir, D.B., **Lang, S.Q.**, Smittenberg, R.H., Hajdas, I., Bernasconi, S.M., Schmidt, M.W.I. (2014) Purification of fire-derived molecular markers for microgram-scale isotope analysis ($\delta^{13}\text{C}$, $\Delta^{14}\text{C}$) using high-performance liquid chromatography (HPLC). *Organic Geochemistry.* 70:1-9
13. Méhay S., Früh-Green G.L., **Lang S.Q.**, Bernasconi S.M., Brazelton W.J., Schaeffer P., and Adam P., (2013) "Record of archaeal activity at the Lost City Hydrothermal Field" *Geobiology.* 11:570-592
12. Schwarzenbach E.M., **Lang S.Q.**, Früh-Green G.L., Lilley M.D., Bernasconi S.M., and Méhay S. (2013) "Sources and cycling of carbon in a continental, serpentinite-hosted alkaline springs in the Voltri Massif, Italy" *Lithos.* 177:226-244.

11. Lang S.Q., Früh-Green G.L., Bernasconi S.M., and Wacker L. (2013). Isotopic ($\delta^{13}\text{C}$, $\Delta^{14}\text{C}$) Analysis of Organic Acids in Seawater Using Wet Chemical Oxidation. *L&O: Methods*. 11:161-175
10. Schrenk M.O., Brazelton W.J., and Lang S.Q. (2013) "Serpentinization, Carbon, and Deep Life." *Reviews in Mineralogy and Geochemistry*. 75(1): 575-606
9. Lang S.Q., Früh-Green G.L., Bernasconi S.M., and Butterfield D.A. (2013). Sources of organic nitrogen at the serpentinite-hosted Lost City hydrothermal field. *Geobiology*. 11:154-169. DOI: 10.1111/gbi.12026
8. Lang S.Q., Früh-Green G.L., Kelley D.S., Lilley M.D., Proskurowski G., and Reeves E.P. (2012) Letter to the Editor: H₂/CH₄ ratios cannot reliably distinguish abiotic vs. biotic methane in natural hydrothermal systems. *Proc. Natl. Acad. Sci. USA*. E3210-E3210. www.pnas.org/cgi/doi/10.1073/pnas.1213138109.
7. Lang S.Q., Früh-Green G.L., Bernasconi S.M., Lilley M.D., Proskurowski G., Méhay S., and Butterfield D.A. (2012) Microbial utilization of abiogenic carbon and hydrogen in a serpentinite-hosted system. *Geochim. et Cosmochim. Acta*. 92:82-99.
6. Lang S.Q., Bernasconi S.M., and Früh-Green G.L. (2012) Stable Isotope Analysis of Organic Carbon in Small (μg) Samples and Dissolved Organic Matter Using a GasBench Preparation Device. *Rapid Communications in Mass Spectrometry*. 26(1):9-16.
5. Lang S.Q., Butterfield D.A., Schulte, M.S., Kelley D.S., and Lilley M.D. (2010) Elevated Concentrations of Formate, Acetate and Dissolved Organic Carbon Found at the Lost City Hydrothermal Field. *Geochim. et Cosmochim. Acta* 74:941-952.
4. Lang S.Q., Lilley M.D., and Hedges J.I. (2007) A method to measure the isotopic (C-13) composition of dissolved organic carbon using a high temperature combustion instrument. *Mar. Chem.* 10:318 – 326.
3. Lang S.Q., Butterfield D.A., Lilley M.D., Johnson H.P., and Hedges J.I. (2006) Dissolved Organic Carbon in Ridge-Flank and Ridge-Axis Environments. *Geochim. et Cosmochim. Acta* 70(15): 3830-3842.
2. Peterson M.L., Lang S.Q., Aufdenkampe A.K., and Hedges J.I. (2003) "Dissolved organic carbon measurements using a modified high-temperature combustion analyzer" *Mar. Chem.* Volume 81 (1-2): 89-104.
1. Johnson, H.P., Baross J., Bjorkland T., Brazelton W., Huber J., Pruis M., Lang S.Q., McCrosky F., Mehta M., Butterfield D., Bowen A., Howland J., Martin W., Roe K., Channing C., Kalk P., Kammerer C., Light R., Miller V., McCarthy M., Moore B., Sharma M., and Voit J. (2003) "Probing for life in the ocean crust with the LEXEN program" *Eos, Trans. AGU.*, 84:109-112.

