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The primary steps of photosynthesis comprise the generation of electronically excited states by light absorption in pigment-protein complexes which are referred to as ~Santennae~T and rapid excitation energy transfer (EET) to so-called ~Sreaction center~T complexes. The major constituent of the antenna of green plants is the light-harvesting complex II (LHC II). The LHC II protein is embedded into the thylakoid membrane of green plants and forms a trimer of subunits, each of which consists of 14 Chorophyll (Chl) molecules, Carotenoids, two amphipathic and three membrane-spanning a~Vhelices. A detailed understanding of the ultrafast Chl b à Chl a excitation energy transfer in LHC II requires determination of the energy level structure of the excited electronic states, which is governed by the Chl-Chl and Chl-protein interactions. In addition, the electronic transitions are coupled to low-frequency protein vibrations (phonons) and higher-frequency localized Chl vibrational modes. Information on most of these factors is gained from high-resolution optical spectroscopy in the frequency domain at low temperature. Quasielastic and inelastic neutron scattering are employed to investigate conformational protein dynamics and its effect on spectroscopic properties of LHC II at physiological temperatures.