Toward the structural basis of far-red light photoacclimation in Photosystem I of *Fischerella thermalis* PCC 7521

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Photosynthesis is one of the most important biological processes on earth; it is the foundation of the generation of energy and releases Oxygen as a byproduct for humans to breathe. Most organisms that do oxygenic photosynthesis use chlorophyll *a* to absorb visible light from 400 nm to 700 nm in the light spectrum. While certain cyanobacteria adapt to a shaded environment by additionally synthesizing chlorophyll *d* and *f*, which absorb far-red light and enrich the organism's absorbance cross-section. Gaining understanding of the molecular bases of how cyanobacteria use far-red light and the structure of the enzymes that bind to chlorophyll *d* and *f* has agricultural significance. Increasing the absorption cross-section of a crop can lead to an increase in yield. The lab aims to provide an architectural basis for engineering the cyanobacteria's properties to crops to maximize photosynthesis rate to improve the biomass. Previous cryo-EM work has revealed the molecular structure of far-red light-absorbing photosystem I from the thermophilic cyanobacterium *Fischerella thermalis* PCC 7521, but it is difficult to distinguish between chlorophyll *a* and *f*, whose structures are very similar. Due to the challenges in distinguishing these chlorophyll types in cryo-EM, we plan to perform X-ray crystallography. The photosystem I from this organism was specifically chosen because it has been shown to be especially stable. Here, we further characterize the far-red light-absorbing photosystem I complex from *Fischerella thermalis* PCC 7521 using SDS-PAGE, LC MS/MS, and negative stain transmission electron microscopy. The results suggest that the sample is at a purity appropriate for crystallization. Using this sample, we were able to identify crystallization conditions and acquire low-resolution diffraction data. Future experiments aim to enhance diffraction resolution.