Recent Results on the Time Dependent Quantum Dynamics of Mode Selective Intramolecular Energy Flow and Tunneling in Polyatomic Molecules and Clusters

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We shall introduce the two major experimental approaches towards intramolecular quantum dynamics and kinetics from spectra, (i) the study of time resolved spectra, which has a long history of many decades, and (ii) deriving time dependent quantum dynamics from highly frequency resolved molecular spectra developed largely in the Zurich group over the last three decades [1-5]making use also of developments in the theory of molecular quantum dynamics We shall then report about recent experimental and theoretical results from our group ranging from femtosecond intramolecular energy flow to picosecond and nanosecond tunneling reactions [6-8], nuclear spin symmetry violation [9-11], and finally time dependent evolution of parity on the time scale of seconds due to electroweak parity violation [3, 12-18] including some recent open problems in molecular quantum dynamics [15]. The role of successive symmetry breakings in defining different time scales of intramolecular primary processes of kinetics will be emphasized [3].

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