Ira A. Fulton Schools of Engineering
Arizona State University

Seminar

School of Sustainable Engineering and the Built Environment

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3:15-4:15pm
College Avenue Commons (CAVC) 333
https://asu.zoom.us/j/7141474924

Gaining fundamental insights from metabolic engineering targets in algal biotechnology

ABSTRACT: The development of standardized molecular tools for genetic engineering can unlock the potential of emerging host organisms for fundamental and applied goals in biotechnology. Since 2014, I have worked with a small, dedicated team to develop two different standardized molecular toolkits for the model green microalga *Chlamydomonas reinhardtii* and used them to expand light-driven CO_2-converting biotechnology applications with this host. *C. reinhardtii* has been a powerful workhorse for testing eukaryotic algal metabolic engineering owing to its ease of cultivation and our synthetic transgene overexpression strategy that overcame historical issues with transgene expression in this alga. Although sharing superficial characteristics as single celled photosynthetic eukaryotes, green and red algal lineages appear to have vastly different genome architectures and (trans)gene expression regulation mechanisms. When comparing the genomes of the green and red model organisms *C. reinhardtii* and *Cyanidioschyzon merolae*, many differences can be readily noted including intron densities, genome sizes, and the capacities for homologous recombination. In many respects, *C. merolae* exhibits more favorable genome readiness as a base strain for biotechnology than *C. reinhardtii*. I will describe our strategies to optimize *C. reinhardtii* molecular toolkits over the past 8 years, propose my goals for the development of molecular tools and synthetic biology approaches for *C. merolae*, and discuss the value of standards in molecular part design. Finally, a note on future engineering potentials using DNA synthesis, big-picture synthetic biology possibilities with red algae and the development of algal biotechnology in ASU will be discussed.

BIOSKETCH: Dr. Kyle J. Lauersen is an Assistant Professor at King Abdullah University of Science and Technology (KAUST) in Thuwal, Saudi Arabia. His group is named Sustainable & Synthetic Biotechnology with their main research focused on engineering algae to be green cell factories. Kyle did his Doctorate of natural sciences at Bielefeld University in Germany, and his master's as well as undergrad at Queen's University in Kingston, Ontario, Canada.

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