

Diving into Freshwater Microbial Genomes to Infer Bacterial Traits

Joshua J. Hamilton

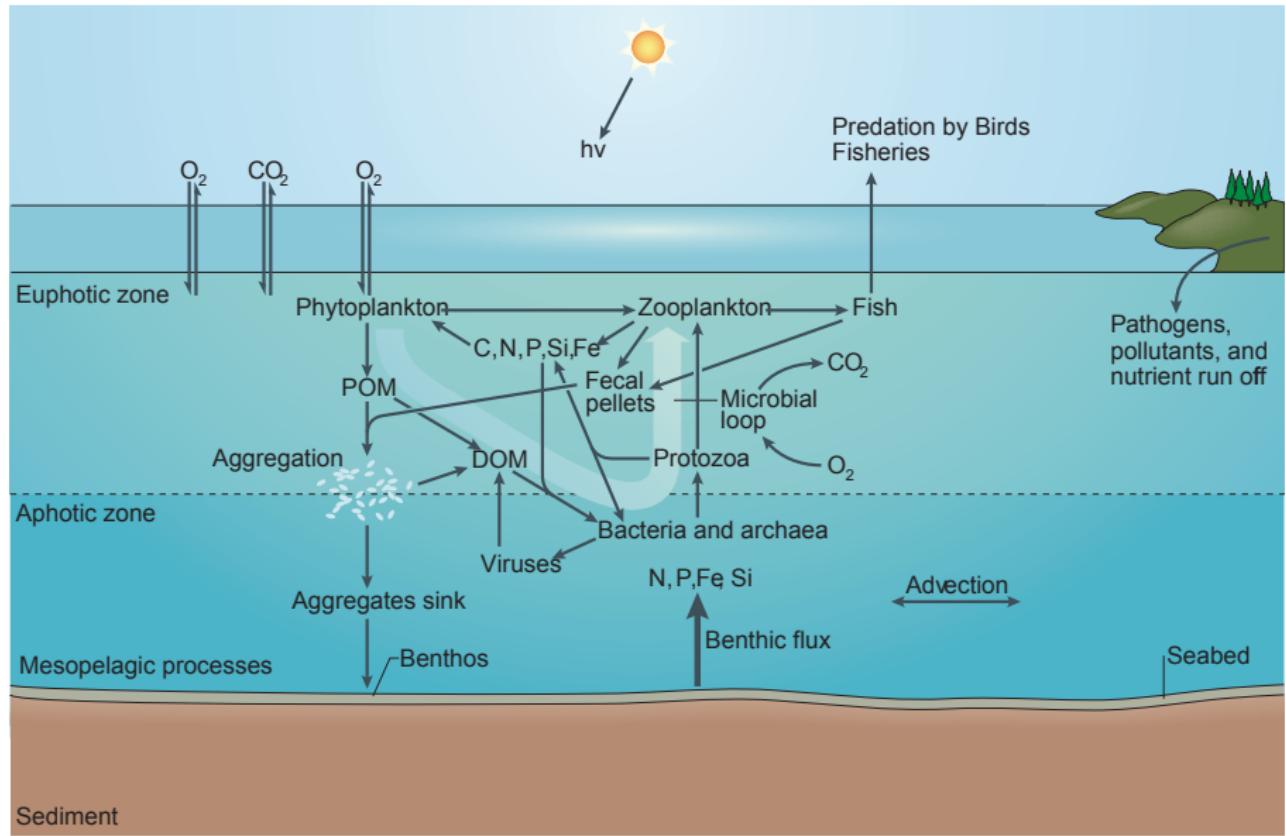
Department of Bacteriology

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WISCONSIN

