Proteins represent up to 80% of the chloroplast thylakoid membrane and by way of molecular recognition create a three-dimensional hierarchical structure with multiple levels of organization – pigment-protein complexes assemble into supercomplexes, which form supercomplex arrays, which are stacked to form grana [1]. Absorbed light energy is transferred via a network of light-harvesting pigment-protein complexes to the photosynthetic reaction centres. Interactions of light-harvesting complex II (LHCII) – the most abundant protein – mediate the grana formation and the efficient long-distance energy transfer. We have studied the energetic connectivity in isolated LHCII aggregates and native thylakoid membranes and Photosystem II-enriched membranes by picosecond time-resolved fluorescence and kinetic modeling and found out that during the excited state’s lifetime the energy can migrate over tens of complexes [2]. Thus, the overall kinetics of photosynthetic charge separation is not limited by energy transfer in the antenna. The regulation of light-harvesting and protection against photodamage under conditions of excess irradiation is also controlled by interactions between LHCIIIs forming oligomers. These interactions are signified by far-red fluorescence emission observed in vitro [3] and in vivo [4]. Protein interactions in LHCII are reported with great sensitivity by circular dichroism (CD) spectroscopy. By comparing the CD spectra of solubilized LHCII with those of LHCII aggregates and native and artificial protein-lipid membranes we demonstrate the importance of protein interactions in the organization of LHCII in the native membrane [5] and identify specific CD spectral signatures. The CD spectral changes occurring upon changing the LHCII microenvironment may be related to actual structural changes with the help of a novel technique, anisotropic CD spectroscopy [6].