Comparison of gene expression in bacteria and chloroplasts

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Compared to their bacterial ancestors, modern chloroplasts (Cp) have undergone massive genetic losses and retain only tiny genomes (50-200 genes) encoding a small fraction of the proteins required for photo-synthesis or for their own expression. While the Cp machinery for genetic expression is still typically prokaryotic-like, Cp are not just cyanobacteria that have transferred most of their genes to the host. Indeed, the cell nucleus tightly controls Cp gene expression, by encoding gene-specific factors that bind Cp mRNAs and govern their stability or translatability. In contrast, the Shine-Dalgarno (SD) sequence, which is critical for translation initiation in bacteria has been lost in most Cp genes.

What are the functional consequences of this post-symbiotic evolution: i) Can Cp genes still be expressed in bacteria? ii) How would their expression be modified upon co-expression with their specific stability and/or translation factors? How do these factors act? iii) Conversely, can a typical bacterial gene still be expressed in the chloroplast of *C. reinhardtii*? If not, what are the minimal requirements to restore its expression?

This collaborative project associates two laboratories hosted at IBPC, respectively expert in regulation of gene expression in bacteria (*Escherichia coli* and *Bacillus subtilis*) or in the Cp of the green alga *Chlamydomonas reinhardtii*.