Microbes Contribute to Ecosystem Fluxes



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



Lake Mendota



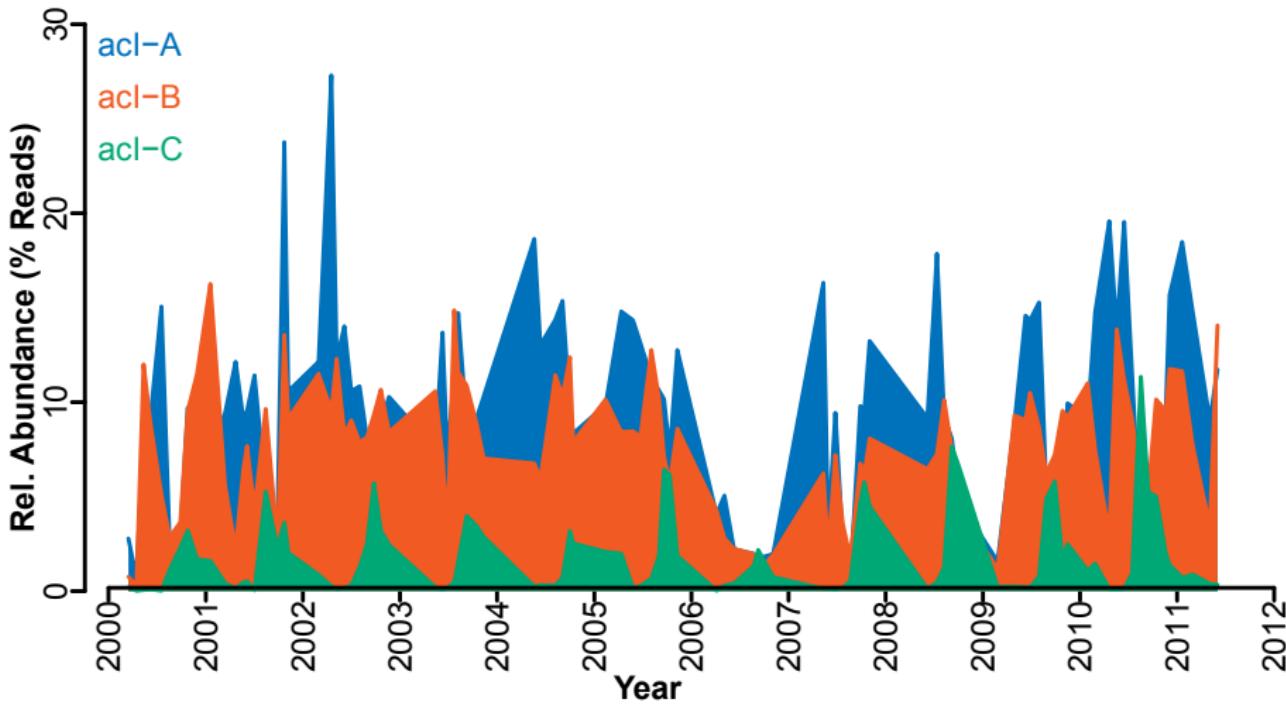
Long-Term Monitoring Yields a Data Smorgasbord



