

Alyssa A. Carrell, Ph.D.
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Education

- 2014 PhD, School of Engineering, University of California, Merced
Dissertation: *Subalpine conifers host core endophytic bacteria conserved across sites and tree species.*
- 2009 BS, Biological Sciences with emphasis in computational biology, University of California, Merced (Graduated with honors)

Positions

- 2024-present *Research Association*, Biosciences Division, Oak Ridge National Laboratory
2019-2023 *Technical Professional*, Biosciences Division, Oak Ridge National Laboratory
2015-2019 *Postdoctoral Researcher*, Biosciences Division, Duke University and Oak Ridge National Laboratory
2009-2014 *Graduate Student Researcher*, Environmental Systems, University of California Merced

Peer-reviewed publications

- 2023 Herndon E, Richardson J, **Carrell AA**, Pierce E, Weston DJ. Sulfur speciation in *Sphagnum* peat moss modified by mutualistic interactions with cyanobacteria. *New Phytologist*. 2023. *In press*.
- Carrell AA**, Hicks BB, Sidelinger E, Johnston ER, Jawdy SS, Clark MM, Klingeman DM and Cregger MA, Nitrogen addition alters soil fungal communities, but root fungal communities are resistant to change. *Frontiers in Microbiology*. 2023.
- Carrell AA**, Clark M, Jawdy SS, Muchero W, Alexandre G, Labbé JL, Rush TA. Interactions with microbial consortia have variable effects in organic carbon and production of exometabolites among genotypes of *Populus trichocarpa*. *Plant Direct*. 2023.
- Moldovan OT, **Carrell AA**, Bulzu PA, *et al.* The gut microbiome mediates adaptation to scarce food in Coleoptera. *Environmental Microbiome*. 2023.
- Hogan JA, Labbé JL, **Carrell AA**, Franklin J, Hoyt KP, Valverde-Barrantes OJ, & Warren JM. Functional variability in specific root respiration translates to autotrophic differences in soil respiration in a temperate deciduous forest. *Geoderma*, 432, 116414. 2023.
- Healey AL, Piatkowski B, Lovell JT, Sreedasyam A, Carey SB, Mamidi S, Shu S, Plott C, Jenkins J, Lawrence T, Aguero B, **Carrell AA**, ... Shaw J. Newly identified sex chromosomes in the *Sphagnum* (peat moss) genome alter carbon sequestration and ecosystem dynamics. *Nature Plants*. 2023.

