CeNT CENTRE OF NEW TECHNOLOGIES

UNIVERSITY OF WARSAW

invites to a seminar by

Prof. John F. Allen

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Why chloroplasts and mitochondria retain their own genomes and genetic systems: Co-location for Redox Regulation of gene expression

13th April 2017 at 1:00 p.m.

Venue: Centre of New Technologies, Banacha 2c,
Lecture Hall 0142 (ground floor)

Host: Prof. Joanna Kargul

Chloroplasts and mitochondria are subcellular bioenergetic organelles with their own genomes and genetic systems. DNA replication and transmission to daughter organelles produces cytoplasmic inheritance of characters associated with primary events in photosynthesis and respiration. The prokaryotic ancestors of chloroplasts and mitochondria were endosymbionts whose genes became copied to the genomes of their cellular hosts. These copies gave rise to nuclear chromosomal genes that encode cytosolic proteins and precursor proteins that are synthesized in the cytosol for import into the organelle into which the endosymbiont evolved. What accounts for the retention of genes for the complete synthesis within chloroplasts and mitochondria of a tiny minority of their protein subunits? One hypothesis is that expression of genes for protein subunits of energy-transducing enzymes must respond to physical environmental change by means of a direct and unconditional regulatory control—control exerted by change in the redox state of the corresponding gene product. This hypothesis proposes that, to preserve function, an entire redox regulatory system has to be retained within its original membrane-bound compartment. Co-location of gene and gene product for Redox Regulation of gene expression (CoRR) is an hypothesis in agreement with the results of a variety of experiments designed to test it and that seem to have no other satisfactory explanation. I present evidence relating to the CoRR hypothesis, and consider mechanisms of redox regulation in chloroplasts. I discuss the development, conclusions, and implications of the CoRR hypothesis, and identify predictions concerning the results of experiments that may yet prove it to be incorrect.