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

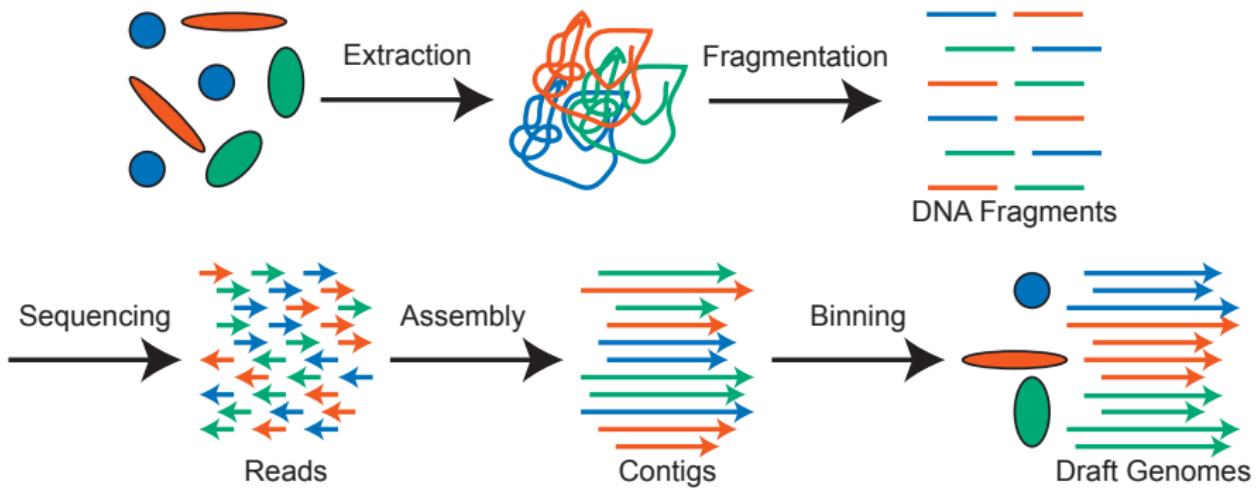


acl Dominate Lake Mendota

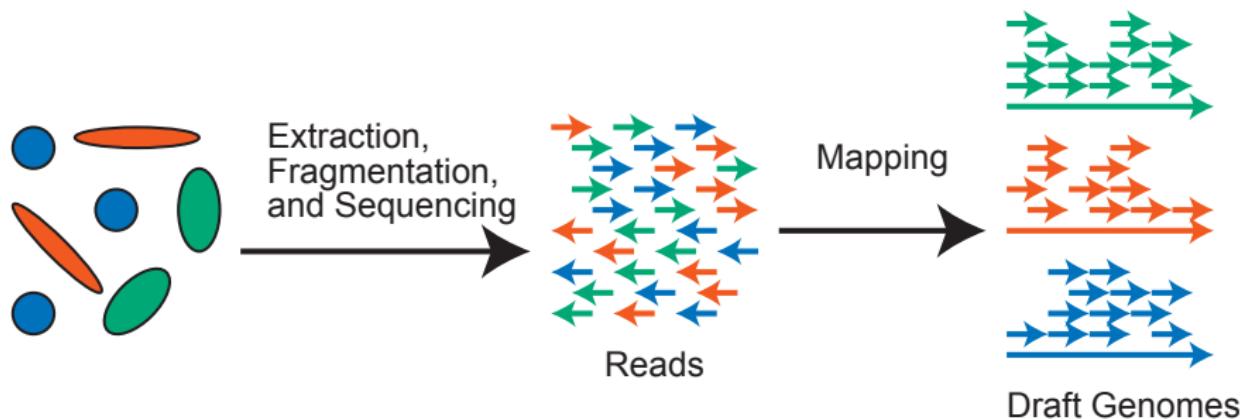


What traits allow the ac
to dominate freshwater
ecosystems?

