

## K. Taylor Cyle, PhD

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### RESEARCH AREA

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I am a biogeochemist who uses analytical chemistry to better understand the cycling of organic compounds in environmental contexts. So far, my research has focused on the use of both complex and simple substrates by soil microbial communities and how that process influences greenhouse gas production. I have used exometabolomics, stable isotopes, and spectroscopy to probe how microbial metabolism drives the formation of mineral-associated organic matter in soil and its subsequent stability. I am currently interested in using my skillsets to provide rigorous scientific support for needed climate solutions.

### PROFESSIONAL APPOINTMENTS

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<b>Assistant Academic Research Scientist</b> – Emory, Atlanta, GA	<i>09/2022-present</i>
<b>Postdoctoral Research Scholar</b> – NCSU, Raleigh, NC	<i>10/2021- 08/2022</i>

### EDUCATION

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<b>Ph.D. Soil Science</b> - Cornell University, Ithaca, NY GPA- 3.86 Advisor- Dr. Carmen Enid Martínez Committee – Dr. Ludmilla Aristilde, Dr. Daniel Buckley	<i>2015-2021</i>
<b>M.S. Soil Science</b> - University of Georgia, Athens, GA GPA- 3.95 Advisor- Dr. Aaron Thompson Committee – Dr. Nicholas Hill, Dr. Paul Schroeder	<i>2012-2015</i>
<b>B.S.E.S. Environmental Chemistry</b> - University of Georgia, Athens, GA <b>Minor in Environmental Soil Science</b> GPA- 3.57	<i>2008-2012</i>

### PEER-REVIEWED PUBLICATIONS

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- Hu, J., **Cyle, K. T.**, Miller, G., Shi, W. (2023) Water deficits shape the microbiome of Bermudagrass roots to be Actinobacteria rich. *FEMS Microbiology Ecology*. doi:<https://doi.org/10.1093/femsec/fiado36>
- Cyle, K.T.**, Klein, A., Aristilde, L., Martínez, C.E. (2022) Dynamic utilization of low-molecular-weight organic substrates across a microbial growth rate gradient. *Journal of Applied Microbiology*. doi:<https://doi.org/10.1111/jam.15652>
- Cyle, K.T.**, Klein, A., Aristilde, L., Martínez, C.E. (2020) Ecophysiological study of *Paraburkholderia* sp. 1N under soil solution conditions: Dynamic substrate preferences and characterization of carbon use efficiency. *Applied and Environmental Microbiology*. doi:10.1128/aem.01851-20:AEM.01851-20
- Wilhelm, R., **Cyle, K.T.**, Karasz, D., Martinez, C.E., Newman, J., Buckley, D. (2020) *Paraburkholderia solitsugae* sp. nov. and *Paraburkholderia elongata* sp. nov., phenolic acid-degrading bacteria isolated from forest soil and emended description of *Paraburkholderia madseniana*. *International Journal of Systematic and Evolutionary Microbiology*. doi: <https://doi.org/10.1099/ijsem.0.004387>
- Barcellos, D., **Cyle, K.T.**, Thompson, A. (2018) Faster redox fluctuations can lead to higher iron reduction rates in humid forest soils. *Biogeochemistry*, doi:10.1007/s10533-018-0427-0
- Cyle, K.T.**, Hill, N., Young, K., Jenkins, T., Hancock, D., Schroeder, P.A., Thompson, A. (2016) Decomposition of high quality substrates drive the formation of silt and clay organic matter associations. *Soil Biology and Biochemistry* 103, 138-148. doi: 10.1016/j.soilbio.2016.08.014
- Machmuller, M. B., Kramer, M. G., **Cyle, K. T.**, Hill, N., Hancock, D., & Thompson, A. (2015). Emerging land use practices rapidly increase soil organic matter. *Nature Communications*, 6. doi:10.1038/ncomms7995

#### MANUSCRIPTS SUBMITTED OR IN PREPARATION

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- Hu, J., **Cyle, K.T.**, Yuan, W., Shi, W. Unlocking the climate change mitigation potential of biochar composts: A biophysical mechanism to understand soil dependence. (Submitted) *Environmental Science & Technology*.
- Jensen, K., Duvall, E., **Cyle, K.T.**, da Ros, L., Frey, D., Goeghegan, E., Irons, M., Kreitinger, L., Mejia, C., Barriers to actionable environmental research: Lessons for early career scientists from the COVID-19 response. (Submitted) *Ecosphere*.
- Cyle, K.T.**, Martínez, C.E. The formation and stability of mineral-associated organic matter: Probing microbial necromass dynamics at the goethite surface. (In preparation) *Environmental Science & Technology*.
- Cyle, K.T.**, Babu, T., Martínez, C.E. Chemical extractions and exometabolomic analyses unravel differences in the biomolecular fingerprint of soil depth profiles of conventional and organically managed agroecosystems. (In preparation)
- Cyle, K.T.**, Babu, T., Martínez, C.E. Biomolecular fingerprint of dissolved organic matter in rhizosphere soils: effect of management, soil depth and plant growth stage. (In preparation)

