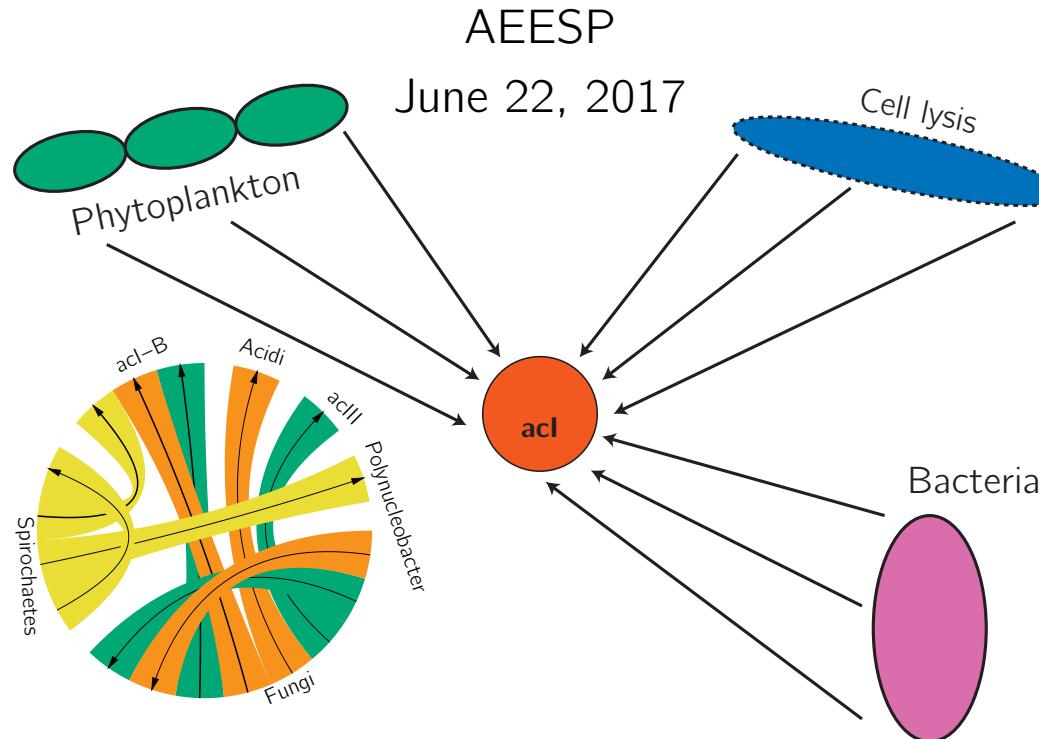


# Metabolic Network Analysis Elucidates Ecophysiology of a Cosmopolitan Freshwater Microbial Lineage

Joshua J. Hamilton

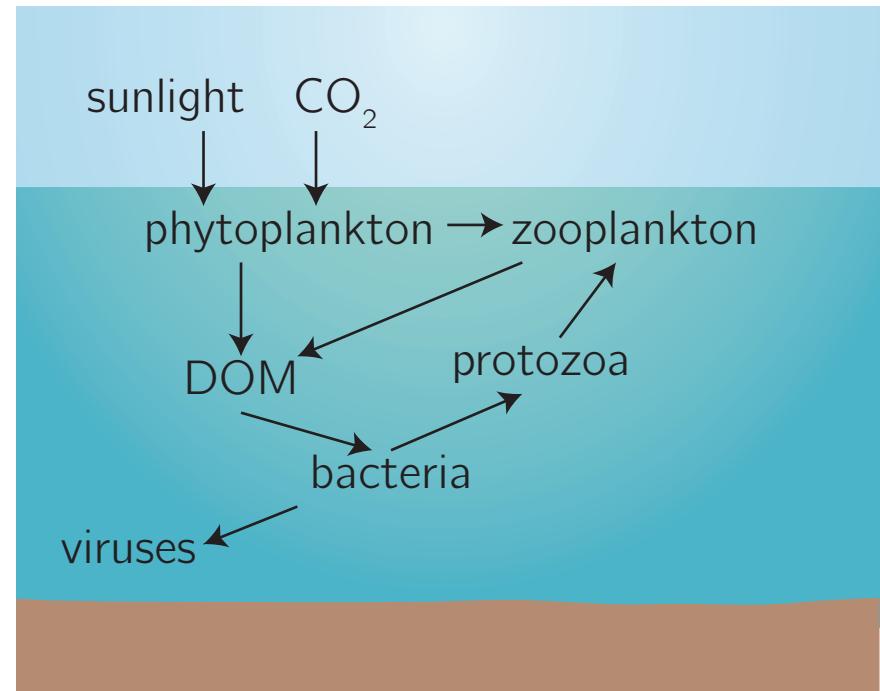
University of Wisconsin-Madison



# Process management through microbiology

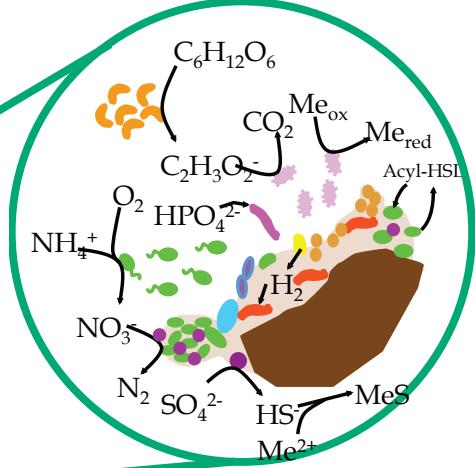
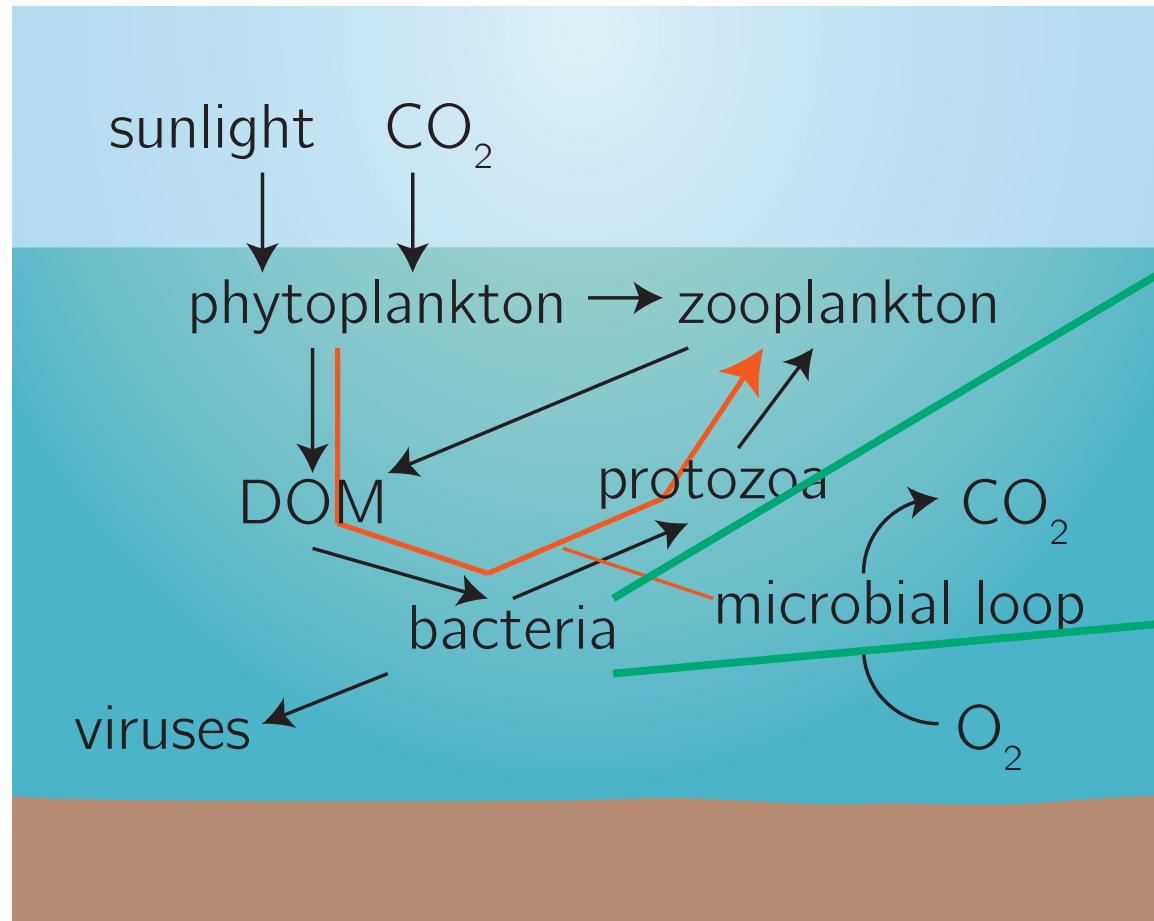