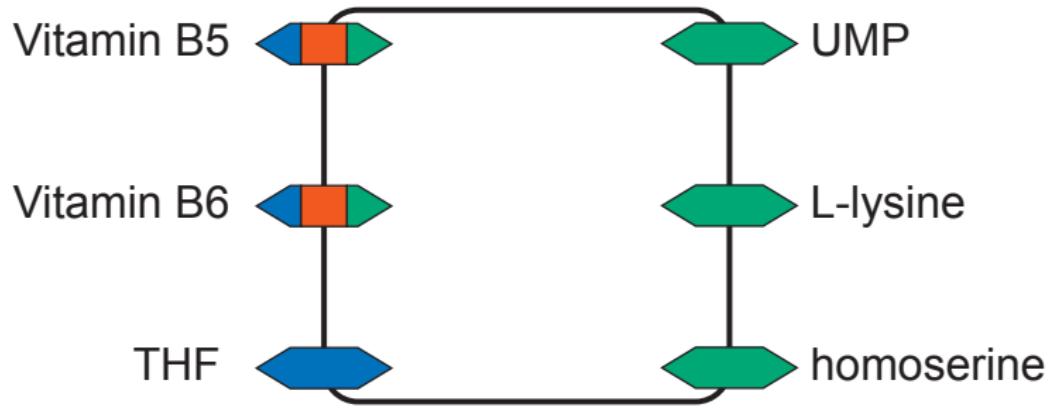
Microbes Studied via DNA Sequencing



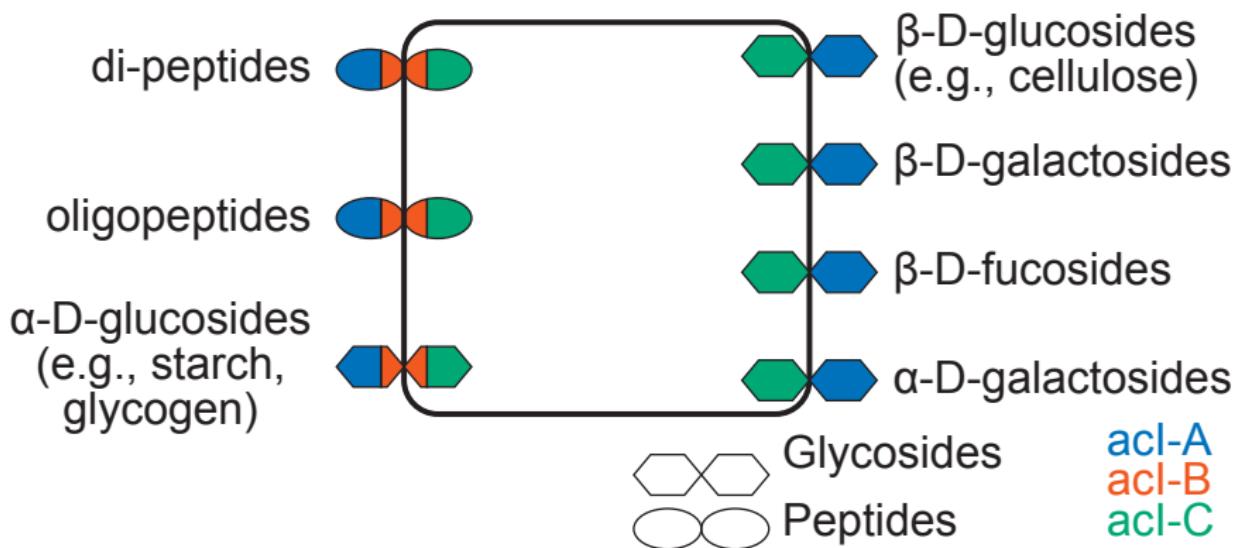
RNA Sequencing Profiles Gene Expression



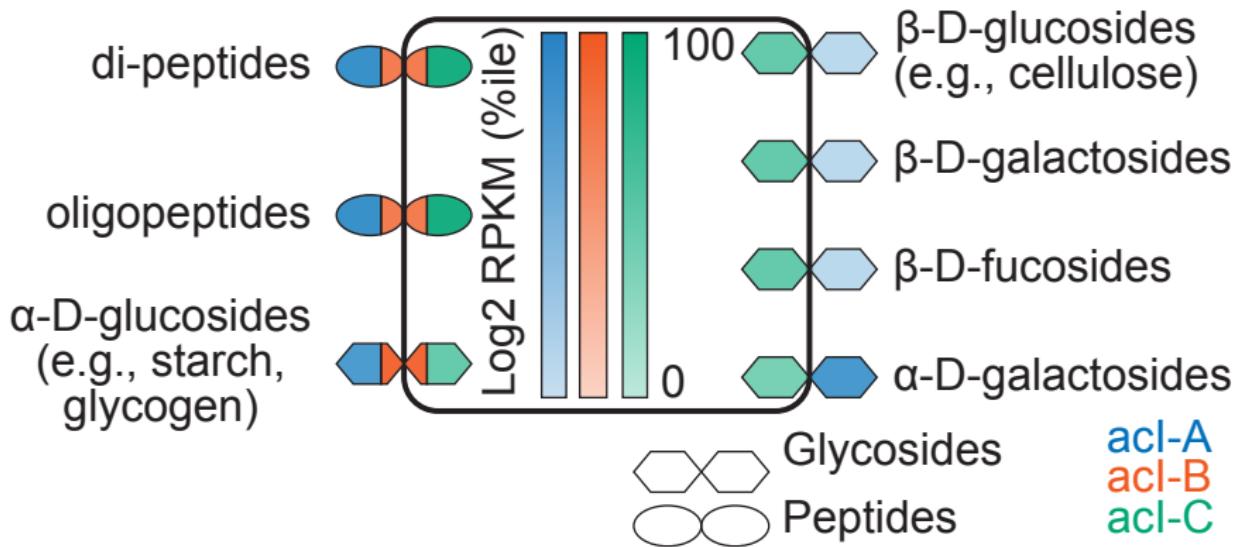
Genome Streamlining Results in Auxotrophies