Not peer reviewed

1. McCaig, A., Lang, S.Q., Blum, P. (2022) Expedition 399 Scientific Prospectus: Building Blocks of Life, Atlantis Massif. <https://doi.org/10.14379/iodp.sp.399.2022>
1. Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., Morgan, S., Akizawa, N., Bayrakci, G., Behrmann, J.-H., Boschi, C., Brazelton, W.J., Cannat, M., Dunkel, K.G., Escartin, J., Harris, M., Herrero-Bervera, E., Hesse, K., John, B.E., Lang, S.Q., Lilley, M.D., Liu, H.-Q., Mayhew, L.E., McCaig, A.M., Menez, B., Morono, Y., Quéméneur, M., Rouméjon, S., Sandaruwan Ratnayake, A., Schrenk, M.O., Schwarzenbach, E.M., Twing, K.I., Weis, D., Whattham, S.A., Williams, M., and Zaho, R. (2017) Expedition 357 Summary. In Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., and the Expedition 357 Scientists, Atlantis massif Serpentinization and Life. *Proceedings of the International Ocean Discovery Program*, 357. College Station, TX. Doi: 10.14379/iodp.proc.357.101.2017.

SCIENTIFIC MEETINGS, INVITED PRESENTATIONS

- (14.) Invited talk cancelled due to COVID-19: Serpentine Days (9/2020)
- (13.) Invited talk cancelled due to COVID-19: Deep Carbon Science Gordon Research Conference (6/2020)
12. Lang, S.Q. "Carbon cycling and serpentinization: an update from Lost City and the Atlantis Massif" Deep Carbon 2019 Annual Meeting (10/2019) Invited Speaker
11. Lang, S.Q. "Serpentinization, fluids, and life" American Society for Microbiology (ASM) Annual Meeting, San Francisco, CA (6/2019) Invited Speaker
10. Lang, S.Q. "Identifying microbial activity in serpentinization systems using organics and isotopes" Royal Society Discussion Meeting, London, England (11/2018) Invited Speaker.

9. Lang, S.Q., Camper, N. Benitez-Nelson, B. "Organics and life in the serpentinite subsurface" Goldschmidt. Boston, MA (8/2018) Invited Keynote.
8. Lang, S.Q. (4/2018) "Serpentinization, carbon, and life" Keynote presentation for the Southeastern Biogeochemistry Symposium, Tallahassee, FL
7. Lang, S.Q., Wanamaker, E., Orcutt, B., Früh-Green, G., Lilley, M.D., Twing, K. (3/2018) "Direct access to the serpentinite subsurface: A biogeochemical characterization of a unique habitat." Deep Carbon Observatory Annual Meeting. St. Andrews, Scotland, U.K.
6. Lang, S.Q. (1/2017) "Carbon in serpentinite-hosted systems." NASA Workshop Without Walls on Serpentinizing Systems Science, Online workshop.
5. Lang, S.Q., Lilley, M.D., Orcutt, B., Früh-Green, G., Twing, K., Monoro, Y., IODP Expedition 357 Science Party (12/2016) "Direct access to the serpentinite subsurface: a biogeochemical investigation to characterize a unique habitat." American Geophysical Union Fall Meeting. San Francisco, CA
4. Lang, S.Q., Lilley, M.D., Orcutt, B., Früh-Green, G., Twing, K., Monoro, Y., IODP Expedition 357 Science Party (10/2016) "Direct access to the serpentinite subsurface: a biogeochemical investigation to characterize a unique habitat." C-DEBI Annual Meeting. Marina, CA
3. Lang, S.Q. (10/2016) "Modern Ecosystems & Ecology – Present." Isotopes Past, Present & Future Symposium, Carnegie Geophysical Laboratory. Washington, D.C.
2. Lang, S.Q., Früh-Green, G.L., Bernasconi, S., Wacker, L. (3/2016) "Linking mantle to microbe in serpentinite-hosted systems." German-American Kavli Frontiers of Science Symposium, hosted by Alexander von Humboldt Foundation and U.S. National Academy of Sciences. Potsdam, Germany
1. Lang, S.Q. (7/2015) Drilling the Atlantis Massif, Goals and Plans. C-DEBI Basement Microbiology Workshop. Cambridge, MA

SCIENTIFIC MEETINGS, CONTRIBUTED PRESENTATIONS

***Undergraduate under the primary supervision of S.Q. Lang*

§Undergraduate carrying out laboratory measurements in the laboratory of S.Q. Lang

