SOCIÉTÉ CHIMIQUE DE GENÈVE

Crosstalk between chloroplast and nucleus: Biogenesis and dynamics of the photosynthetic machinery

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The primary reactions of photosynthesis occur in the thylakoid membranes and are catalyzed by four major protein complexes: Photosystem II and photosystem I with their light-harvesting systems, the cytochrome b_6f complex and the ATP synthase.

This system is capable of converting light energy into chemical energy with a remarkably high efficiency. The biogenesis of these complexes depends on the concerted cooperation between the nuclear and chloroplast genetic systems and involves a large number of regulatory and assembly factors.

Because plants are sessile they have to adapt to constant changes in their light environment. At high light when the absorbed energy exceeds the capacity of the photosynthetic system, photosynthetic organisms are able to dissipate the excess energy as heat. In contrast under conditions of low light the photosynthetic apparatus optimizes its performance by reorganizing its antenna system through a process called *state transitions* which involves both chloroplast protein kinases and phosphatases.

We have studied these processes using genetic, biochemical and biophysical approaches in the green unicellular alga *Chlamydomonas reinhardtii* and the land plant *Arabidopsis thaliana*, two organisms which have emerged as powerful model systems.

Conférence présentée le

LUNDI 27 FÉVRIER 2012 à 17h30

Université de Genève – Bâtiment Sciences II
Auditoire A. Pictet – A100
30, quai Ernest-Ansermet, Genève

La conférence est publique

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