Prize Talk PV IX Wed 14:45 V53.01

Quantum Effects in Biology — •Martin B Plenio — Institut für Theoretische Physik, Universität Ulm — Blackett Laboratory, Imperial College London — Laureate of the Max-Born-Prize

The determination, description and explanation of physical phenomena in biological systems at the molecular and supra-molecular level represents one of the major challenges in modern science. In this lecture I touch upon two aspects of this problem.

I will explain how quantum control techniques may be used to achieve high performance sensing and imaging devices with atomic scale resolution that may be capable of probing the structure and dynamics of individual proteins under physiological conditions. This in turn may allow us to address unsolved challenges of fundamental research. Amongst these the role of quantum mechanics in biological organisms represents one of the important open questions in modern biology and I will discuss on which level quantum phenomena may be expected to play an important role. In this respect the interplay between quantum coherent evolution and the vibrational environment is of fundamental importance to the quantum dynamics of bio-molecular systems and I will present concrete examples for biological systems where such effects may play a role.