

# Omics-Enabled Insights into the Metabolism of Freshwater Bacteria

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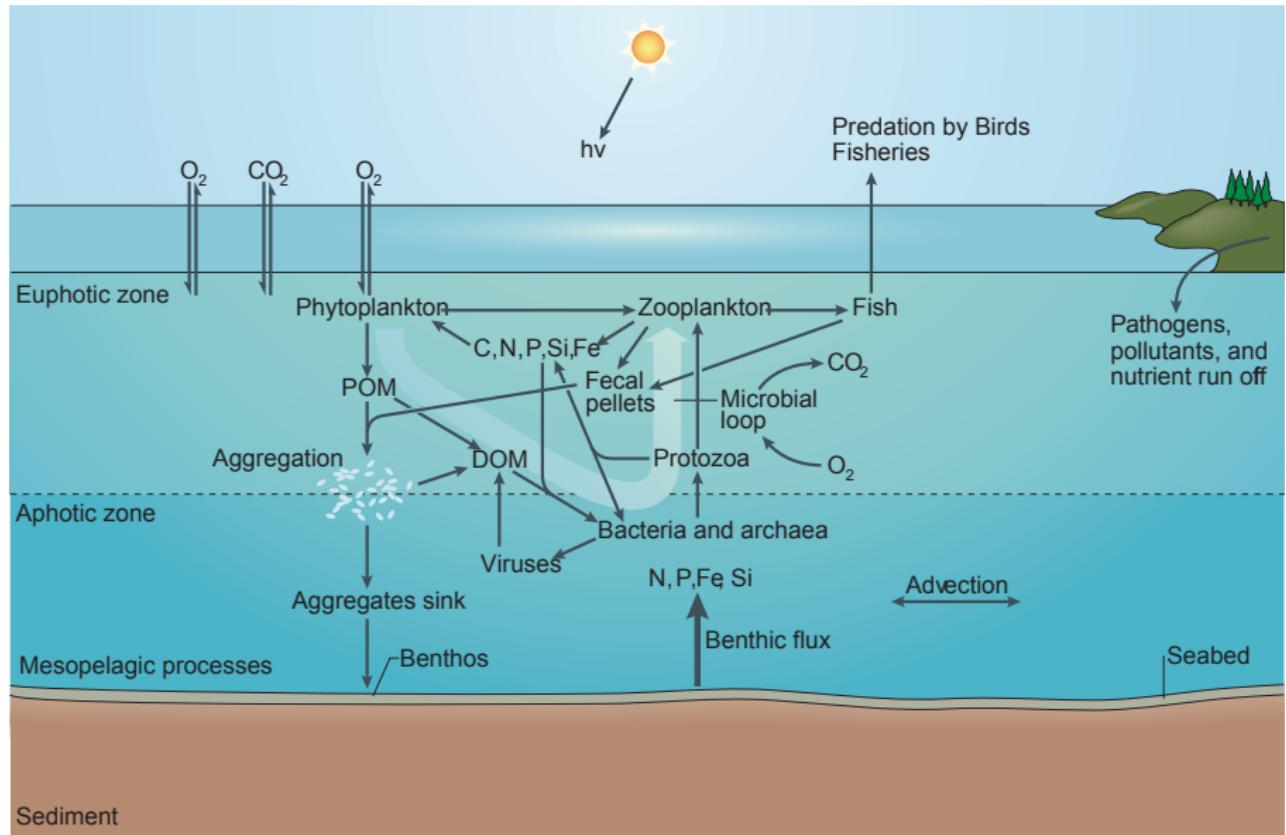


