

Exploring carotenoid-mediated photophysics in plants with ultrabroadband 2D electronic spectroscopy

Plants absorb sunlight across the visible region of the solar spectrum and collect the energy required for photochemical reactions in lower-lying states. Previous 2D experiments to study plants were limited to these low-energy states. We describe the development of ultrabroadband 2D electronic spectroscopy and its application to the major antenna complex of plants. First, we identify a debated dark state on a single carotenoid, lutein 2, that mediates relaxation. Second, we measure chlorophyll-to-carotenoid energy transfer, a hypothesized but previously unobserved pathway to safely dissipate excess energy.