†Graduate student under the primary supervision of S.Q. Lang

‡Research technician under the primary supervision of S.Q. Lang

47. Lang, S.Q., Benitez-Nelson, B., Vincent, M., Mau, A., Simpson, A.J., Kock, F.V.C., Lysak, D.H., and Soong, R., (9/2022) Seawater DOC is rapidly removed in ultramafic hydrothermal systems and replaced by 14C-free labile organics. 24th Radiocarbon International Conference, Zurich, Switzerland
46. **Lang, S.Q.**, Lilley, M.D., Baumberger, T., Früh-Green, G., Walker, S.L., Brazelton, W.J., Kelley, D.S., Elend, M., Butterfield, D.A., Mau, A. † (12/20) Extensive decentralized hydrogen export from the Atlantis Massif. AGU Fall Meeting.
45. Mau, A. †, Simpson, A., Soong, R., Kock, F.F.C., Lysak, D.H., Seewald, J., McCollom, T.M., **Lang, S.Q.** * (12/2020) Different fates for Dissolved Organic Carbon in Mid-Cayman Rise Hydrothermal Systems Revealed through Novel Characterizations. AGU Fall Meeting.
44. Frankle, J. †, Moore, W.S., Benitez-Nelson, C.R., **Lang, S.Q.** * (12/2020) Remarkably elevated activity of short-lived radium in an ultramafic hydrothermal system on the Mid-Cayman Rise. AGU Fall Meeting.
43. Rogers, K.L., Cario, A., Daniel, I., Frank, K.L., Garel, M., **Lang, S.Q.**, Marre, S., Seewald, J., Sylva, S., Tamburini, C., Yoshimura, K. (12/2020) Combined technologies for high-pressure sampling, transfer, enrichment, and filtration from deep-sea hydrothermal vents. AGU Fall Meeting.
42. McCaig, A., Blackman, D.K., Orcutt, B., Menez, B., Lilley, M.D., Wheat, C.G., Lissenberg, J., Ildefonse, B., Klein, **Lang, S.Q.**, Seyfried, W.E., Andreani, M., John, B.E., Godard, M., Morris, A., Schwarzenbach, E., MacLeod, C.J., Savov, I.P., Abe, N., Ohara, Y. (12/2020) Accessing the Building Blocks of Life: deepening Hole U1309D, Atlantis Massif, Mid-Atlantic Ridge: IODP Proposal 937. AGU Fall Meeting.

