**KAUST-University of Arizona Summer Seminar Series: Towards a Joint Center for Sustainable Agriculture in Desert Environments**

**Monika Chodasiewicz & Jesse Woodson**

**Tuesday, June 15**

**9:00-10:30 am MST / 7:00-8:30 pm AST**

**On** [**Zoom**](https://kaust.zoom.us/j/93988721070)

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**password: 905015**

**Stress Granules – membrane-less aggregates of protein, mRNA, and metabolites in plants**

Speaker: Monika Chodasiewicz

Assistant Professor of Plant Science, KAUST

**Abstract**

Stress granules (SGs) are evolutionary conserved aggregates of proteins and untranslated mRNAs formed in response to stress. Despite their importance for stress adaptation, the understanding of SGs in plants is still poor. In order to understand the mechanism of SGs assembly and its relevance for plants, identification of SGs stress-specific components is crucial. In our lab, we provide evidence that not only proteins and mRNA, but also metabolites can be sequestered into SGs, and composition of heat stress induced granules is quite diverse. A quarter of the identified proteins constituted known or predicted SG components in human cells. Intriguingly, the remaining proteins were enriched in key enzymes and regulators, such as cyclin-dependent kinase A (CDKA), that mediate plant responses to stress. In addition to proteins, nucleotides, amino acids, and phospholipids also accumulated in SGs.

Recently we showed that SGs can be also formed in plastids, recruiting mRNA, proteins, and metabolites. Taken together, our results indicated the presence of a preexisting SG protein interaction network; an evolutionary conservation of the proteins involved in SG assembly and dynamics; an important role for SGs in moderation of stress responses by selective storage of proteins and metabolites.

**About the Speaker**

Monika Chodasiewicz completed her PhD at the Max Planck Institute of Plant Physiology in Potsdam Germany in 2014. Her PhD research contributed significantly to the discovery of the oxygen sensing mechanism in plants, which was recognized by Sir Peter J. Ratcliffe in his 2019 [Nobel lecture](https://www.nobelprize.org/prizes/medicine/2019/ratcliffe/lecture/). She continued at Max Planck as a postdoctoral fellow in the group of Prof. Lothar Willmitzer and Dr. Aleksandra Skirycz, where she studied small molecule-protein interactions using novel methods in biochemistry. Professor Chodasiewicz developed her research topic during this time, and formed her research group at the KAUST Center for Desert Agriculture in 2020 to continue it. Her work focuses on stress-specific components (proteins, metabolites and mRNA) of stress granules (SGs) formed under different environmental conditions, and the stress-specific components of desert plants that make them resistant to harsh environmental conditions.

**Control of photo-oxidative stress by chloroplast quality control pathways**

Speaker: Jesse Woodson

Associate Professor, School of Plant Sciences, University of Arizona

**Abstract**

Chloroplasts constantly experience photo-oxidative stress while performing photosynthesis. This is particularly true under abiotic stresses that lead to the accumulation of reactive oxygen species (ROS). While ROS leads to the oxidation of DNA, proteins, and lipids, it can also act as a signal to induce chloroplast degradation, cell death, and nuclear gene expression. Although the mechanisms behind ROS signaling from chloroplasts remain mostly unknown, several genetic systems have been devised in the model plant Arabidopsis to understand their signaling properties. One system uses the plastid ferrochelatase two (fc2) mutant that conditionally accumulates the ROS singlet oxygen (1O2) leading to chloroplast degradation and eventually cell death. Here we have mapped mutations that suppress chloroplast degradation in the fc2 mutant (fts mutations) and demonstrate that they affect loci encoding chloroplast proteins predicted to be involved in post-transcriptional gene expression and nucleotide metabolism. These fts mutations were shown to lead to broadly reduced chloroplast gene expression, impaired chloroplast development, and reduced chloroplast stress signaling. 1O2 levels were uncoupled to chloroplast degradation, however, suggesting that these mutations also affect ROS signaling pathways. Together, these results suggest plastid gene expression (or the expression of specific plastid genes) is a necessary prerequisite for chloroplasts to activate 1O2 signaling pathways to induce chloroplast degradation and/or cell death.

**About the Speaker**

Jesse Woodson received his PhD in microbiology at the University of Wisconsin investigating the biochemistry of vitamin synthesis in archaea. As a postdoc at the Salk Institute within Dr. Joanne Chory's group, his interests shifted toward understanding the complex relationship between chloroplast organelles, photosynthesis, and cellular signaling in plants. In 2018, he started his first faculty position at the University of Arizona, where his research group investigates how chloroplasts can sense their environment and signal to the cell for acclimation.

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