This seminar will summarize some of the work from my lab to explore basic mRNA processing mechanisms in chloroplasts and mitochondria of photoautotrophs to address two questions: 1. What steps are necessary to prepare organelle mRNAs for translation? and 2. How widespread are these mechanisms and what has or has not been evolutionarily conserved between algae and embryophytes?

Semi-autonomous eukaryotic organelles (chloroplast and mitochondria) have their own chromosomes and gene expression systems that are distinct from the nucleus, and in some ways resemble prokaryotic gene expression. One of the unusual RNA processing steps in embryophytes is a heavy reliance on the post-transcriptional modification of specific nucleotides known as RNA editing. This adaptation allows the correction of deleterious mutations within the asexually reproducing and presumably non-recombinant chloroplast and mitochondrial genomes. There are no reports of RNA editing in any of the green algae so this phenomenon is presumed to have originated in embryophytes either after the invasion of land or in the now extinct algal ancestor of all land plants. This was challenged when a recent in silico screen for RNA edit sites based on genomic sequence homology predicted edit sites in the green alga *Chara vulgaris*, a multicellular alga found within the Streptophyta clade and one of the closest extant algal relatives of land plants. I will describe work completed in my lab to find evidence (or lack thereof) of editing in the macro-algae, *Chara vulgaris* and the microalgae *Chlamydomonas reinhardtii*. During this study a second RNA processing was discovered which led to a second study focusing on C. reinhardtii mitochondria. I will provide evidence that processed linear mRNAs are poly-cytidylated on their 3’ termini and then circularized in this system, which places the 3’ UTR upstream of the 5’ start codon, creating a leader sequence *ex post facto*. The circular mRNAs were found to be ribosome associate by polysome profiling experiments suggesting they are translated.