41. Gunnells, S., Hoffman, C.L., Lohan, M.C., Tagliabue, A., Lough, A.J.M., Resing, J., **Lang, S.Q.**, Bundy, R.M. (2020) Exploring organic metal-binding ligands at the Lost City hydrothermal field. Ocean Sciences Meeting.
40. Wheat, C.G., Seewald, J., **Lang, S.Q.** (12/2019) Borehole Observatories on the Mariana Forearc: A window into Dynamic Processes Within a Subduction Channel. AGU. San Francisco, CA
39. Rogers, K.L., Steele, A., Fox, P.A., Catalano, J.G., Goldman, A.D., Iwsa, J., Korenaga, J., **Lang, S.Q.**, LaRowe, D., McCollom, T.M., McGown, L., Shelley, J., Schaller, M.F., Trail, D., Watson, E.B. (12/2019) The Earth First Origins Project: Constructing Life from the Ground Up. AGU. San Francisco, CA
38. Zaunbrecher, S., Pinckney, J.L., Lang, S.Q. (2019) Spatial variability of benthic microalgae in the South Atlantic Bight. CERF Biennial Conference.
37. McGonigle, J.M., **Lang, S.Q.**, Brazelton, W.J. (6/2019) Metabolic Strategies of the Dense Biofilms Inhabiting the Lost City Hydrothermal Vent Field. Astrobiology Science Conference. Bellingham, WA.
36. Aquino, K.A., Fruh-Green, G.L., Bernasconi, S.M., **Lang, S.Q.** (8/2019) Stable isotope geochemistry of carbonate-brucite chimneys and vent fluids from the Lost City Hydrothermal Field, 30N MAR. Goldschmidt. Barcelona Spain.
35. Moore, W.S., Frankle, J.D. †, **Lang, S.Q.**, Benitez-Nelson, C. (8/2019) Enormous excess ²²³Ra in fluids from the Lost City hydrothermal field. Goldschmidt. Barcelona Spain.
34. Rogers, K.L., Steele, A., Fox, P.A., Catalano, J.G., Goldman, A.D., Iwsa, J., Korenaga, J., **Lang, S.Q.**, LaRowe, D., McCollom, T.M., McGown, L., Shelley, J., Schaller, M.F., Trail, D., Watson, E.B. (6/2019) The Earth First Origins Project: Constructing Life from the Ground Up. Astrobiology Science Conference. Bellingham, WA.
33. Nguyen, T.B.†, Topçuoğlu, B.D., Holden, J.F., **Lang, S.Q.** (8/2018) "Influence of energy availability on the carbon isotopes of methane and biomarkers during hydrogenotrophic methanogenesis" Goldschmidt. Boston, MA. Poster presentation
32. McGonigle, J.M., Brazelton, W.J., **Lang, S.Q.** (8/2018) "Deeply-sourced formate fuels sulfate reducers but not methanogens at Lost City hydrothermal field" Goldschmidt
31. Nguyen, T.B.†, Topçuoğlu, B.D., Holden, J.F., **Lang, S.Q.** (4/2018) "Influence of energy availability on the carbon isotopes of methane and biomarkers during hydrogenotrophic methanogenesis" Southeastern Biogeochemistry Conference. Tallahassee, FL. Poster presentation
30. Camper, N.†, **Lang, S.Q.**, IODP Expedition 357 Science Party (4/2017) "Amino Acids in Serpentinization Fluids from the Atlantis Massif" 2017 Astrobiology Science Conference. Mesa, AZ. Poster presentation.
29. Cable, M.L., Postberg, F., **Lang, S.Q.**, Aluwihare, L.I., Huber, J., Clark, B., Spilker, L.J., Lunine J.I. (4/2017) Mechanisms for Enrichment of Organics in the Enceladus Plume. Astrobiology Science Conference (AbSciCon), Mesa, Arizona
28. Hickok, K.†, Nguyen, T.†, Orcutt, B., Früh-Green, G., IODP Expedition 357 Science Party, **Lang, S.Q.** (4/2017) "Serpentinization and Synthesis: Can Abiotic and Biotic Non-Volatile Organic Molecules Be Identified in the Subsurface of the Atlantis Massif?" Southeastern Biogeochemistry Conference. Athens, GA. Poster presentation.
27. **Lang, S.Q.**, Früh-Green, G., Bernasconi, S.M., Brazelton, W.J., McGonigle, J.M. (12/2016) The potential role of formate for synthesis and life in serpentinization systems. American Geophysical Union Fall Meeting. San Francisco, CA
26. Hickok, K.†, Nguyen, T.†, Orcutt, B., Früh-Green, G., Wanamaker, E. ‡, and **Lang, S.Q.** (12/2016) Serpentinization and Synthesis: Can abiotic and biotic non-volatile organic molecules be identified in the subsurface of the Atlantis Massif? American Geophysical Union Fall Meeting. San Francisco, CA
25. Lilley, M.D., **Lang, S.Q.**, Früh-Green, G., Orcutt, B. (12/2016) Sensor Package Data and H₂ and CH₄ concentrations in Pre-and Post-Drilling Water Samples: IODP Expedition 357. American Geophysical Union Fall Meeting. San Francisco, CA
24. Lechleitner, F.A., **Lang, S.Q.**, McIntyre, C., Baldini, J.U.L., Dittmar, T., and Eglinton, T.I. (2016) Source to sink characterization of dissolved organic matter in a tropical karst system. Poster. EGU. Vienna, Austria.
23. Park, H. **, Wanamaker, E. ‡, and **Lang, S.Q.** (2016) Sample Storage and Contamination Considerations for IODP Rock Cores. Poster, Southeastern Biogeochemistry Symposium, Knoxville, TN, Feb 2016