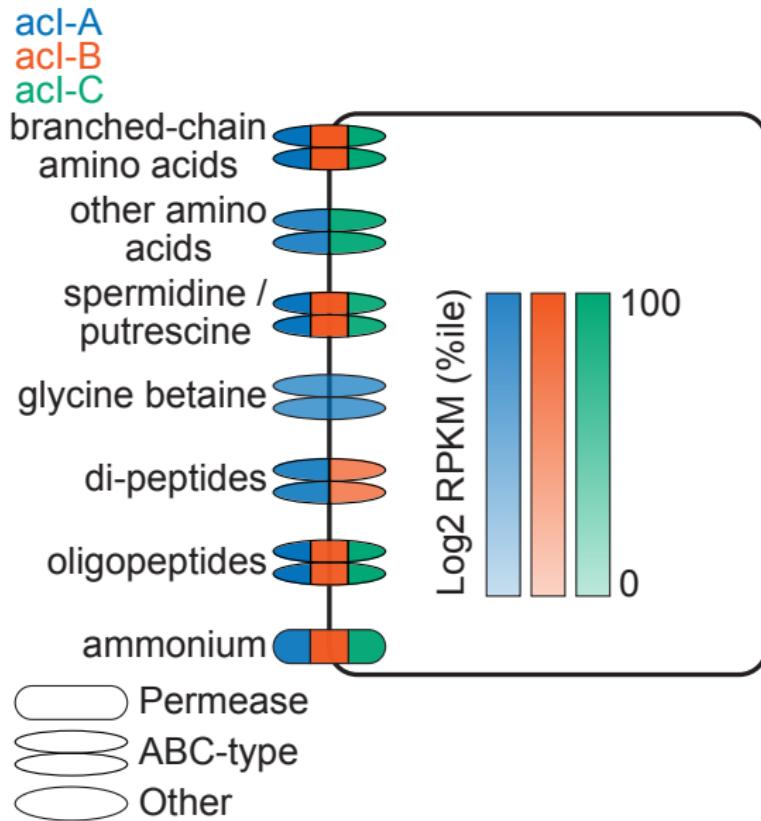
acl Consume Amino Acids and Glycosides



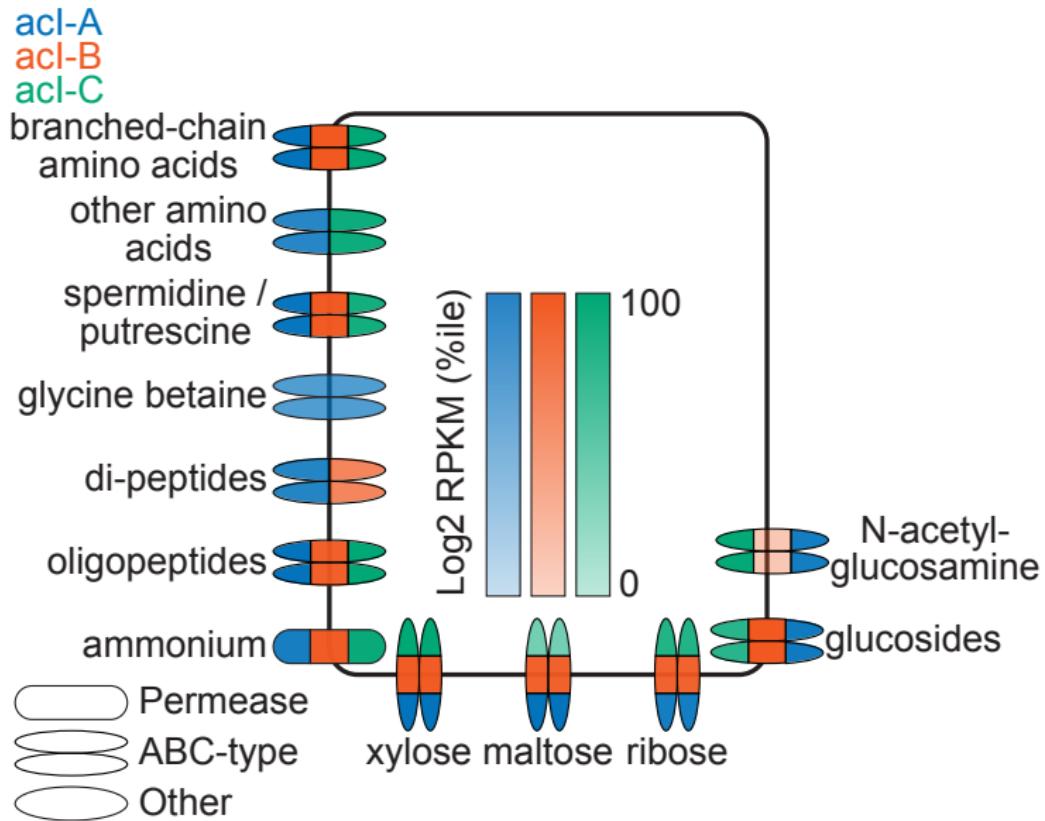
