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Academic interests: Bioinformatics, Life sciences
Research Focus & Techniques of Expertise: Molecular mechanisms by which photosynthetic organisms cope with high light-stress that causes inhibition to photosynthesis and reduction in crop yield. Understanding these mechanisms will help in developing crop plants that are able to thrive even under harsh environmental conditions. Currently we are focusing our studies on a family of four high light inducible polypeptides (HLIP) with similarity to the light harvesting chlorophyll a/b-binding proteins of vascular plants in the cyanobacterium Synechocystis sp. PCC 6803. These polypeptides accumulate under a variety of stress conditions and they are required for surviving exposure to high intensity light. The exact mechanism of HLIP action and the function of the polypeptides in survival during high light exposure are not clearly understood. HLIPs are preserved in vascular plants; they may play important roles in these systems as well. The regulatory mechanism that governs the expression of the genes encoding HLIPs (hli) has not yet been elucidated. Several important questions are being addressed. These include how hli genes are regulated, whether HLIPs form complexes, and what are the roles of HLIPs in cell survival. The approaches being used combine genomics, proteomics and bioinformatics tools.

Current Research Projects:
Microalgae are capable of high-level protein expression in low-cost growth media, and are easy to culture under various growth conditions, using relatively little energy. The application of microalgae for enhancing production of plant secondary metabolite is essentially lacking. The research of the project focuses on *de novo* construction of caffeic acid biosynthesis pathway in the blue green algae *Synechocystis* PCC 6803 and study the potential role of caffeic acid in photoprotection under high light conditions.

- One objective is to explore the possibility of using *Synechocystis* PCC 6803 as cell factory for the production of caffeate from phenylalanine, which requires three enzymes for catalytic reactions.
- A second objective of the project is to explore the possibility of using cyanobacterial cells as a living experiment station to study the potential functions of caffeic acid in cell survival.

It is our hope that the use of *Synechocystis* 6803 in the study not only will provide direct information in what is thought to be an evolutionary progenitor to higher plant chloroplasts, but also will provide results that can direct research in some aspects of phenylpropanoid biosynthesis in higher plants.