Environmental controls

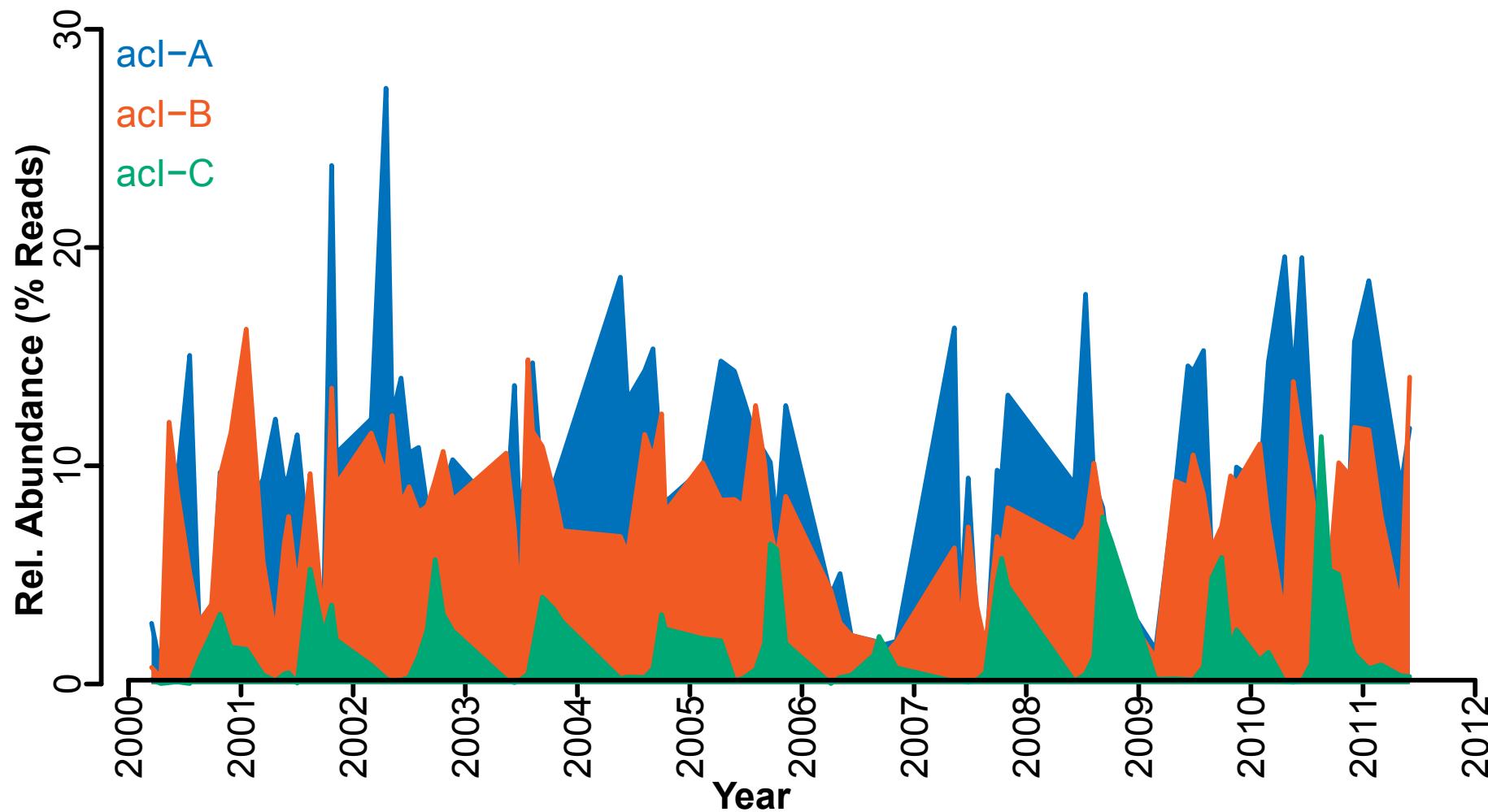


Microbial processes

# Microbial loop contributes to net ecosystem flux

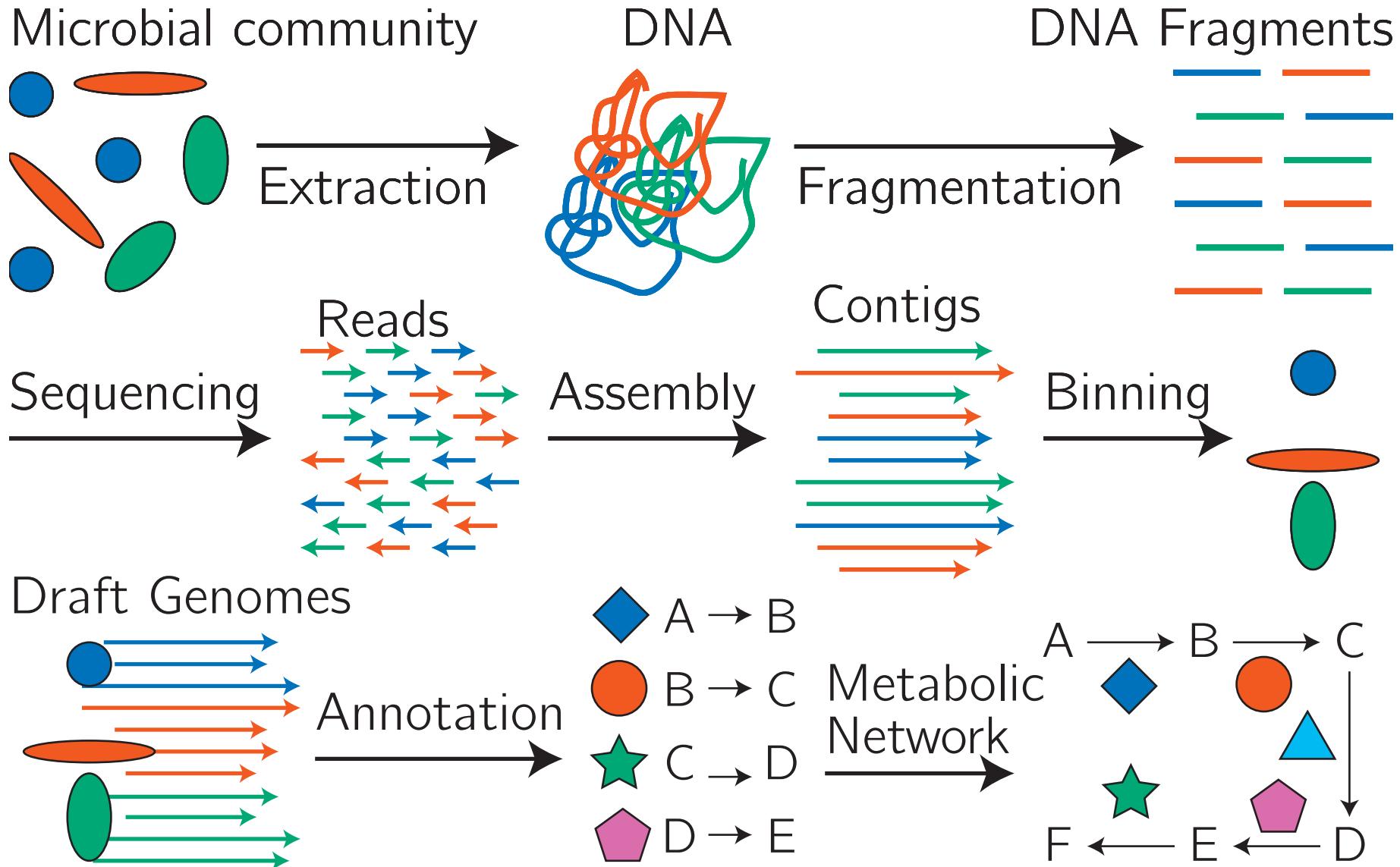