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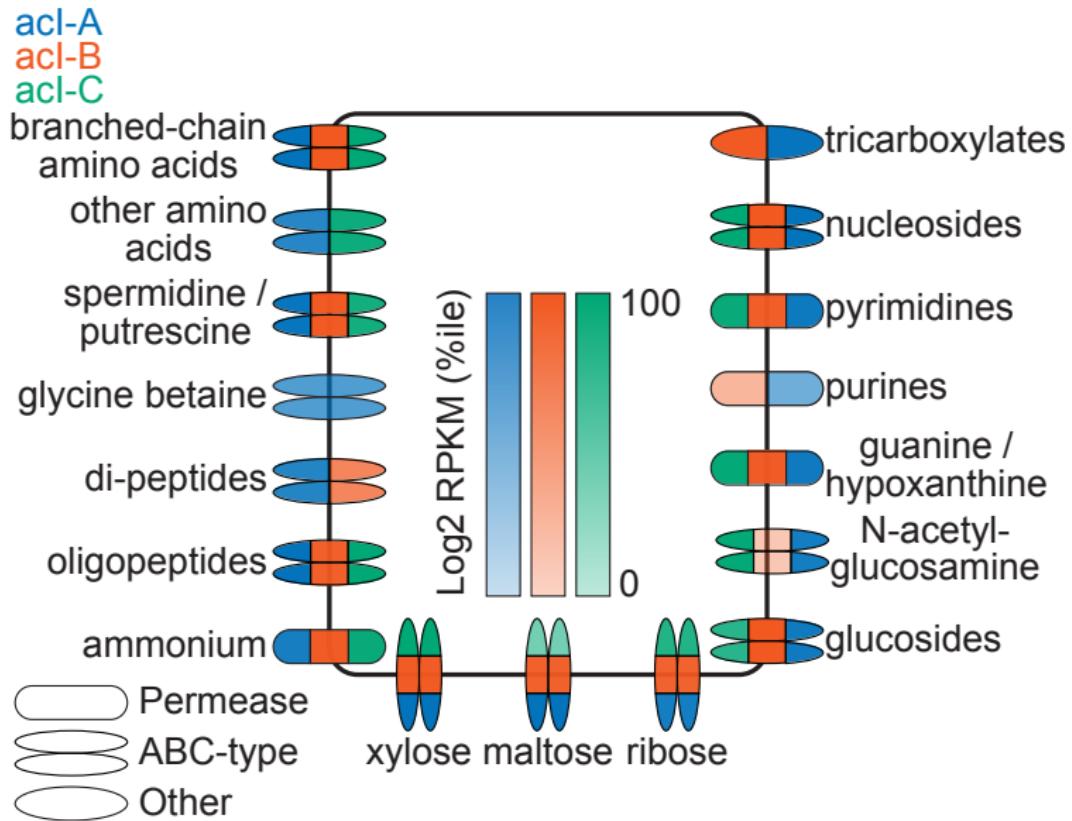
acl Actively Transport Diverse Metabolites