**WISCONSIN**

# Lake Mendota Affected by Eutrophication



# Microbes Contribute to Ecosystem Fluxes



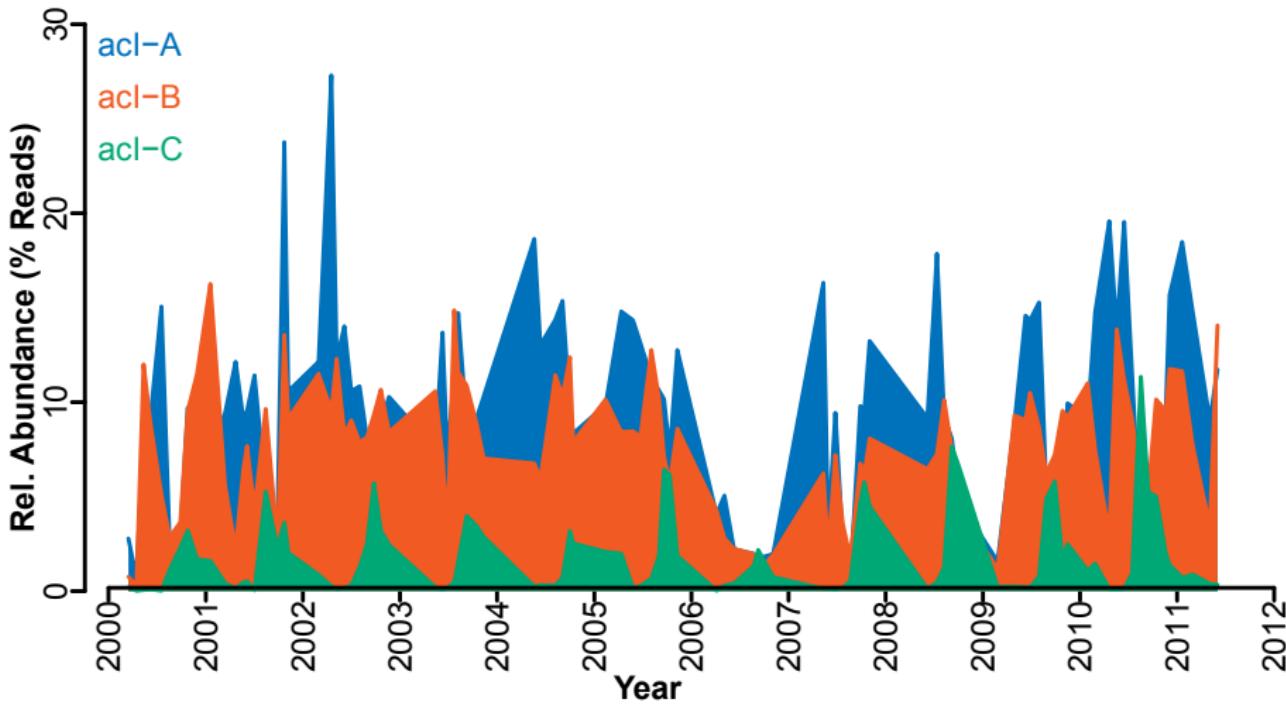
Bacteria play an  
important role in the  
carbon balance around  
freshwater ecosystems

# Long-Term Monitoring Yields a Data Smorgasbord



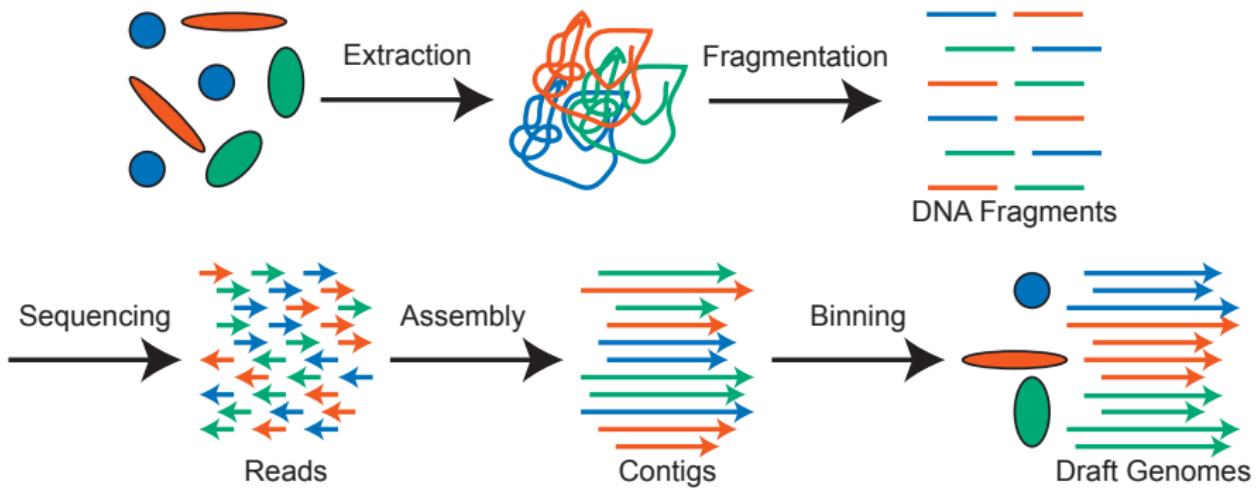
- 12 years (96 samples) of 16S rRNA gene sequences
- 5 years (92 samples) of shotgun metagenomes
  - Yielding 102 population genomes (MAGs)