- Petro C, **Carrell AA**, Wilson RM, Duchesneua K, Noble-Kuchera S, Song T, Iversen CM, Childs J, Schwaner G, Chanton JP, Norby RJ, Hanson PJ, Glass JB, Weston DJ, Kostka JE. Climate drivers alter nitrogen availability in surface peat and decouple N₂ fixation from CH₄ oxidation in the *Sphagnum* moss microbiome. *Global Change Biology*. 2023.
- Roth SW, Griffiths NA, Kolka RK, Oleheiser KC, **Carrell AA**, Klingeman DM, Seibert A, Chanton JP, Hanson PJ, Schadt CW. Elevated temperature alters microbial communities, but not decomposition rates, during 3 years of *in situ* peat decomposition. *mSystems*. 2023.
- Lee JH, Burdick LH, Piatkowski B, **Carrell AA**, Doktycz MJ, Pelletier DA, Weston DJ. A rapid assay for assessing bacterial effects on *Arabidopsis* thermotolerance. *Plant Methods*. 2023.
- Sreedasyam A *et al.* (**Carrell AA**). JGI Plant Gene Atlas: an updateable transcriptome resource to improve functional gene descriptions across the plant kingdom, *Nucleic Acids Research*. 2023.
- Meena MG, Lane MJ, Tannous J, **Carrell AA**, Abraham PE, Giannone RJ, Ané JM, Keller NP, Labbé JL, Geiger AG, Kainer D, Jacobson DA, Rush TA, A glimpse into the fungal metabolomic abyss: Novel network analysis reveals relationships between exogenous compounds and their outputs, *PNAS Nexus*. 2023.
- 2022 **Carrell AA**, Lawrence TJ, Cabugao KGM, Carper DL, Pelletier DA, Lee JH, Jawdy SS, Grimwood J, Schmutz J, Hanson PJ and Shaw AJ. Habitat-adapted microbial communities mediate Sphagnum peatmoss resilience to warming. *New Phytologist*, 234(6), pp.2111-2125. 2022.
- Carrell AA**, Veličković D, Lawrence TJ, Bowen BP, Louie KB, Carper DL, Chu RK, Mitchell HD, Orr G, Markillie LM, Jawdy SS, et al. Novel metabolic interactions and environmental conditions mediate the boreal peatmoss-cyanobacteria mutualism. *The ISME journal*, 16(4), pp.1074-1085. 2022.
- Lenz RR, Shrestha HK, **Carrell AA**, Labbé J, Hettich RL, Abraham PE & LeBoldus JM, Proteomics reveals pathways linked to *Septoria* canker resistance and susceptibility in *Populus trichocarpa*. *Frontiers in Analytical Science*, 2. 2022.
- Rush TA, Tannous J, Lane MJ, Gopalakrishnan MM, **Carrell AA**, Golan JJ, Drott MT, Cottaz S, Fort S, Ané JM & Keller NP, Lipo-Chitoooligosaccharides induce specialized fungal metabolite profiles that modulate bacterial Growth. *Msystems*, 7(6), pp.e01052-22. 2022.
- Kristy B, **Carrell AA**, Johnston E, Cumming JR, Klingeman DM, Gwinn K, Syring KC, Skalla C, Emrich S and Cregger MA. Chronic drought differentially alters the belowground microbiome of drought-tolerant and drought-susceptible genotypes of *Populus trichocarpa*. *Phytobiomes Journal*, 6(4), pp.317-330. 2022.
- Piatkowski BT, Carper DL, **Carrell AA**, Chen IMA, Clum A, Daum C, Eloe-Fadrosch EA, Gilbert D, Granath G, Huntemann M, Jawdy SS, & Weston DJ. Draft metagenome

- sequences of the *Sphagnum* (Peat Moss) microbiome from ambient and warmed environments across Europe. *Microbiology resource announcements*, 11(10), pp.e00400-22. 2022.
- Dove NC, Carrell AA, Engle NL, Klingeman DM, Rodriguez M, Wahl T, Tschaplinski TJ, Muchero W, Schadt CW & Cregger MA. Relationships between Sphaerulina musiva Infection and the Populus Microbiome and Metabolome. *Msystems*, 7(4), pp.e00120-22. 2022.
- Schwartz GE, Muller KA, Rathore SS, Wilpieszski RL, **Carrell AA**, Cregger MA, Elias DA, Podar M, Painter SL & Brooks SC. Incorporating concentration-dependent sediment microbial activity into methylmercury production kinetics modeling. *Environmental Science: Processes & Impacts*, 24(9), pp.1392-1405. 2022.
- 2021 Lawrence TJ, Carper DL, Spangler MK, **Carrell AA**, Rush TA, Minter SJ, Weston DJ & Labbe JL. amPEPpy 1.0: a portable and accurate antimicrobial peptide prediction tool. *Bioinformatics*. 2021.
- Carrell AA**, Schwartz GE, Cregger MA, Gionfriddo CM, Elias DA, Wilpieszski RL, Klingman DM, Wymore AM, Muller KA & Brooks SC. Nutrient exposure alters microbial composition, structure, and mercury methylating activity in periphyton in a contaminated watershed. *Frontiers in Microbiology*. 2021.
- Dove NC, Klingeman DM, **Carrell AA**, Cregger MA & Schadt C. W. Fire alters plant microbiome assembly patterns: integrating the plant and soil microbial response to disturbance. *New Phytologist*, 230(6), 2433–2446. 2021.
- 2020 Carper DL, Lawrence TJ, **Carrell AA**, Pelletier DA & Weston DJ. DISCo-microbe: Design of an identifiable synthetic community of microbes. *PeerJ*. 2020
- 2019 **Carrell AA**, Kolton M, Glass JB, Pelletier DA, Warren MJ, Kostka JE, Iverson CM, Hanson PJ & Weston DJ. Experimental warming alters the community composition, diversity, and N₂ fixation activity of peat moss *Sphagnum fallax* microbiomes. *Global Change Biology*. 2019.
- Griffin EA, Harrison JG, Kembel SW, **Carrell AA**, Wright SJ, Carson PC. Soil macronutrients and plant host identity explain little variation in endophyte community composition: disturbance as an alternative explanation. *Journal of Ecology*. 2019.
- Nagy G, Velickovic D, Chu RK, **Carrell AA**, Weston DJ, Ibrahim YM, Anderton CR, Smith RD. Towards resolving the spatial metabolome with unambiguous molecular annotations in complex biological systems by coupling mass spectrometry imaging with structures for lossless ion manipulations. *Chemical Communications*. 2019.
- Winkler DE, **Carrell AA**, Jabis MD, Lubetkin KC, Yang Y, Kueppers LM, Response of alpine plant communities to climate warming In *Ecosystem consequences of soil warming* (ed Mohan. J., Academic Press, 2019).
- Veličković D, Chu RK, Carrell AA, Thomas M, Paša-Tolić L, Weston DJ, Anderton CR. Multimodal MSI in conjunction with broad coverage spatially resolved MS2 increases confidence in both molecular identification and localization. *Analytical Chemistry*. 2017.