22. Gomez-Saez, G.V., Niggemann, J., Dittmar, T., Pohlabein, A.M., **Lang, S.Q.**, Noowong, A., Pichler, T., Wörmer, L., Bühring, S.I. (2016) Sources and fate of dissolved organic sulfur at the redox interface of marine shallow hydrothermal systems. Ocean Sciences Meeting.
21. **Lang, S.Q.**, Früh-Green, G.L., Bernasconi, S., Wacker, L. and Lilley, M. (2015) “¹⁴C of Individual Molecules to Track Deep Carbon, Deep Life” Deep Life Community Science Meeting, Lisbon, Portugal
20. Nguyen, T.Ş, **Lang, S.Q.**, Walla, M., Al-Sudani, K., Pournelle, J.R. (2015) Establishing site boundaries in Basra Governorate, southern Iraq using fecal sterol biomarkers in sediments. Poster, American Schools of Oriental Research Annual Meeting.
19. Kohl, I., Cumming, E., Cox, A., Suzuki, S., Morrissey, L., Rietze, A., **Lang, S.Q.**, Richter, A., Nealson, K.H., Morrill, P.L. (2015) Exploring the Metabolic Potential of Microbial Communities in Ultra-basic, Reducing Springs at The Cedars, CA: Evidence of Microbial Methanogenesis and Heterotrophic Acetogenesis. AGU.
18. Krueger, R.**, Thunell, R., Ziolkowski L., and **Lang, S.Q.** (2015) Leaf Waxes as an Indicator of Past Precipitation. Poster, USC Summer Research Symposium.
17. Park, H.***, Wanamaker, E.‡, and **Lang, S.Q.** (2015) Sample Storage and Contamination Considerations for IODP Rock Cores. Poster, USC Summer Research Symposium.
16. **Lang, S.Q.**, Schwarzenbach, E.M., and Früh-Green, G.L. (2014) Tracking the fate of carbon in serpentinite-hosted systems. Goldschmidt Meeting, Sacramento, June 2014
15. McIntyre C., Lechleitner, F., **Lang, S.Q.**, Wacker, L., Fahrni, S., Eglinton, T. (2014) “¹⁴C Contamination Testing Using Wet Chemical Oxidation and a Gas Ion Source” AMS-13 Aix en Provence
14. Hindshaw, R., Heaton, T., Boyd, E., **Lang, S.Q.**, Tipper, E. (2014) Significant differences in biogeochemical processes between a glaciated and a permafrost dominated catchment. EGU General Assembly. Vienna, Austria, April 2014.
13. Larson, B. I., **Lang, S.Q.**, Lilley, M.D., Olson, E.J., Lupton, J., Nakamura, K., Buck, N. (2014) Stealth export of hydrogen and methane from a low temperature serpentinization system. Symposia in honor of Peter Rona. Rutgers
12. **Lang S.Q.**, Früh-Green G.L., Bernasconi S.M., and Wacker L. (2012) “Tracking the transfer of carbon from the geosphere to the biosphere in a serpentinite-hosted environment” Oral Presentation. Serpentine Days, Porquerolles Island, France.
11. Früh-Green G.L. and **Lang S.Q.** (2012) “Fluid-rock-microbe interactions in serpentinite-hosted hydrothermal systems: Life in a CO₂-limited world.” Oral Presentation. Dark energy biosphere institute research coordination network meeting, Bremen, Germany.
10. **Lang S.Q.**, Früh-Green G.L., Bernasconi, S.M., and Lilley M.D. (2011) “The Influence of Hydrogen on Organic Matter Cycling at the Lost City Hydrothermal Field.” Poster Presentation, International Meeting of Organic Geochemistry.
9. **Lang S.Q.**, Früh-Green G.L., Bernasconi S.M., Butterfield D.A., Lilley M.D., Proskurowski G., and Méhay S. (2011) “Microbial Utilization of the Products of Serpentinization at the Lost City Hydrothermal Field.” Oral Presentation, Goldschmidt.
8. Schwarzenbach, E., Früh-Green, G.L., Bernasconi, S.M., Méhay, S., Lilley, M. and **Lang, S.Q.** (2010) “Present-Day Serpentinization and Microbial Activity in Peridotites Hosting High-Ph Spring Waters, Gruppo di Voltri (Italy).” Oral Presentation, Goldschmidt.
7. **Lang, S.Q.** and Aluwihare L.I. (2008) “Investigating the carbon and nitrogen sources supplying the base of the Suisun Bay food web: a compound-specific isotope approach.” Poster. CALFED Science Conference.
6. **Lang, S.Q.**, Butterfield, D.B., and Lilley, M. (2008) “Organic Geochemistry of Lost City Hydrothermal Fluids: Implications for Microbial Communities.” Oral Presentation. 5th Annual Southern California Geobiology Symposium.
5. **Lang, S.Q.**, Butterfield, D. A., and Lilley, M.D. (2007) “Organic Geochemistry of Lost City Fluids.” Oral Presentation, InterRidge Theoretical Institute.
4. **Lang S.Q.**, Hutnak M., Johnson H. P., Butterfield D.A., and Lilley M.D. (2006) “Evidence for a ‘third fluid’ at Baby Bare Seamount: Implications for Chemical Fluxes.” Poster. RIDGE Theoretical Institute
3. **Lang, S.Q.**, Hedges, J.I., Butterfield, D., and Lilley, M.D. (2005) “Production of Isotopically Heavy Dissolved Organic Carbon From the Lost City Vent Field.” Oral Presentation. AGU Fall Meeting