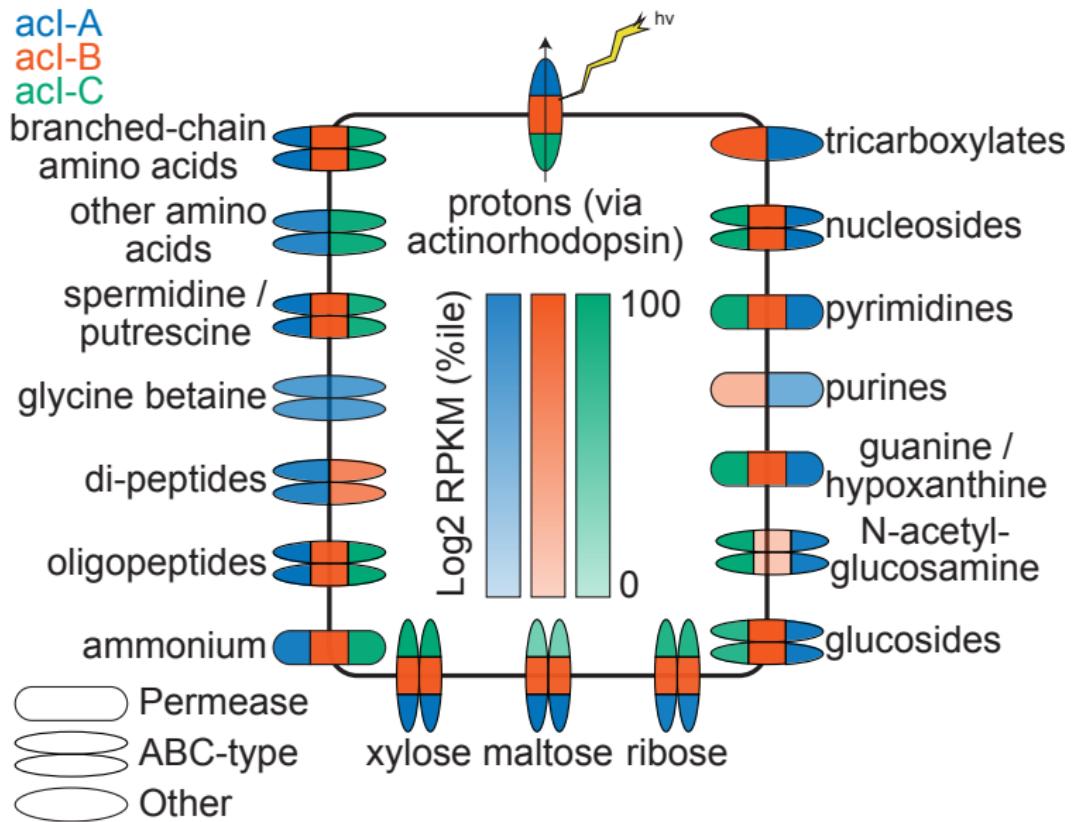
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acl Actively Transport Diverse Metabolites