# Uncultivated acl bacteria dominate freshwater lakes

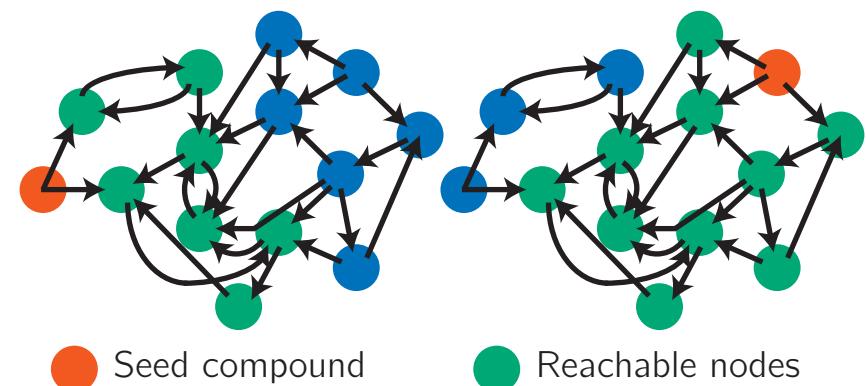
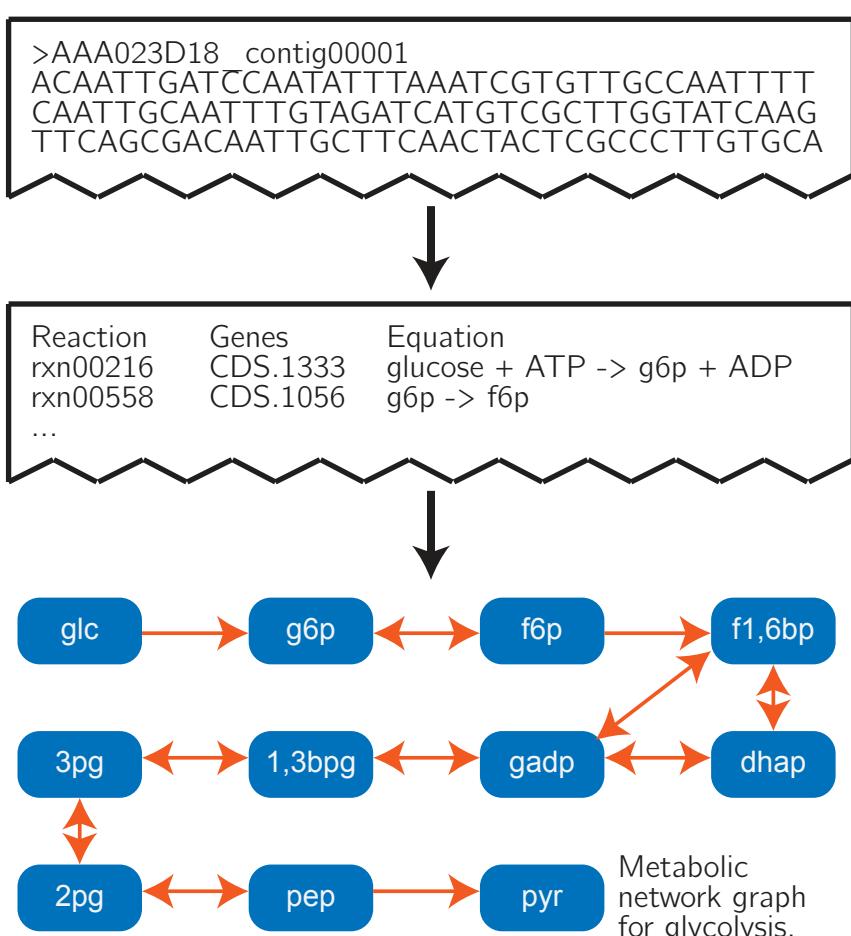


What metabolic traits allow acI to dominate freshwater ecosystems?