- 2018 Timm CM, Carter KR, **Carrell AA**, Jun S, Jawdy SS, Velez JM, Gunter LE, Yang Z, et al. Abiotic stresses shift belowground *Populus*-associated bacteria toward a core stress microbiome. *Msystems*. 2018.
- Carper DL, **Carrell AA**, Kueppers LM, Frank AC. Bacterial endophyte communities in *Pinus flexilis* are structured by host age, tissue type, and environmental factors *Plant and Soil*. 2018.
- 2017 Velickovic D, Chu RK, **Carrell AA**, Thomas M, Pasa-Tolic L, Weston DJ, Anderton CR. Multimodal MSI in conjunction with broad coverage spatially resolved MS2 increases confidence in both molecular identification and localization. *Analytical Chemistry*. 2017.
- Cabugao KG, Timm CM, **Carrell AA**, Childs J, Lu TYS, Pelletier DA, Weston DJ, Norby RJ. Root and rhizosphere bacterial phosphatase activity varies with tree species and soil phosphorus availability in Puerto Rico tropical forest. *Frontiers in Plant Science*. 2017.
- Weston DJ, Turetsky MR, Johnson MG, **Carrell AA**, et al. The Sphagnum project: enabling ecological and evolutionary insights through a genus-level sequencing project. 2017.
- 2016 **Carrell AA**, Carper DL, Frank AC, Subalpine conifers in different geographic locations host similar foliar bacterial endophyte communities. *FEMS Microbiology Ecology*. 2016.
- Shaw AJ, Schmutz J, Devos N, Shu S, **Carrell AA**, Weston, D.J. The *Sphagnum* genome project: a new model for ecological and evolutionary genomics. *Genomes of photosynthetic organisms and fungi*. 2016.
- 2015 **Carrell AA** and Frank AC. Bacterial endophyte communities in the foliage of coast redwood and giant sequoia. *Frontiers in Microbiology*. 2015.
- 2014 **Carrell AA** and Frank AC. *Pinus flexilis* and *Piceae engelmannii*. share a simple and consistent needle endophyte microbiota with a potential role in nitrogen fixation. *Frontiers in Microbiology*. 2014.