2. **Lang, S.Q.**, Hedges, J.I., Butterfield, D., and Lilley, M. (2004) “Stable Carbon Isotopes of the Lost City Hydrothermal Vent Field.” Poster. Gordon Research Conference on Organic Geochemistry, Plymouth, New Hampshire
1. **Lang, S.Q.**, Hedges, J.I., and Butterfield, D. (2001) “Dissolved Organic Carbon in Endeavour Segment of Juan de Fuca Ridge.” Oral Presentation. ACS Spring Meeting

SEMINARS

- Biology Seminar, University of South Carolina (2/12/2021)
- Marine Science Seminar, University of Georgia (9/23/2019)
- Earth & Environmental Sciences Seminar, Boston University (3/12/2019)
- Earth & Environmental Sciences Seminar, Lehigh University (1/27/2017)
- Environmental Engineering & Earth Sciences, Clemson University (9/9/2016)
- Earth and Planetary Sciences, University of Tennessee – Knoxville (9/10/2015)
- Marine Sciences Seminar, University of South Carolina (1/16/2015)
- Virginia Tech Geosciences Department Seminar, Virginia Tech (9/26/2014)
- Illinois State Geological Survey (1/29/2013)
- Department of Earth and Atmospheric Sciences, University of Houston (2/1/2013)
- Department of Earth and Ocean Sciences, University of South Carolina (2/4/2013)
- College of Marine Science, University of South Florida (2/11/2013)
- Texas A&M Oceanography Department, Texas A&M (2/14/2013)
- Geophysical Laboratories Seminar, Carnegie Institution of Washington (11/13/2012)
- EAWAG (Swiss Federal Institute of Aquatic Science and Technology) (11/18/2012)
- AMS Seminar, ETH-Zürich (10/26/2011)
- Oceanography Department Seminar, University of Washington (4/2010)
- Marine Science Institute Seminar, University of Texas at Austin (2009)

OCEANOGRAPHIC EXPEDITIONS

- 2020. Carbon at Cayman. 26-day cruise with *ROV JASON* on the *R/V Atlantis* to collect samples from the Von Damm and Piccard Hydrothermal fields
- 2018. Chief Scientist. Lost City as an urban center for seafloor life. 24-day cruise with *ROV Jason* on the *R/V Atlantis* to collect fluid and rock samples from the Lost City Hydrothermal Field.
- 2015. Organic Geochemist. IODP Expedition 357: Atlantis Massif Seafloor Processes: Serpentinization and Life. 47-day sea-bed rock drilling on *RRS James Cook*
- 2008. Chief Scientist. Metabolisms of the Deep-sea. Metabolisms of deep-sea microbial communities Deep-ocean sampling via *R/V Sproul*.
- 2008 - 2009. Multiple cruises, sampling in the San Francisco Bay and Delta. Participant. *R/V Polaris*
- 2005. Visions. Participant. Juan de Fuca Ridge via *R/V Thompson* and *ROV JASON*
- 2005. Virtual Lost City. Participant. Lost City hydrothermal field via *R/V Ronald H. Brown* and the Institute for Exploration's *ROV Argus* and *Hercules*
- 2003. Lost City. Participant. Lost City hydrothermal field via *R/V Atlantis* and *DSV ALVIN*
- 2003. Life in Extreme Environments return cruise. Participant. Main Endeavour Field, Axial Seamount, and the Juan de Fuca flanks via *R/V Thompson* and *ROV JASON*
- 2002. Life in Extreme Environments. Participant. Main Endeavour Field, Axial Seamount, and the Juan de Fuca flanks via *R/V Thompson* and *ROV JASON*
- 2001. New Millennium Observatory. Participant. Axial Seamount via *R/V Ronald H. Brown* and *ROV ROPOS*
- 2000. Tidal Perturbations return cruise. Participant. Main Endeavour Field via *R/V Atlantis* and *DSV ALVIN* and *ROV JASON*
- 2000. Tidal Perturbations. Participant. Main Endeavour Field via *R/V Atlantis* with *DSV ALVIN* and *ROV JASON*