# DNA sequencing reveals microbial function



# Computing seed compounds from metabolic networks

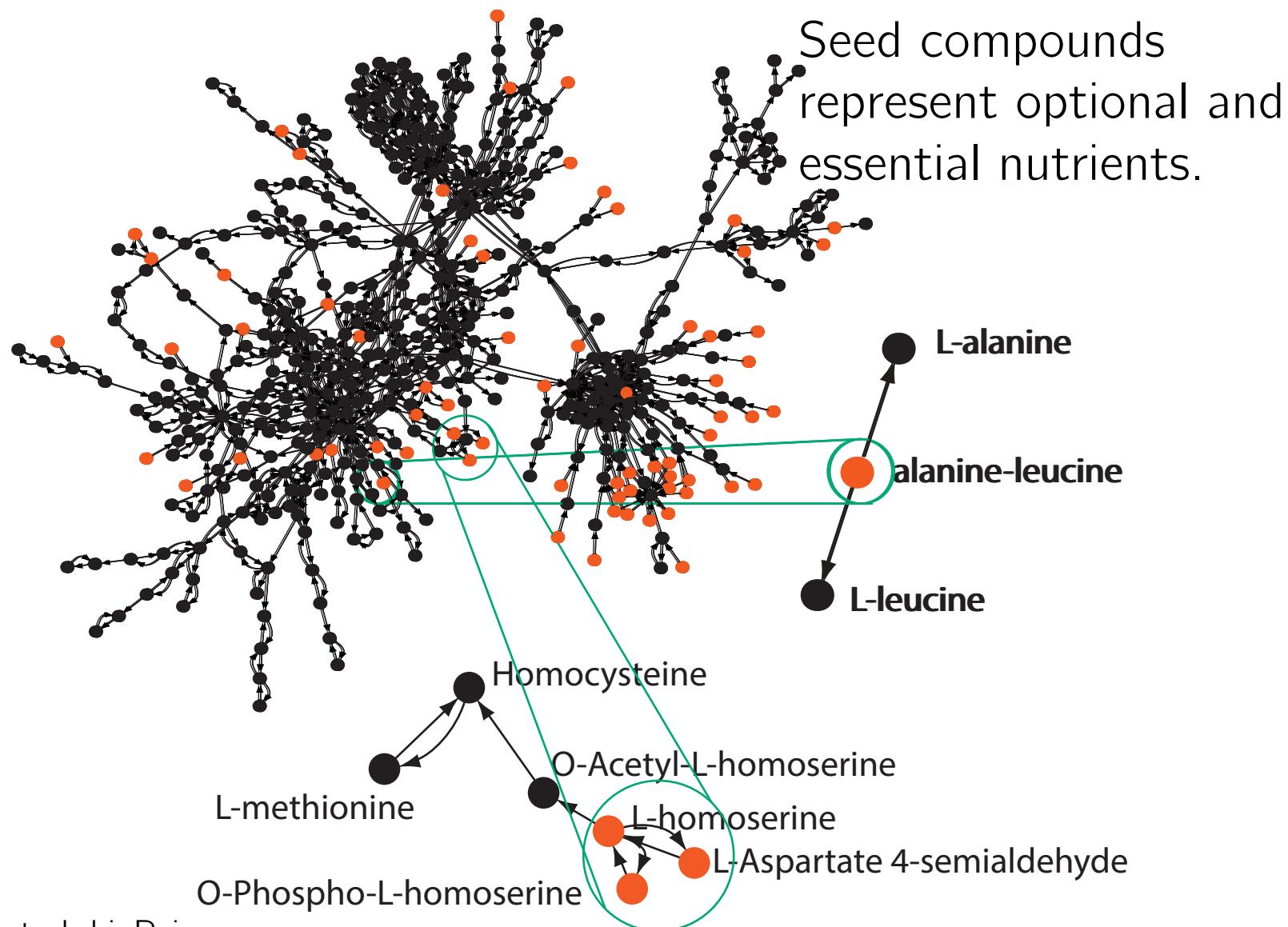


Seed compounds: the minimal set of compounds from which all others can be synthesized

