The existence of virtually all living organisms on the Earth relies on the photosynthetic activity of chlorophylls, the major photosynthetic pigments, responsible for the capture and conversion of as much as 2.5×20^{21} J of solar energy p.a., eventually stored as biomass. Their molecular skeleton consists of four pyrrole rings forming a macrocycle, closely resembling that of a porphyrin. Carotenoids are a large group of natural isoprenoid pigments which play numerous important roles in living organisms. Perhaps the most amazing feature of Chls is their versatility in photosynthetic apparatus, where they function as excellent antenna pigments, active in the photon capture, the excitation energy storage and transfer, and as strong electron donors and acceptors in the photosynthetic reaction centers. The major role of Crts in photosynthetic apparatus is photoprotection (on several levels) but they also participate in light harvesting and play stabilizing structural role. For all these reasons, for over a century, these fascinating green and yellow pigments are a subject of intensive investigations in many laboratories all over the world. Intriguingly, the functioning of photosynthetic pigments is controlled only via weak interactions between pigment molecules and the surrounding proteins, but the details of this control are not well understood. The objective of the project is to bring to light and investigate new features and interactions of chlorophylls and carotenoids, and verify whether/how they contribute to photosynthesis. We propose novel experimental and computational approaches in identification and investigations of intra- and intermolecular interactions which influence photophysics and photochemistry of the pigment. Our experimental approach is based on the use of high hydrostatic pressure to force the pigment molecules into stronger interactions with the surrounding molecules and follow the effects by using several advanced spectroscopic techniques.