UNCOVERING THE "EVOLUTION" OF CYSTEINE-BASED REDOX REGULATION IN PHOTOSYNTHETIC ORGANISMS

Redox homeostasis consists of an intricate network in which reactive molecular species (RMS), redox modifications and redox proteins act in concert to allow both physiological responses and adaptation to stress conditions. The intracellular redox state is influenced by multiple factors involving the equilibrium between RMS production and scavenging systems and the direct/indirect action of diverse redox couples such as NAD(P)H/NAD(P)$^+$ and GSH/GSSG. The different RMS mainly exert their functions by inducing different cysteine-based post-translational modifications that may alter protein functions and structures. These redox modifications generally involve cysteine thiols that are activated by their protein microenvironment and are controlled by multiple systems involving glutathione, glutathione-related enzymes, and redox proteins belonging to the thioredoxin superfamily (i.e. thioredoxins and glutaredoxins). The general aim of this lecture is to provide a comprehensive account for plant redox biology with special emphasis on structural/molecular mechanisms governing the most relevant light- and RMS-dependent thiol switching regulatory pathways.