Secondary structural changes in phytochromes

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Phytochromes are a major family of red-light photosensor receptors, which are found in higher plants, bacteria, algae and fungi.[1]These biliprotein photreceptros control diverse cellular functions. For example, in plants they regulate seed germination, stem extension, flowering time and other several light effects.[2]
The phytochrome photoreceptors are divided into two main groups that have antagonis- tic photobiological properties; the so called canonical phytochromes and the bathy phy- tochromes. While the former are thermally stable in the parent Pr (red absorbing) state, the later exhibit a dark-adapted Pfr (far-red absorbing) state. The co-factor that senses light consist of tetra-pyrrole rings connected by three methylene bridges, that is buried inside the GAF domain of the phytochrome, whereas the photo-sensory domain of the phytochrome is built out of PAS-GAF-PHY domains. It is known that, an incident red light could cause a flip of ring-D around the methylene bridge. This isomerization inducessecondary structural changes(figure:1) in the PHY domain of the phytochrome.[3;4]
In our theoretical studies, we employ MD-simulations to understand and explain these important rearrangement at an atomic level and their role in the signalling processes by phytochromes.
Figure:1: left: Cph1-phytochrome in Pr form, right: PaBphP-phytochrome in Pfr form.

References:

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[3] Xiaojing Yang, Zhong Ren, Jane Kuk, and Keith Moffat. Temperature-scan cryocrystal- lography reveals reaction intermediates in bacteriophytochrome.Nature, 479:428-433, November 2011.
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figure 1

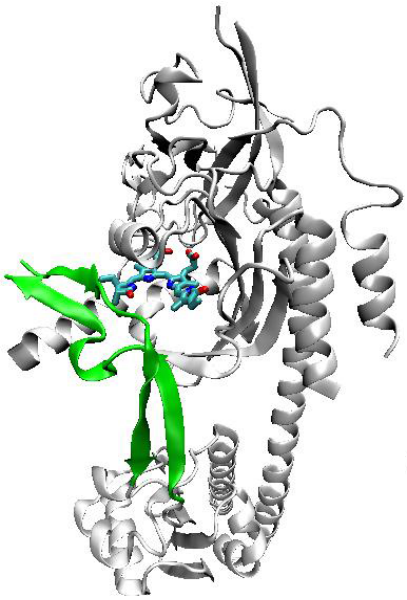

figure 2