Jianping Hu

**Education**  
Postdoctoral Researcher, 1998-2003, Howard Hughes Medical Institute, Salk Institute for Biological Studies, La Jolla, CA   
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**Research: Molecular Mechanisms of Energy Organelle Dynamics and Interorganellar Interaction and Communication**

In eukaryotic cells, biochemical reactions are compartmentalized in specific subcellular organelles. Plant mitochondria, peroxisomes, and chloroplasts are essential organelles in development and coordinate in a number of metabolic pathways required for energy capture, conversion, and metabolism. The Hu laboratory is interested in understanding molecular mechanisms underlying the dynamic behavior of peroxisomes and mitochondria and how peroxisome metabolism influences photosynthesis in the chloroplast at the mechanistic level.

For adaptation, subcellular organelles can alter their abundance, morphology, and protein composition depending on the developmental and environmental conditions. One research goal of the Hu lab is to elucidate molecular mechanisms by which peroxisomes and mitochondrial proliferate to ultimately understand how organelle dynamics contribute to changes in plant physiology and development. To this end, we have identified and characterized components of the machineries that govern the biogenesis, division and proliferation of peroxisomes and mitochondria (Fig. 1) and revealed transcriptional and post-translational regulatory mechanisms of these processes. Recent effort is on understanding the regulatory role of proteases and ubiquitin-proteasome mediated proteolysis in peroxisome and mitochondrial biogenesis and division and in plant stress response.

The Hu lab also collaborates with other labs in the PRL and on campus to study the impact of peroxisomal metabolism on photosynthesis, a fundamental process that occurs in chloroplasts and is subject to regulation by cellular and external environmental cues. Peroxisomes are often found to be physically associated, and act collaboratively, with chloroplasts. Using the Dynamic Environment Phenotype Imager (DEPI), we have screened our collection of Arabidopsis peroxisome mutants and identified those mutants showing photosynthetic deficiencies under light conditions that are more relevant to the natural environment. Currently we focus on understanding the regulatory links between photorespiration and photosynthesis under dynamic environmental conditions (Fig. 2).

Our research has agricultural and economical relevance, as knowledge gained may provide molecular bases for developing strategies for rational engineering of crop plants to improve metabolism, bioenergy production, and defense against environmental stresses. Our research may also provide useful information to biomedical studies in curing human peroxisomal and mitochondrial diseases.