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Sommario/riassunto	This thesis presents a highly innovative study of the ultrafast structural and vibrational dynamics of hydrated phospholipids, the basic constituents of cell membranes. As a novel approach to the water-phospholipid interface, the author studies phosphate vibrations using the most advanced methods of nonlinear vibrational spectroscopy,

including femtosecond two-dimensional infrared spectroscopy. He shows for the first time that the structure of interfacial water undergoes very limited fluctuations on a 300 fs time scale and that the lifetimes of hydrogen bonds with the phospholipid are typically longer than 10 ps. Such properties originate from the steric hindrance of water fluctuations at the interface and the orienting action of strong electric fields from the phospholipid head group dipoles. In an extensive series of additional experiments, the vibrational lifetimes of the different vibrations and the processes of energy dissipation are elucidated in detail.