Light management in microalgae: metabolism, motility and communication

Idan Tuval

Mediterranean Institute for Advanced Studies, IMEDEA, UIB-CSIC, 07190 Esporles, Balearic Islands, Spain
ituval@imedea.uib-csic.es

Photosynthetic microorganisms underpin major food webs, contribute half of the global oxygen production, and promise new avenues to produce complex chemicals and biofuels. Their fitness hinges on the ability to sense, elaborate and respond to external stimuli, especially light. Light has several roles for photosynthetic microorganisms: sensed by photoreceptors it provides spatiotemporal information, used e.g., to regulate cell cycle or as means for intercellular communication; absorbed by chloroplast pigments it supplies energy for photosynthesis, crucial for life on Earth. To thrive, plants and algae evolved the ability to integrate information and energy provided by light, through complex mechanisms currently not well understood. Motile microalgae can do so via phototaxis, an active steering response based on light reception (swimming towards/away from light), often with unexpected collective consequences. Non-motile species rely on intracellular photo-responses capable of inducing social patterns. Here I will summarise our current understanding of how microalgae combine these responses into a coherent and effective strategy for light management.