# acl Dominate Lake Mendota

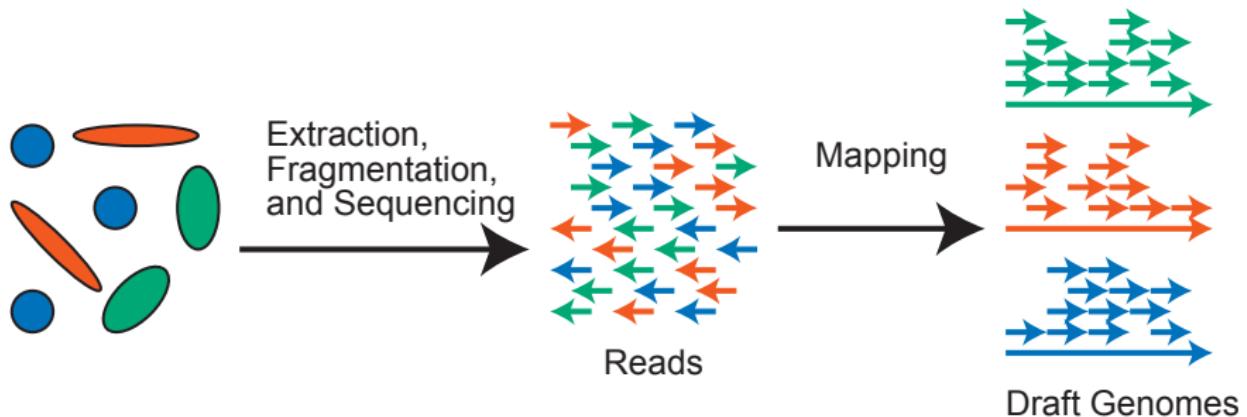


What traits allow the ac  
to dominate freshwater  
ecosystems?