Concept: Borenstein et al PNAS 2008

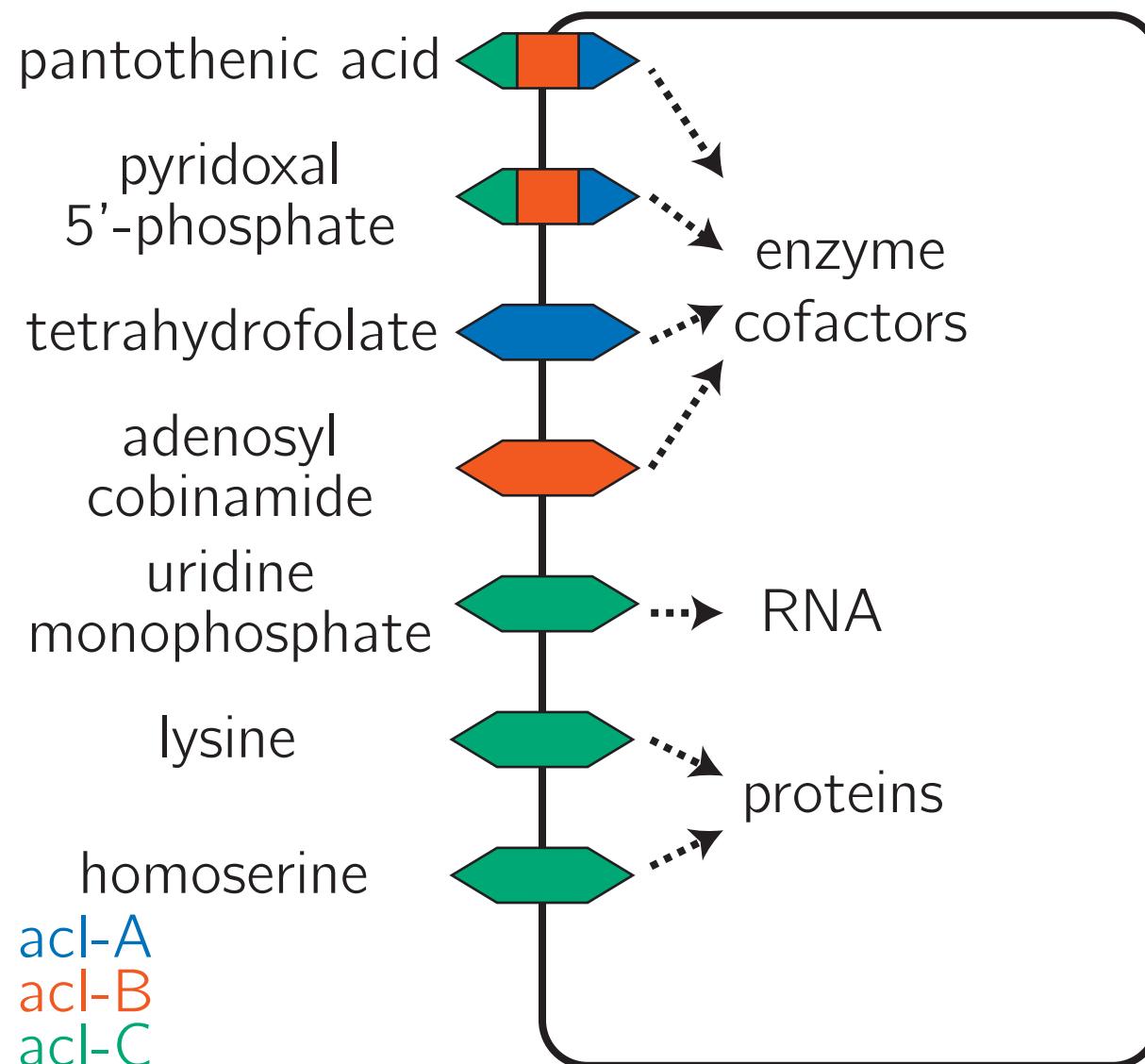
Software: <https://github.com/joshhamilton/reverseEcology>