Leadership and mentoring experience

- 2023-present Biological and Environmental Systems Science Directorate Strategic Planning committee member.
- 2022-2023 ORNL, served on Women in Science and Engineering (WISE) executive committee.
- 2021-present ORNL, senior mentor of technical team in the Biosciences Division
- 2018 Ecological Society of America Annual Meeting, New Orleans, LA. Co-organizer, organized oral session titled *Plant microbiomes in a Changing World*.
- 2016-2018 ORNL, mentored undergraduate students: Bennett Croft, Colleen Hulsey, and Samantha Votzke
- 2010-2014 UC Merced, mentored undergraduate students: Daniel Speljak, Jonna Danielsson, Caroline Stoor, Ashley Graham, Johnny Daliwal, and April Williams

Professional Service

- 2020 Served on Reimagine ORNL hiring committee for Bioscience Division
 2012-2014 Environmental Systems, Ecology and Evolution group, UC Merced. Co-organizer of graduate student and postdoc group to develop an ecology and evolution science community with a focus on career development.
 2011-2012 UC Merced Undergraduate Grossman Scholarship of Excellence Award, Life and Environmental Sciences, Selection Committee.

Funding contributions

- 2018-present Contributed data and text to a 6.5M per annum U.S. Department of Energy science focus area award to Oak Ridge National Laboratory on plant and
 2016-2017 PI for award sponsored by Oak Ridge National Laboratory Center for Nanophase Material Sciences titled, Determine the specificity of elemental and small molecule exchange in a plant-cyanobacteria symbiosis using TOF-SIMS and MALDI
 2016-2017 Co-PI for award sponsored by the Environmental Molecular Sciences Laboratory titled, Characterizing metabolite exchange and gene expression within a tripartite plant – fungus – cyanobacterium interaction using MALDI FTICR Mass Spectrometry Imaging and fluorescence-based techniques

Awards and Fellowships

- 2022 Biosciences Division Technical Excellence Award.
 2014 American Society of Microbiology Travel Grant (\$500)
 UC Merced Bobcat Fellowship Award (\$7,500)
 2013 UC Merced ES Summer Graduate Fellowship (\$10,000)
 2012 UC Merced GRC Summer Fellowship (\$7,500)
 New Phytologist Symposium Travel Grant (\$1200)
 UC Merced Graduate Division General Fellowship (\$3,855)
 UC Merced Faculty Mentor Program Fellowship (\$34,120)
 2011 UC Merced GRC Spring Fellowship (\$7,500)
 NSF Graduate Research Fellowship Program, Honorable Mention
 2010 UC Merced Graduate USAP Award (\$10,000)

Invited Presentations

Carrell AA, Carper DL, Pelletier DA, Shaw J, Weston DJ. Utilizing *Sphagnum* genomes to understand the underlying mechanisms of the plant-microbiome mutualism. Plant and Animal Genomes. San Diego, CA, January 2023.

Carrell AA, Pelletier DA, Weston DJ, *Sphagnum* peat moss microbiome interactions in a changing environment. NASA Kennedy Space Center. September 2022.

Carrell AA, Zivkovic T, Carper DL, Pelletier DA, Shaw J, Weston DJ. *Sphagnum* peat moss thermotolerance is modulated by the microbiome. Bryophyte and Lichen, June 2021

Carrell AA, Methods in metagenomics, Cumberland University, November 2019.

Carrell AA, Kostka JE, Kolton M, Glass J and Weston DJ, Experimental warming reduces diversity and functional potential of the *Sphagnum* microbiome. Ecological Society of America, New Orleans, LA, August 2018.

Carrell AA, Pelletier DA, Weston DJ, Defining a diazotroph and plant interaction from ecosystem to individual scales. Brookhaven National Lab, November 2016.

Carrell AA, Characterizing the *Sphagnum*-microbiome: From natural surveys to manipulation studies. Botany, Savannah, GA, August 2016

Carrell AA, The Diversity of Beneficial Bacteria in Forest Trees, University of California, Merced, Genome Biology (BIO 142), February 2013

Carrell AA, Frank AC. Diversity of Conifer Endophytic Bacteria, California State University Stanislaus Biology Colloquium, Turlock, CA, March 2012.

Carrell AA. What to Expect in Graduate School, Yosemite REU Summer Research Program, YNP, CA, June 2010.

