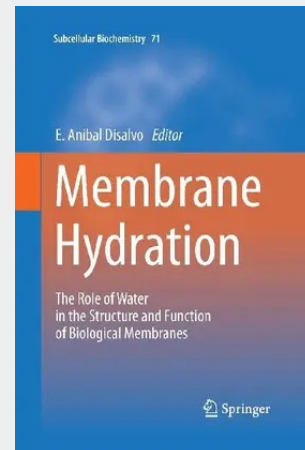


Membrane Hydration

This book is about the importance of water in determining the structure, stability and responsive behavior of biological membranes. Water confers to lipid membranes unique features in terms of surface and mechanical properties. The analysis of the hydration forces, plasticiser effects, controlled hydration, formation of microdomains of confined water suggests that water is an active constituent in a water-lipid system. The chapters describe water organization at the lipid membrane–water interphase, the water penetration, the long range water structure in the presence of lipid membranes by means of X-ray and neutron scattering, general polarization, fluorescent probes, ATR-FTIR and near infrared spectroscopies, piezo electric methods, computer simulation and surface thermodynamics. Permeation, percolation, osmotic stress, polarization, protrusion, sorption, hydrophobicity, density fluctuations are treated in detail in self-assembled bilayers. Studies in lipid monolayers show the correlation of surface pressure with water activity and its role in peptide and enzyme interactions. The book concludes with a discussion on anhydrobiosis and the effect of water replacement in microdomains and its consequence for cell function. New definitions of lipid/water interphases consider water not only as a structural-making solvent but as a mediator in signalling metabolic activity, modulating protein insertion and enzymatic activity, triggering oscillatory reactions and functioning of membrane bound receptors. Since these effects occur at the molecular level, membrane hydration appears fundamental to understand the behavior of nano systems and confined environments mimicking biological systems. These insights in structural, thermodynamical and mechanical water properties give a base for new paradigms in membrane structure and function for those interested in biophysics, physical chemistry, biology, bio and nano medicine, biochemistry, biotechnology and nano sciences searching for biotechnological inputs in human health, food industry, plant growing and energy conversion.

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