# Seed compounds predict substrate uptake



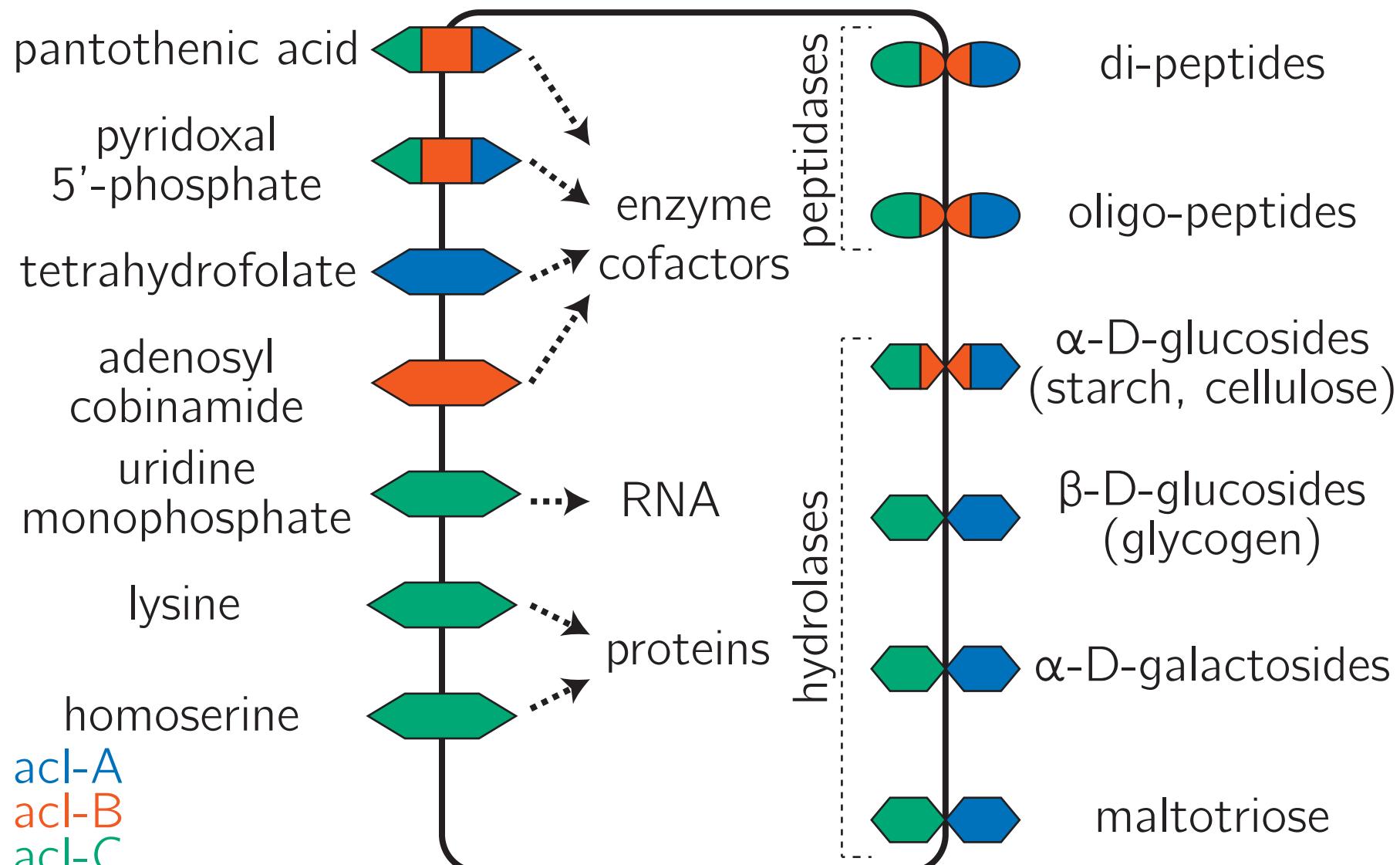
Hamilton et al, bioRxiv

# acI require nutrients from their environment



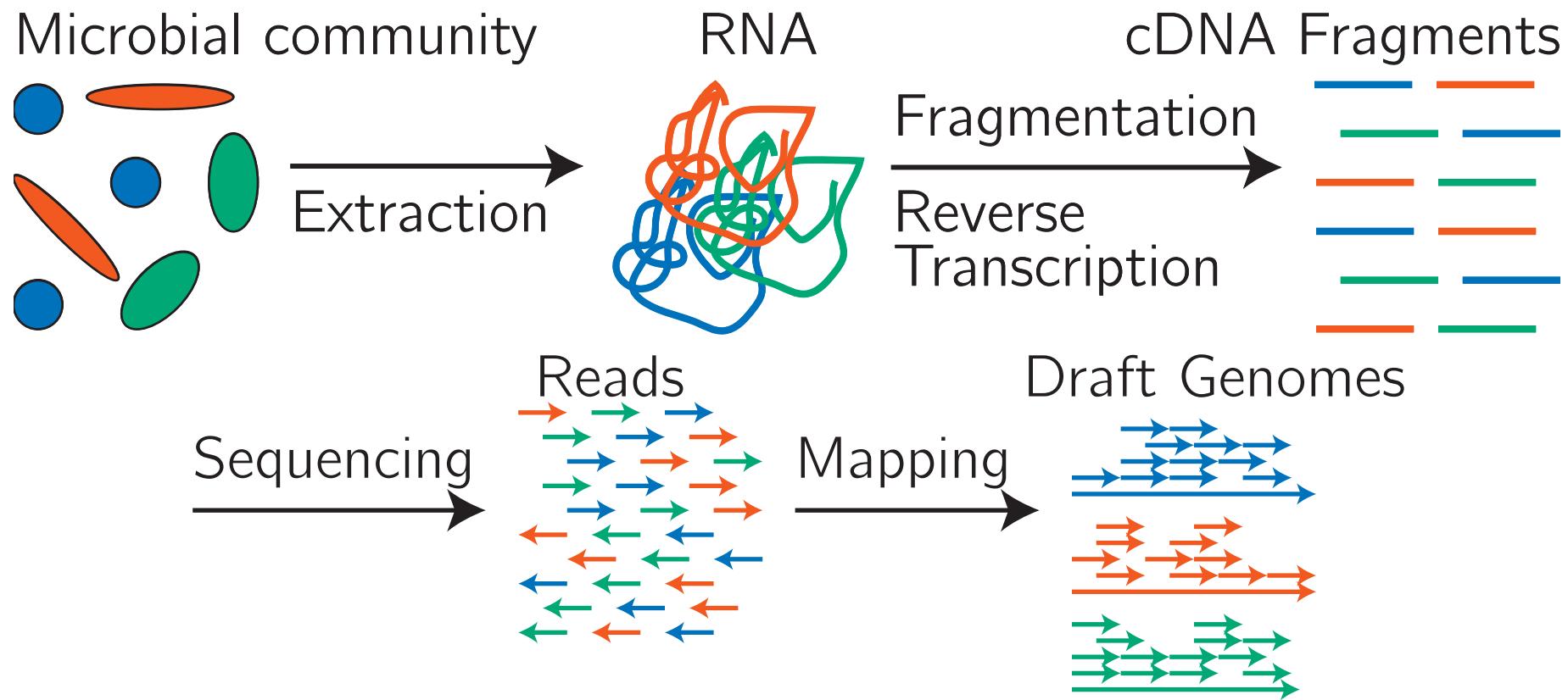
Hamilton et al, bioRxiv

# acl also degrade peptides and polysaccharides

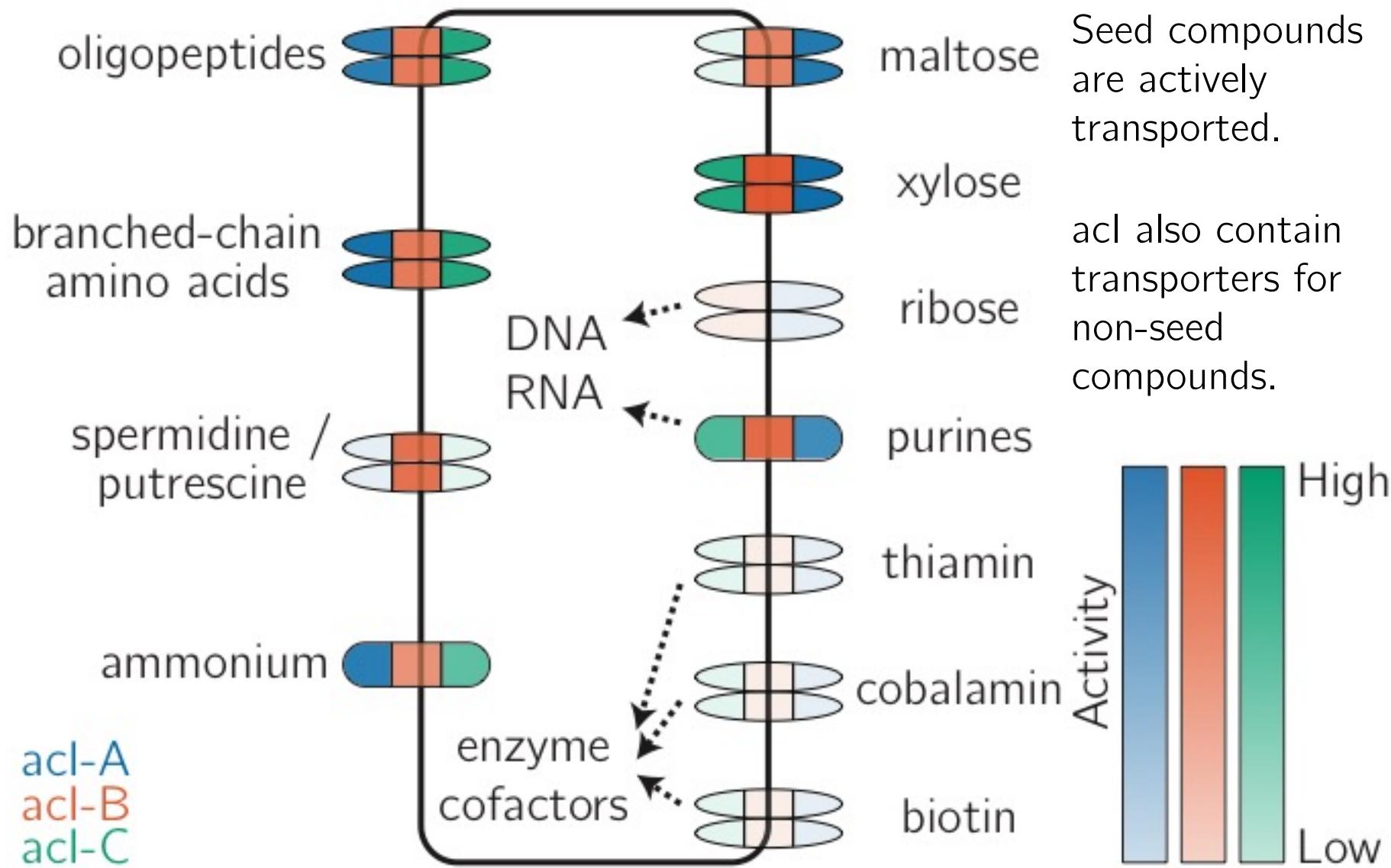


