

Biophysical Analytics of Single Molecules

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Advances in biomolecular detection, characterization and manipulation methodology pushed the sensitivity to the ultimate level of single molecular individuals. At this level traditional boundaries between biology, chemistry and physics vanish and interdisciplinary concepts allow investigation of molecular structure, related biological function as well as physiological phenomena on the molecular scale.

New concepts of detecting, addressing and manipulating individual molecules by means of mechanical (atomic force microscopy, optical tweezers), optical (fluorescence microscopy & spectroscopy) and electrical (electric fields) experiments are reviewed.

Examples of single molecule DNA protein interaction experiments (gene regulation) and experiments to separate, detect and analyze sparse molecules in nanofluidic systems are presented and discussed with respect of future applications.