#### RESEARCH PROJECTS

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**Soil Carbon and Greenhouse Gas Dynamics in a Vegetable Production System** *Present*

Assistant Academic Research Scientist – Emory University, Atlanta, GA

Principal Investigator: Dr. Debjani Sihi – debjani.sihi@emory.edu

Analytical Skills: Picarro G2508, EA Analyzer - NC Soil Argon, Shimadzu TOC/TN, Tecan Plate Reader

Technical Skills: Reproducible data processing as a team using R/RStudio and OneDrive CommOperator, PC400, Teamviewer, Multiplexer construction – soldering/electrical design, auto-chamber design, field deployment of mobile lab, lab management and protocol development, field coordination with farm manager, plot management through growing season

**Biochar Alteration of Soil Exometabolome** *10/2021 – 08/2022*

*Postdoctoral Research Scholar* – NC State University, Raleigh, NC

Principal Investigator: Dr. Wei Shi – wshi3@ncsu.edu

Analytical Skills: GC- $\mu$ ECD, LI-COR 870, UV-VIS, wet chemistry/colorimetry, filtration, UHPLC-MS in collaboration with NCSU-METRIC

Technical Skills: Reproducible data processing as a team using R/RStudio and Google Drive

**The Role of Microbial Metabolism on Organomineral Formation** *08/2015-08/2021*

*Graduate Research Assistant*- Cornell University, Ithaca, NY

Principal Investigator: Dr. Carmen Enid Martinez – cem20@cornell.edu

Analytical Skills: ATR-FTIR, UV-VIS, GC-MS,  $^1\text{H}$  NMR, UHPLC-MS, Shimadzu TOC/TN, stable isotope probing ( $^{13}\text{C}/^{15}\text{N}$ ), wet chemistry/colorimetry, filtration, microbial cultivation, microbial isolation, PCR, 16S/ITS sequencing, SEM

Technical Skills: R/RStudio, Opus, XCalibur, UVProbe, Mnova, XCMS, MetaboAnalyst, MetaboQuest, ClassyFire

**Nitrogen Dynamics in the Tropics/Soil Ecosystem Services** *05/2015-08/2015*

*Field Assistant* - University of Georgia Research Station, San Luis, Costa Rica

Principal Investigator: Dr. Dorcas Franklin - dory.franklin@uga.edu

Analytical Skills: Wet Chemistry, UV-Vis, Titration, Field Sampling

**Impacts of Land Use Change on Carbon Dynamics in the SE US** *08/2011-05/2015*

*Graduate Research Assistant*- University of Georgia, Athens, GA

Principal Investigator: Dr. Aaron Thompson - aaront@uga.edu

Analytical Skills: Picarro G2201-I, Shimadzu TOC/TN, ICP-MS, AA spectroscopy, SEM-EDS, TEM, water retention curves, selective metal extractions, stable isotope probing (SIP –  $^{13}\text{C}/^{15}\text{N}$ ), field sampling, field gas measurements (LI-COR)

Technical Skills: JMP, SigmaPlot, Excel

**Iron Reduction Kinetics of Model Iron Oxides** *01/2011-05/2011*

*Internship Position*- University of Georgia, Athens, GA

Principal Investigator: Dr. Aaron Thompson - aaront@uga.edu

Analytical Skills: microbial cultivation, colorimetry, use of anaerobic glovebox

EMBL-MBI Metabolights Database – MTBLS3558: Dynamic utilization of low-molecular-weight substrates across a microbial growth rate gradient - under review  
EMBL-MBI Metabolights Database – MTBLS1692: Ecophysiological Study of *Paraburkholderia* sp. Strain 1N under Soil Solution Conditions: Substrate Preferences and Characterization of Carbon Use Efficiency - <https://www.ebi.ac.uk/metabolights/MTBLS1692>  
KBase - Public Narrative – Draft Genome Annotation - <https://narrative.kbase.us/narrative/55022>

## GRANTS

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USDA NIFA EWD Predoctoral Fellowship Grant <b>\$120,000</b>	2019-2021
Cornell CALS SNIPS Grant - (co-PI) <b>\$8,909</b>	2020
CSBC IGERT/Atkinson Center Small Grant: <b>\$7,600</b>	2016-2017
UGA CAES Undergraduate Research Grant: <b>\$500</b>	2012

## FELLOWSHIPS

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Cornell Fellowship; <b>\$28,430</b>	2017-2018
NSF CSBC IGERT Traineeship; <b>\$60,000</b>	2015-2017

## PROFESSIONAL SERVICE

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### Leadership:

Co-President of Cornell BESS-GSA	01/2017-08/2019
Treasurer of Cornell Soil and Crop Science GSA	01/2017-08/2018
Founding Officer of UGA-Agronomy Graduate Student Association	01/2013-05/2015
Webmaster of UGA-AGSA	01/2013-05/2015
Webmaster of Environmental Soil Chemistry Lab	08/2012-05/2015