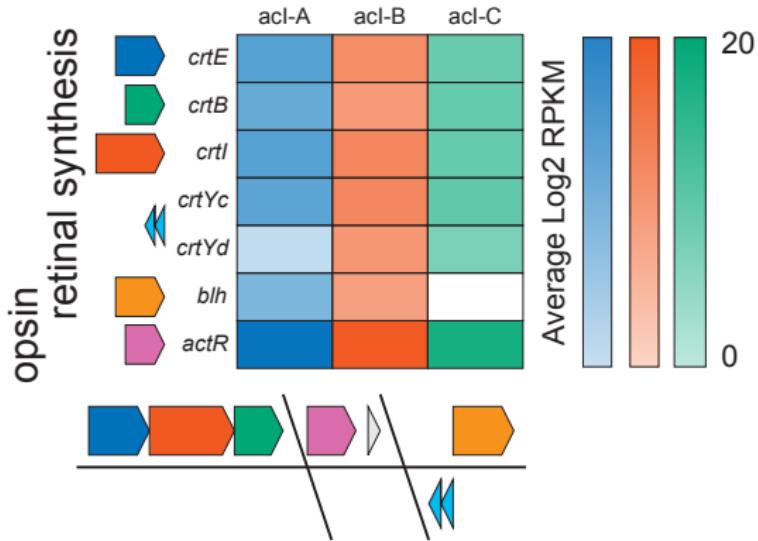


acl Actively Transport Diverse Metabolites



Actinorhodopsin: A Light-Sensitive Proton Pump

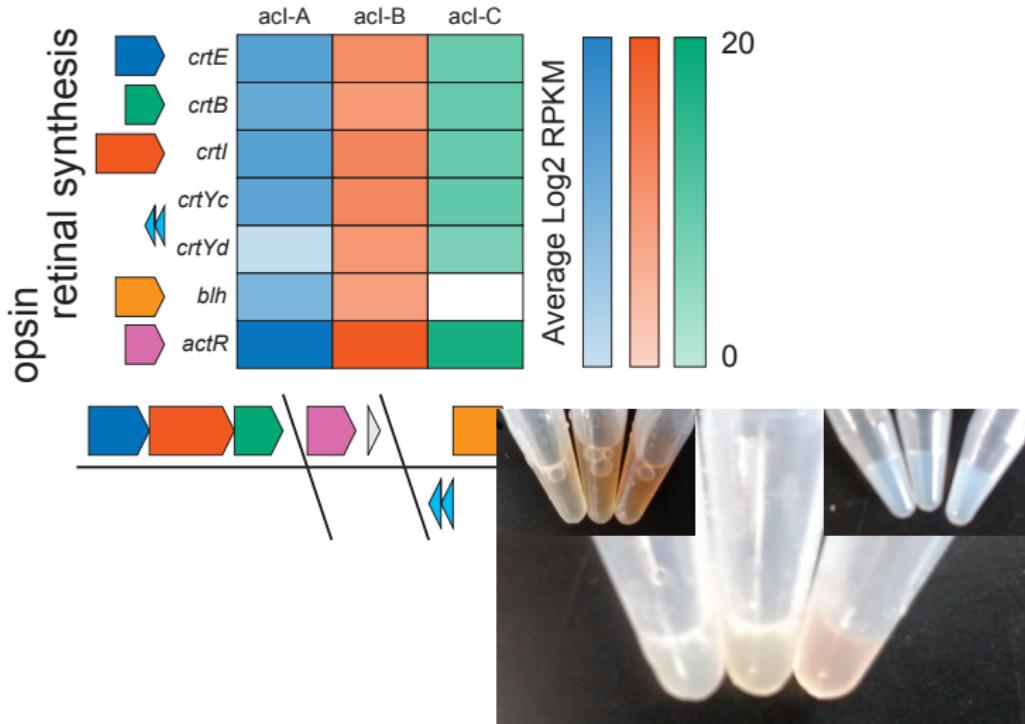
opsin + retinal = actinorhodopsin



with Katy Forest and Jeff Dwulit-Smith

Actinorhodopsin: A Light-Sensitive Proton Pump

opsin + retinal = actinorhodopsin



with Katy Forest and Jeff Dwulit-Smith



Conclusions

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



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- The "passive yet successful" way of life is associated with expression of a wide array of transporters with broad substrate specificity
- Photoheterotrophy may provide acl with energy to power its transporters



Conclusions

- acl specialize in N-rich compounds, simple sugars, and carbohydrates
- 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
- Photoheterotrophy may provide acl with energy to power its transporters
- Bacteria play an important role in nutrient cycling in all ecosystems

Acknowledgements

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- Katherine McMahon
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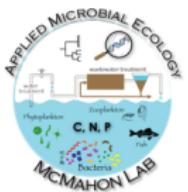
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Bigelow Laboratory

- Ramunas Stepanauskas



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Questions? Comments?