# Microbes Studied via DNA Sequencing

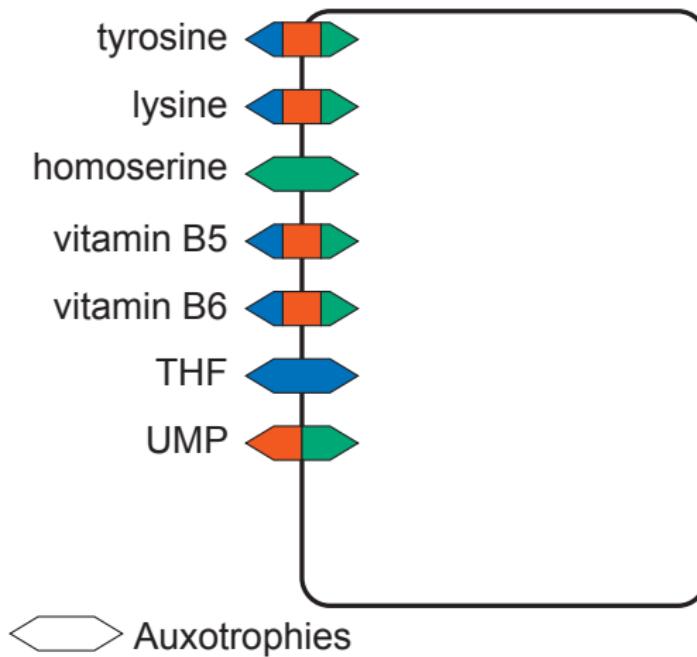


# RNA Sequencing Profiles Gene Expression



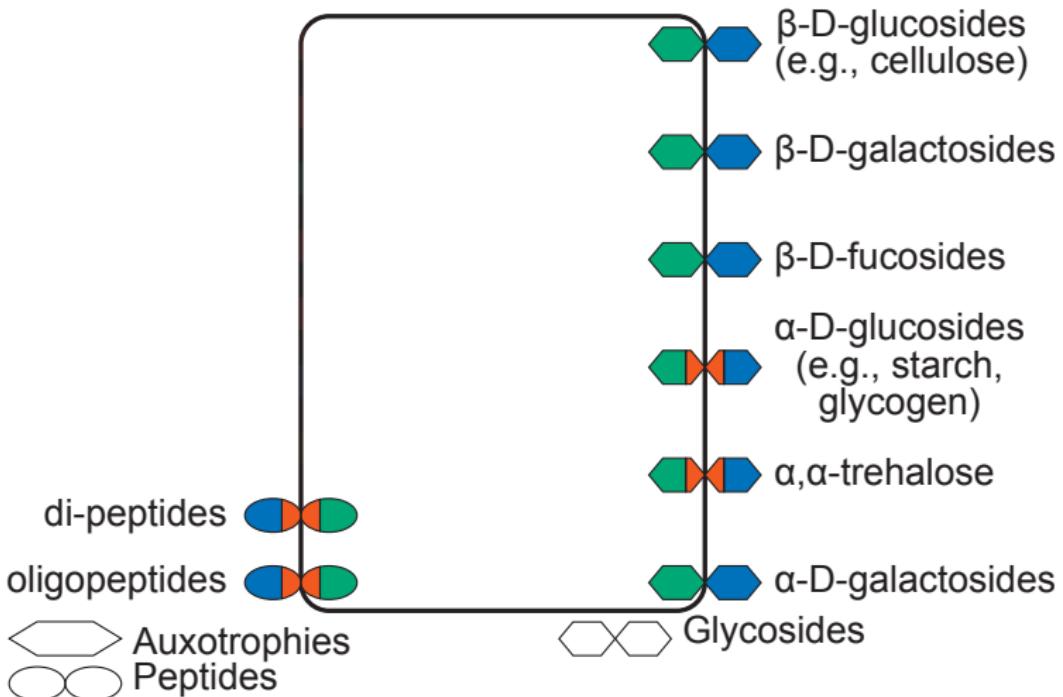
# Genome Streamlining Results in Auxotrophies

acl-A  
acl-B  
acl-C



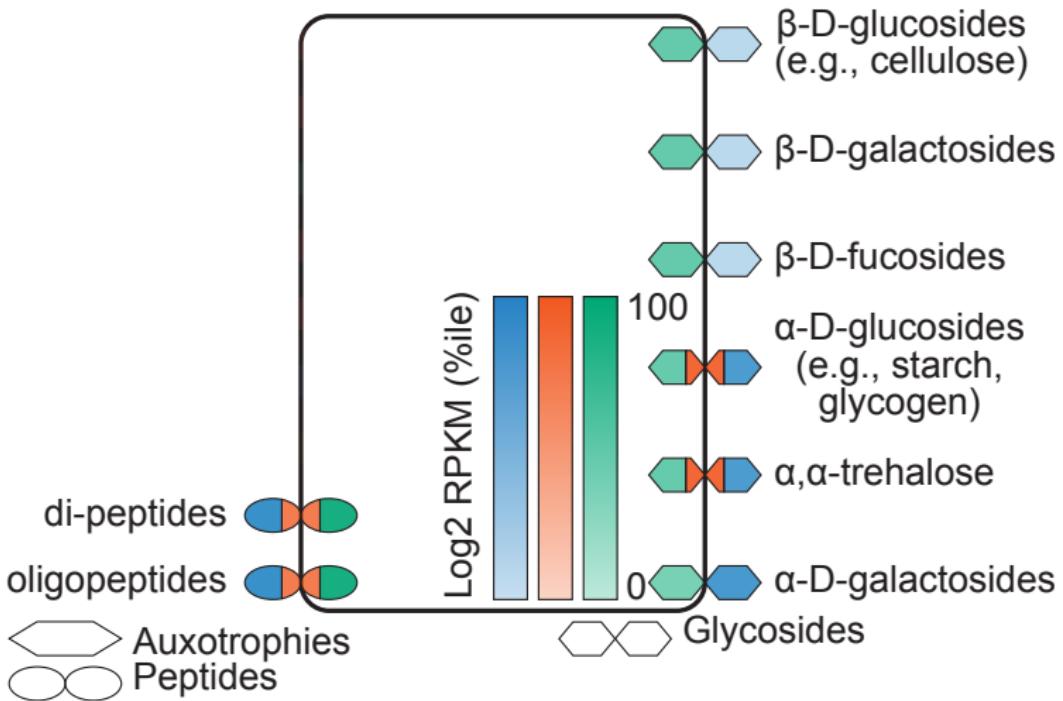
# acl Consume Amino Acids and Glycosides