RESEARCH FUNDING

- 2019-2022. “Collaborative Research: Characterization of Subduction Channel Processes, Borehole Sampling at Active Serpentinite Mud Volcanoes on the Mariana Forearc” PI: G. Wheat (U. Alaska), Co-Is: J. Seewald (WHOI) and **S. Lang** (UofSC). Award: 1.1M total, \$269,692 to Lang
- 2018-2021 “Collaborative Research: Investigating the Fate of Carbon at an Ultraslow Spreading Center” PI: **S. Lang** Co-Is J. Seewald (WHOI) and T. McCollom (U. Colorado) Award: \$902,601 total, \$378,424 to Lang
- 2019-2024 “Reconciling Prebiotic Paradigms: Mapping Planetary Reality onto Experimental Strategies” PI: K. Rogers (RPI). Co-PIs: 12, including S. Lang (UofSC). Award: \$10M; \$290,924 to Lang. NASA - NAI
- 2018-2019 “Modifications to Large Volume Sampler for improved hydrothermal fluid sampling” PI: S. Lang (Subcontract from Alfred P. Sloan Foundation / Deep Carbon Observatory, via Marine Biological Laboratory) Award: \$35,840
- 2018-2021 “Groundwater sources of “new” N for benthic microalgal production in the South Atlantic Bight” (NSF Biological Oceanography) PI: J. Pinckney Co-Is: A. Wilson, **S. Lang** Award: \$992,461 total, \$163,142 to Lang
- 2018-2021 “The DEEP Project: Detecting Extraterrestrial Piezophiles in Ocean Worlds Analogs” (NASA – PSTAR) PI: K. Rogers (RPI). Co-PIs: K. Frank (UH) and **S. Lang** Award: Award: 1.1 M total, \$88,808 to Lang
- 2016-2017 “Direct Access to the Serpentinite Subsurface: a Biogeochemical Investigation of Fluids to Characterize a Unique Habitat” (NSF Center for Dark Energy Biosphere Investigations) **PI: S. Lang** Award: \$79,972
- 2015-2016. “Sewage overflows from the 1000-year rain event and their impacts on the cycling of carbon and toxic metals in the Congaree river watershed.” (USC Office of Research Special Initiative to Address 1,000 Year Flood Event) PI: S. Rothenberg Co-PIs: **S. Lang**, M. Baalousha, M. Bizimis, B. Stangler Award: \$30,000 total, \$6,000 to Lang
2016. “Acquisition of Equipment for Preparing Compound Specific Radiocarbon Samples.” (USC Aspire III). PI: L. Ziolkowski Co-PIs: **S. Lang**, R. Benner Award: 76,387.76
- 2015-2020. “Collaborative Research: Investigating the Lost City as an ultramafic urban center of the seafloor, fueled by energy and carbon from the mantle” (NSF Biological Oceanography) Award: \$621,928 total with \$290,836 to USC, including supplement. **PI: S. Lang** Co-PIs: W. Brazelton, M. Lilley, D. Kelley, G. Früh-Green
- 2015-2017. “Offshore Participant Support for IODP Expedition 357: Atlantis Massif Seafloor Processes: Serpentinization and Life” (U.S. Science Support Office, International Ocean Discovery Program) Award: \$60,687. **PI: S. Lang**
- 2015-2016. “Bioenergetic influences upon carbon flow in alkaliphilic sulfate-reducing microbial populations with relevance to the subsurface biosphere at the Lost City Hydrothermal Field. (NSF Center for Dark Energy Biosphere Investigations) **PI: S. Lang**, Co-PI M. Schrenk. Award: \$110,000 total (with \$40,944 subcontract to Schrenk).
2015. “Amino acids as a reflection of chemolithoautotrophy, heterotrophy, and abiotic processes in diverse subsurface fluids” (Deep Life Initiative, Deep Carbon Observatory) **PI: S. Lang** Award: \$24,900
2014. “Early Career: Instrument and Technician Support for the Isotopic Analysis of Individual Organic Compounds in the Earth System” (National Science Foundation) Award: \$99,934. **PI: S. Lang**. Co-PIs: R. Benner and L. Ziolkowski.
- 2007 – 2009. “Investigating the Lower Trophic Levels of the Susiun Bay Food Web: A Biomarker-Specific Isotope Approach. (CALFED Science Fellows Program). Award: \$215,759 for salary and research. **PI: S. Lang** Co-PI: L. Aluwihare
2007. “Metabolisms of the Deep-Sea” (Scripps Institution of Oceanography). Award: 5 days of ship time **PI: S. Lang** (Chief Scientist) Co-PI: L. Aluwihare