Hamilton et al, bioRxiv

# RNA sequencing reveals microbial activity

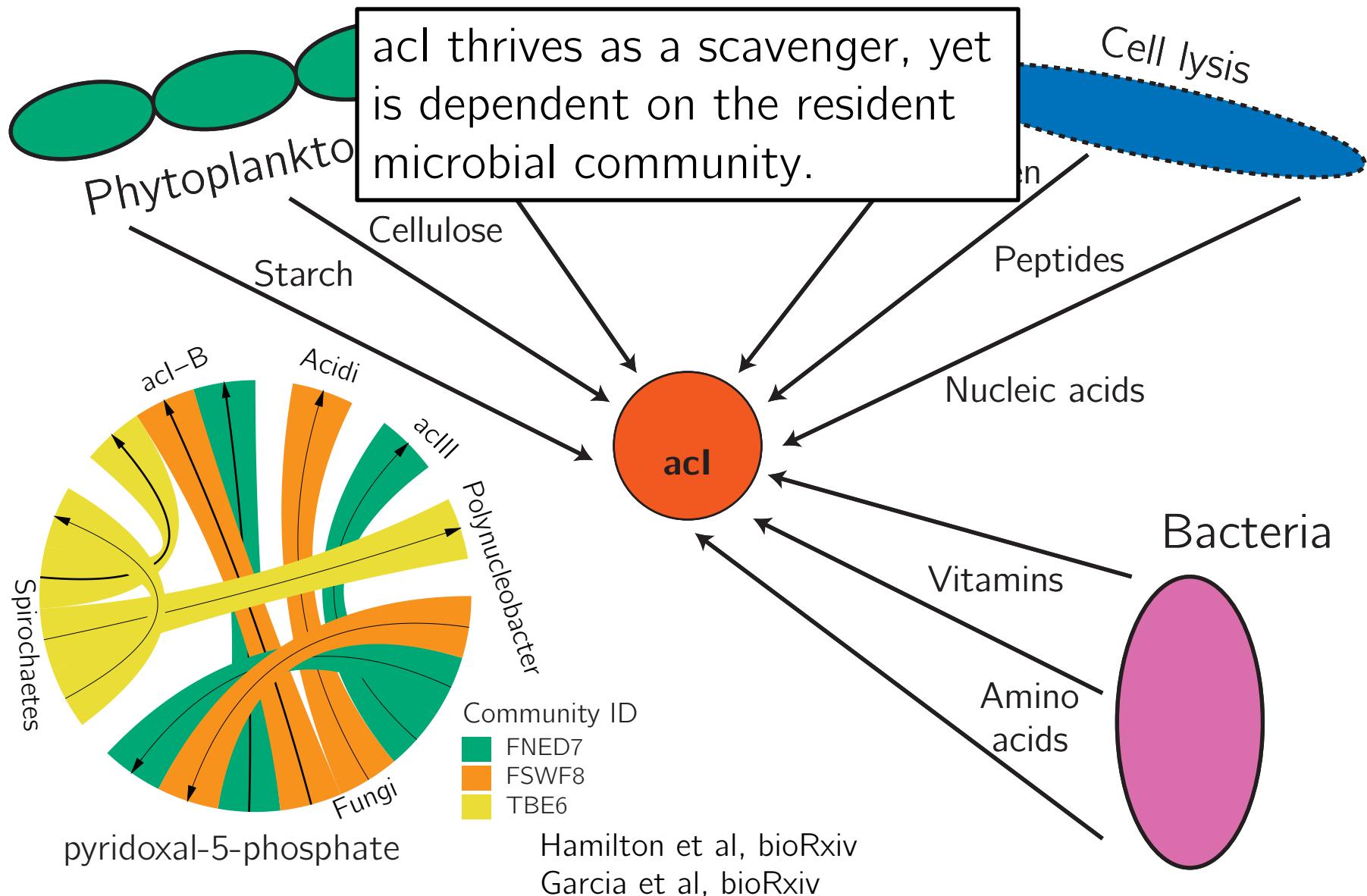


# acl transport required and optional compounds

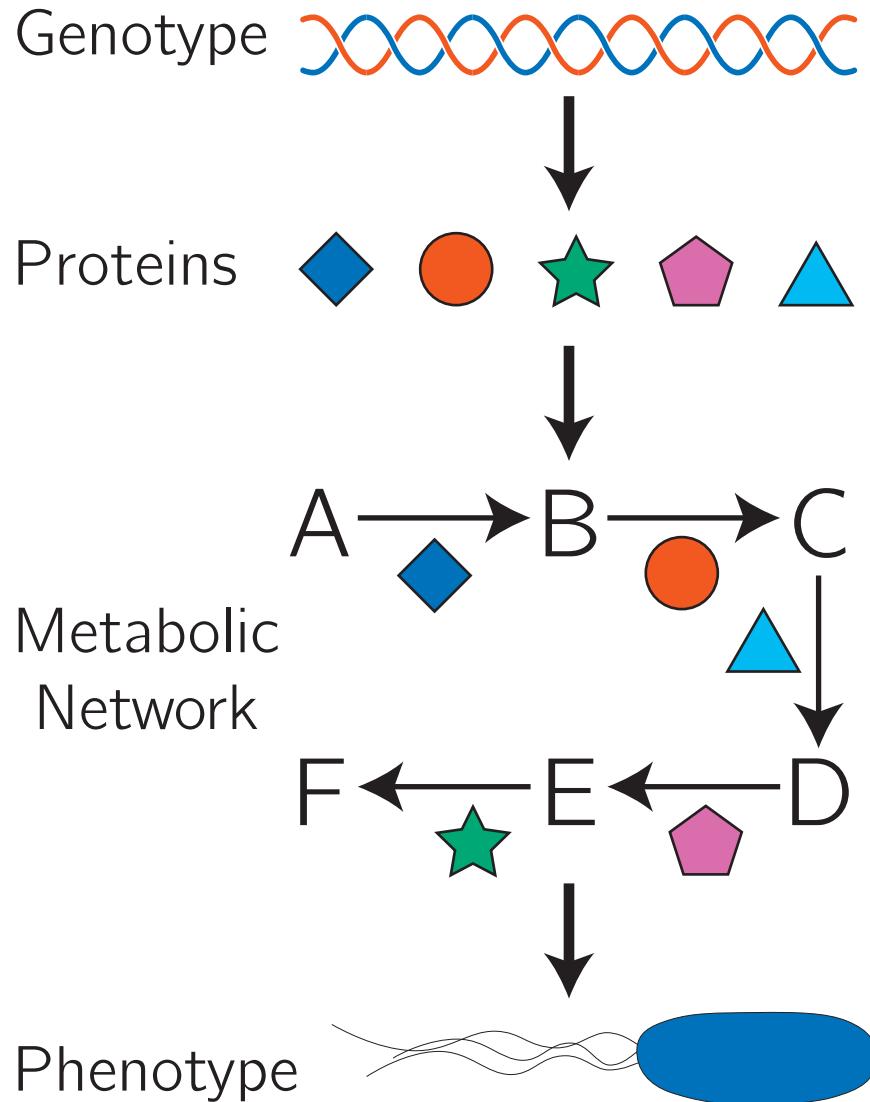


Hamilton et al, bioRxiv

# acl scavenge peptides, polymers, and essential nutrients

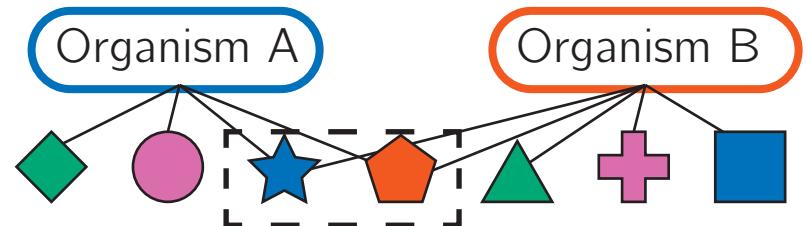


# Metabolic network analysis reveals ecology of acl



Substrate uptake capacities emerge from metabolic network structure

Predicts cooperation and competition



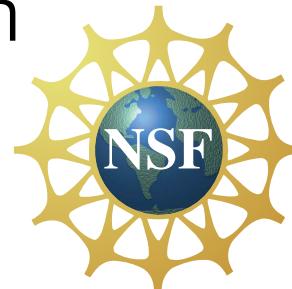
Competition for shared seed compounds

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