

AG2PI SEED GRANT - PROJECT FINAL REPORT

PROJECT NAME	Cross-species genomic analysis of Photosystem II: Building connections from molecular structure to phenotype
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PROJECT PRINCIPAL INVESTIGATOR	TODAY'S DATE	PROJECT START DATE	DATE OF COMPLETION
Carmela Rosaria Guadagno	06/10/2023	12/01/2021	02/28/2023
TEAM MEMBERS (co-PI, co-I, personnel)	COLLABORATORS		
Marilyn Gunner			

ACCOMPLISHMENTS

Please provide a short summary of the conclusions (both successes and failures) made from your project. Include a description of how this project will provide benefits to the agricultural genome to phenome community and, possibly, to a broader audience. You should include both qualitative and quantitative details, as necessary, to support your conclusions. Include a short accomplishment statement in non-technical language and do not include names.

This is not a technical report. Please keep to no more than 6-8 sentences (e.g., 1-2 sentences per point, above).

- Thanks to the AG2PI funds we were able to develop a transformative approach in the study of photosystem II (PSII) as a key protein for all photosynthetic organisms. Preliminary results brought to light crucial aminoacidic differences in the water channels between cyanobacteria and higher plants which we will continue characterizing for plants of different drought resistance.
- Our project used the first principles of biophysics to study genotype and environment influence on the phenotype of photosynthetic organisms. A current challenge in G2P is to find an appropriate framework that advances our understanding of the hierarchy of life—breaking down the current silo mentality and allowing tools, data, and models to become cross-disciplinary. Our work started to build a common language based on a scale-invariant property (i.e., water dynamics) that can describe the characteristic features of a living system at all spatiotemporal scales.

(HINT: You can expand sections as necessary by pulling down on the square in the lower right corner of each box)

Products

Please list any products from this project. This may include (but not limited to) publication, concept/white paper, workshop, conference presentation, website, publicly available data or pipelines, etc. Reminder: you are required to make your products available to the broader stakeholder community using standard USDA practices, open source, FAIR, or other models. Metrics may include number of participants or times accessed, etc. Include links to recordings, DOI, etc. when possible. For presentations and posters, provide authors, date, location and presentation title.

ACTIVITY / PRODUCT	DESCRIPTION (include URL, if applicable)	OUTCOME / METRICS
AG2PI Workshop	https://youtu.be/G2OVHKP6u_0	Views
Conference Presentation – Eastern Regional Photosynthesis Conference 2023	Talk: Cross-Scale Water Dynamics to Mechanistically Inform Plant Phenotyping and Productivity Models Carmela R. Guadagno	Participation/Publication in Book of Conference
Conference Presentation– Eastern Regional Photosynthesis Conference 2023	Poster: Characterizing Variation of PSII Water Channels Between Cyanobacteria and Higher Plants Jose C. Ortiz-Soto, Benjamin C. Romanjenko, Carmela R. Guadagno and Marilyn R. Gunner	Participation/Publication in Book of Conference
Conference Presentation– Eastern Regional Photosynthesis Conference 2023	Talk: Characterizing Variation of PSII Water Channels Between Cyanobacteria and Higher Plants Benjamin C. Romanjenko	Participation/Publication in Book of Conference
Manuscript in prep	“Characterizing Variation of PSII Water Channels Between Cyanobacteria and Higher Plants” – in preparation for Biochimica et Biophysica Acta (BBA)	Peer Reviewed Publication
Dataset	Link to be published on AG2PI website	Github hits
Pipeline	Link to be published on AG2PI website	Github hits
Access to MCCE	https://gunnerlab.github.io/Stable-MCCE/	Github hits

Audience

With whom has this work been targeted to and shared? Please describe how this project and its products have been disseminated to a community of interest. Include any outreach activity or information sharing as well as training or professional development opportunities provided in this project.

- The project provide training and partial support for two PhD students.
- Results have been disseminated already through a workshop for the AG2PI community and to a larger audience during the Eastern Photosynthesis Conference (April 2023).

CONTINUATION OF WORK

Next steps

How do you/your team plan to continue moving this project forward? Include how AG2PI can assist in your forward momentum.

Currently working on finalizing the published dataset and paper, also drafting a joint proposal for NSF-IOS that will leverage the results obtained during the AG2PI grant to look at the evolutionary aspects of water dynamics phenotypes.