### Teaching/Mentorship:

Sihi Lab Undergraduate Coordinator	09/2022-present
NCSU – WMEP Mentor	05/2022-07/2022
PROGRESS Mentor	10/2021-06/2022
Undergraduate Mentor (Manlin Jia)	08/2020-02/2020
Graduate TA for PLSCS 3650	01/2019-05/2019
Graduate TA for PLSCS 1900	08/2018-10/2018
Cornell Enviro-mentor	01/2016-12/2016
Graduate TA for Soil Chemistry (4670/6670)	01/2013-05/2013
Mentor for UGA/CAES Young Scholars Program	06/2013-07/2013

### Peer-Review:

Soil Biology and Biochemistry, SOIL, Plant and Soil, Vadose Zone Journal, PeerJ

### Membership:

American Geophysical Union (AGU)

Soil Science Society of America (SSSA)  
American Chemical Society (ACS)  
American Society for Microbiology (ASM)

## SELECTED PRESENTATIONS

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### Oral Presentations:

- Sihi, D., Cory, A., **Cyle, K.T.**, Wang, Zhuonan. *A continental view of the molecular composition of soil organic matter*. (Ecological Society of America, Portland, OR, 2023).
- Cyle, K.T.**, Martínez, C.E. *Role of microbial metabolism in the formation of mineral-associated organic matter* (Cornell University – SCS Section Seminar Series 2021)
- Cyle, K.T.**, Martínez, C.E. *Linking microbial substrate use efficiency (SUE) and the formation of mineral-organic associations* (Cornell University- SCS Section Seminar Series 2017)
- Cyle, K.T.**, Hill, N., Young, K., Jenkins, T., Hancock, D., Schroeder, P.A., Thompson, A. *Substrate quality impacts on the formation of organomineral associations* (University of Delaware- Departmental Seminar, 2015)
- Cyle, K.T.**, Hill, N., Young, K., Jenkins, T., Hancock, D., Schroeder, P.A., Thompson, A. *High quality substrates drive the formation of mineral organic associations in a sandy Ultisol* (UGA-CSS Departmental Seminar, 2015)
- Cyle, K.T.**, Hill, N., Young, K., Jenkins, T., Hancock, D., Schroeder, P.A., Thompson, A. *From grass to manure: How does digestion affect decomposition and SOM formation?* (UGA: Plant-Soil Symposium, 2014)

### Poster Presentations:

- Sihi, D. Cory, A. Zheng, J. **Cyle, K.T.**, Davidson, E., Megonigal, P., Weintraub, M., Cardon, Z., Thomas, S. *Simulating greenhouse gas fluxes across the terrestrial-aquatic interface: A spatially explicit approach*. (Environmental Science System Meeting, Bethesda, MD, 2022)
- Cyle, K. T.**, Hu, J., Shi, W. *Biochar-manure co-compost application: Understanding how biochar pyrolysis temperature and application rate impact CO<sub>2</sub> and N<sub>2</sub>o missions across a soil texture gradient*. (Soil Science Society of America, Baltimore, MD, 2022)
- Cyle, K.T.**, Klein, A., Aristilde, L., Martínez, C.E. *Linking substrate identity to the formation of mineral-associated organic matter in soils: A model systems approach* (American Geophysical Union, Virtual, 2020)
- Cyle, K.T.**, Klein, A., Aristilde, L., Martínez, C.E. *The role of substrate identity on the processing of low molecular weight carbon and nitrogen in soil solution* (American Geophysical Union, San Francisco, CA, 2019)
- Cyle, K.T.**, Martínez, C.E. *Investigating substrate use efficiency in soil-extracted, solubilized organic matter* (American Geophysical Union, New Orleans, LA, 2017)
- Cyle, K.T.**, Hill, N., Young, K., Jenkins, T., Hancock, D., Schroeder, P.A., Thompson *The effects of forage maturity and ruminal digestion on substrate decomposition and the formation of organomineral associations* (SOM6 International Workshop, Kiawah Island, SC, 2014)

## PROFESSIONAL TRAINING & OUTREACH

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Outreach Assistance to Beginning Farmers, Oxford Farm, GA	<i>April 15, 2023</i>
EMSL Summer School: Soils Exposed, PNNL	<i>July 18-22, 2022</i>
Teaching and Learning in the Diverse Classroom, Cornell University	<i>March – April, 2020</i>
Community Land Model (CLM) Tutorial, NCAR, Boulder, CO, USA	<i>September 12-16, 2016</i>
Summer Soil Institute, Colorado State University, Fort Collins, CO, USA	<i>June 14-28, 2014</i>

## AWARDS

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MacDonald-Musgrave Graduate Student Award – Cornell SCS Section	2020
2 <sup>nd</sup> Place-M.S. Category for Oral Presentations at UGA: Plant-Soil Symposium	2014
Mentor Award UGA-CAES Young Scholar Research Program	2013