Contributed Presentations

Carrell AA, Moore JAM, Carper DL, Michener JK, Muchero W, Abraham PE, Klingeman DM, Kristy B, Wymore AM, Clark MM, McLennan D, Vasileva D, Burdick L, Cregger MA. Biofertilizer additions have differential effects on microbiome composition and diversity across poplar genotypes. American Society of Plant Biology. 2023.

Carrell AA, Johnston E, Sideline E, Hicks B, Jawdy SS, Clark MM, Klingeman D, Difazio S, Cregger MA. Nitrogen fertilization alters belowground plant – microbe interactions in *Populus*. CBI Annual Science Meeting. 2022.

Carrell AA, Clark MM, Klingeman D, Jawdy SS, Cregger MA. Nitrogen fertilization alters belowground plant – microbe interactions in two *Populus* species. Ecological Society of America. 2022.

Carrell AA, Schwartz GE, Cregger M, Gionfriddo CM, Elias DM, Wilpiseski RL, Klingeman DM, Wymore AM, Muller KA, Brooks S. Microbial composition, structure, and mercury methylating activity are altered by nutrient exposure in periphyton in a contaminated watershed. Ecological Society of America, August 2021.

Carrell AA, Kostka JE, Kolton M, Glass J, Weston DJ. Experimental warming effects on microbial communities of *Sphagnum* moss., Yosemite Symbiosis Workshop, Wawona, CA, May 2016.

Carrell AA, Norby R, Walker A, Timm CM, Gu L, Childs J, Kostka J, Hanson PJ, Weston DJ. Investigating *Sphagnum* and its microbiome under warming stress: from gene to ecosystem level, Climate Change Science Institute Science Advisory Board Meeting, Oak Ridge, TN, March 2016.

Carrell AA, Carper DL, Frank AC. Taxonomic diversity and functional consistency in the foliar bacterial endophyte community of giant trees, Yosemite Symbiosis Workshop, Wawona, CA, May 2015.

Carrell AA, Carper DL, Frank AC. Consistent and persistent domination of a potential N₂-fixer across limber pine range., Yosemite Symbiosis Workshop, Wawona, CA, May 2014.

Carrell AA, Carper DL, Frank AC. Potential for aboveground endophytic N₂ fixation in

subalpine conifers revealed by 16S rRNA gene analysis, Yosemite Symbiosis Workshop, Wawona, CA, May 2014.

Carrell AA, Frank AC. Diversity and Distribution of Endophytic Bacteria in *Pinus flexilis* Foliage, Ecological Society of America, Portland, OR. August 2012. (poster)

Carrell AA, Frank AC. Diversity and Distribution of Endophytic Bacteria in *Pinus flexilis* Foliage, American Society of Microbiology, San Francisco, CA. June 2012. (poster)

Carrell AA, Frank AC. Diversity of Endophytic Bacteria in *Pinus flexilis* Foliage, New Phytologist Symposium, Rhodes, Greece. May 2012. (poster)

Carrell AA, Frank AC. Diversity of Endophytic Bacteria in *Pinus flexilis* Foliage, UC Merced Research Week, Merced, CA April 2012. (poster)

Carrell AA, Frank AC. Endophytic Symbionts of *Pinus flexilis* Seedlings of Different Elevations, Subalpine and Alpine Species Range Shifts with Climate Change Annual Meeting, Berkeley, CA, November 2011.

Carrell AA, Frank AC. Diversity of *Pinus flexilis* Endophytic Bacteria, Joint Genome Institute Microbial Genomics and Metagenomics, Walnut Creek, CA, September 2011. (poster)

Carrell AA, Frank AC. Microbial Symbionts of Coniferous Trees, Symbiosis Workshop, Yosemite, CA, April 2011. (poster)

Carrell AA, Frank AC. Microbial Symbionts of Coniferous Trees, UC Merced Research Week, Merced, CA, April 2011. (poster)

Carrell AA, Frank AC. Developing Methods to Study Microbial Symbionts of Conifers, Subalpine and Alpine Species Range Shifts with Climate Change Annual Meeting, Berkeley, CA, October 2010.