



## **ABSTRACT**

*“Can Plants think? Light Memory, Photo-Electric Signaling and Arabidopsis from Avatar”*

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We demonstrated that absorbed photons in excess regulate acclimation and immunedefenses in Arabidopsis (1, 2). We showed that local and systemic response to excess light episode is associated with photo-electro-physiological signaling (PEPS), and changes in the nonphotochemical quenching and reactive oxygen species levels. Therefore, PEPS could be a new component of the signaling network that regulate systemic acquire acclimation (SAA). PEPS propagation speed and its electrical action potential depend on glutathione synthesis in the chloroplasts and functional APX2 that is exclusively express in the bundle sheath cells. PEPS can transduce information from photosystem II of directly stressed chloroplasts to the naive chloroplasts, which never experienced excess light episodes before. DCMU and LaCl3 treatment, and mechanical braking of a petiole vasculature of exposed leaves lead to strongly reduced systemic PEPS changes and to absence of SAA. PEPS is specific for excess of blue and red light, and red but not blue light of the similar provided energy induced both, immunodefence and light acclimation. Different light episodes are differentially memorized and the wavelength-specific cellular light memory is lasting for at least several days. Our results suggest that plants could be an intelligent life forms (capable to learn and memorize), and indeed leaves in the dark are able to not only see the light (3, 4), but also are able to differently remember its spectral composition and use this memorized information to increase their survival chances.

### References

1. Mateo et al. (2004). Plant Phys. 136: 2818-2830.
2. Mühlenbock et al. (2008). Plant Cell 20: 2339 - 2356.
3. Foyer, C.H. and Noctor G. (1999). Science 284: 599&#8211;601.
4. Karpinski et al. (1999). Science 284: 654&#8211;657.