STUDENTS MENTORED

Graduate Students

Madelyn Petersen, Ph.D. Mar. Sci. (9/2020-present) Nicholas Camper, M.S. Geol. Sci. (6/2016-5/2018)
Aaron Mau, M.S. Mar. Sci. (8/2019-12/2021) Tran Nguyen, M.S. Mar. Sci. (6/2016-5/2018)
Jessica Frankle, M.S. Geol. Sci. (1/2019-5/2021) Katherine Hickok, M.S. Geol. Sci. (6/2015-8/2018)

Undergraduate students

Claire Matta, Mar. Sci. (9/2020-present) Sedona Edgar, Geol. Sci. (1/2017 – 05/2017)
Jessica Rodgers, Mar. Sci. (05/2019–2022) Hannah Park, Mar. Sci. (09/2014 – 05/2017)
John Freier, Mar. Sci. (01/2018–09/2020) Alexandra Mele, Geol. Sci. (10/2014 – 05/2015)
Cameron Henderson, Mar. Sci. (09/2016 – 05/2019) Russel Kruger (Summer REU 2015)
Philip Fahy, Mar. Sci. (10/2015-05-2016)

TEACHING

Cultural Geology (GEOL 110; 400 non-majors) Chemical Ocean. (MSC 782; ~16 grad students)
Earth Systems Through Time (GEOL 305; ~30 majors) Isotope Biogeochem. (GEOL 715; ~8 grad students)

PROFESSIONAL SERVICE

National Service

Board Member, Advisory and Planning Board of National Ocean Sciences Accelerator Mass Spectrometry (NOSAMS)

Meeting organizer:

Co-Chair, Southeastern Biogeochemistry Symposium 2019
Session co-organizer, Goldschmidt Conference 2014

Proposal Panel Service: Panel Chair, NASA Habitable Worlds Program; Panelist, NSF Chemical Oceanography

Proposal reviewer: NASA, National Science Foundation (Chemical Oceanography, Marine Geology & Geophysics, Geobiology and Low temperature geochemistry), Gordon and Betty Moore Foundation, American Chemical Society, C-DEBI

Manuscript reviewer: Nature Geosciences, PNAS, Geology, Geochimica et Cosmochimica Acta, Analytical Chemistry, Radiocarbon, G-cubed, Deep Sea Research, Limnology and Oceanography, Marine Chemistry, Rapid Communications in Mass Spectrometry, Journal of Geophysical Research, Analytica Chimica Acta, Continental Shelf Research, Chemical Geology, Estuary Science, Nature Communications, Scientific Reports, Geophysical Research Letters, Organic Geochemistry, ISME, Environmental Microbiology

University Service

University Service:

Faculty Senator (2017-2020)
College of Arts and Sciences Dean's Advisory Committee (2020-present)

Departmental Service:

Geology and Geophysics (G&G) Program Representative on the SEOE Faculty Committee (2019 – present)
Responsibilities include overseeing the G&G Program courses, curriculum, and hiring plans
Oversaw the unfortunate but necessary termination of the geophysics degree with unanimous approval of the faculty, including approval of replacement geophysics concentration
Search Committee (5 to date): SEOE director in 2020, 2018; Marine Microbial Ecologist; Geochronology; Chemical Oceanographer
Geology and Geophysics Undergraduate Students Committee (2020- present)
Geology and Geophysics Graduate Studies Committee (2014-2020)
Faculty Mentor (2 Assistant Professors)
Student advisory committees (8 M.S., 3 Ph.D.)

Presentations to prospective students and families (3-6 per year)
Round Table Participant: Faculty jobs for GEOL students
EOS Peer Review Committee

Public Service and Outreach:

Featured interview, Audible.com "A Grown-up Guide to Oceans"
TV appearance, Canadian Television Network's This Morning
Talk to Explorers Club, Greater Piedmont Chapter
Panelist, Climate change theater action, Presbyterian College
Laboratory tours, "Girls go for I.T.", summer camp for middle school girls