acl-A  
acl-B  
acl-C

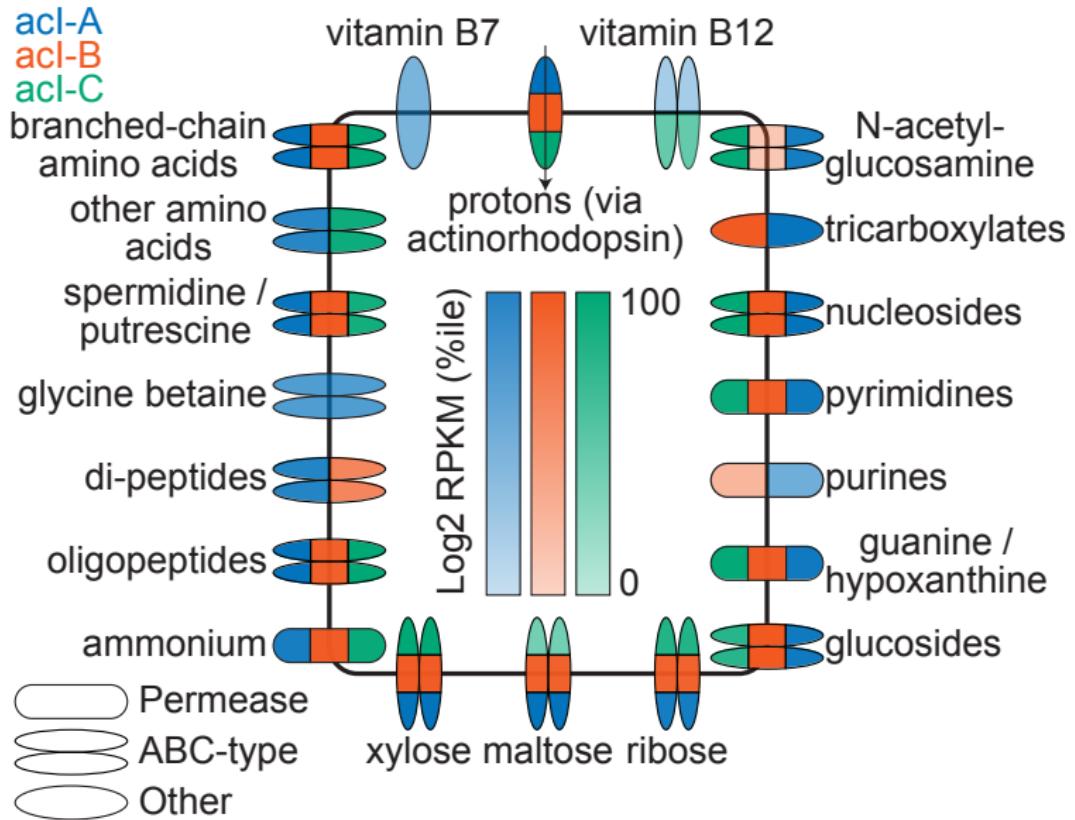


# acl Consume Amino Acids and Glycosides

acl-A  
acl-B  
acl-C



# acl Actively Transport Diverse Metabolites





# Conclusions

- acI specialize in N-rich compounds, simple sugars, and carbohydrates
- Differences among clades may underpin differences in abundance patterns



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- Differences among clades may underpin differences in abundance patterns
- The "passive yet successful" way of life is associated with expression of a wide array of transporters with broad substrate specificity
- Bacteria play an important role in nutrient cycling in all ecosystems

# Acknowledgements

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- Katherine McMahon
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## DOE JGI

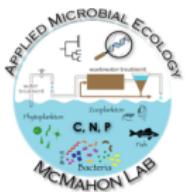
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## Bigelow Laboratory

- Ramunas Stepanauskas



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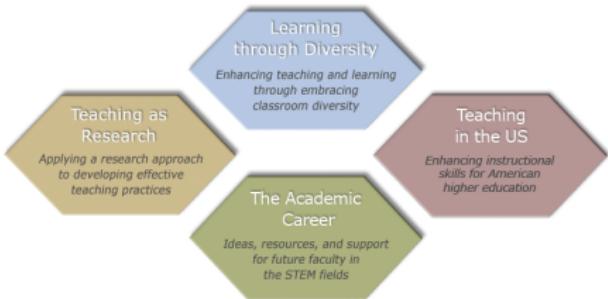
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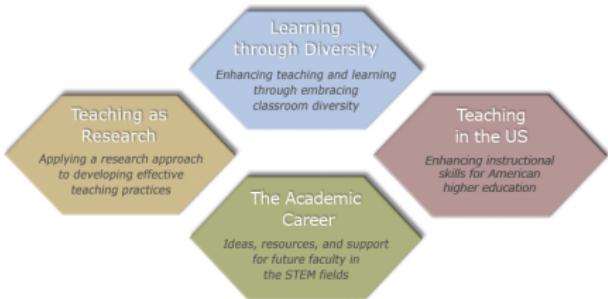
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## Teaching as Research

## Science of Teaching and Learning

Teaching is a science.

# Questions? Comments?

