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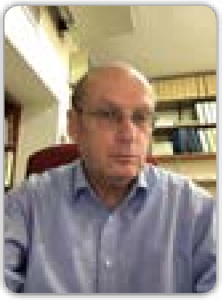

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The transition path time distribution - quantum mechanics, vanishing tunneling flight times and special relativity

Recent experimental measurements of the transition path time distributions of proteins demonstrate that these distributions are experimentally measurable. The folding unfolding dynamics of proteins is classical mechanical in nature but the experiments suggest that there is value in developing a quantum theory of transition path time distributions. The formalism is used to study the quantum dynamics of thermal position correlation functions. Highlights are the proof of a vanishing mean tunneling time at the parabolic barrier crossover temperature and that increasing the length of the path traversed may decrease the mean transition time. The mean transition path time is used to define a coarse-grained momentum for passage from one side of the barrier to the other. The product of the uncertainty in this momentum with the uncertainty in the location of the particle is shown under certain conditions to be smaller than the $\hbar/2$ formal uncertainty limit. The transition path formalism will then be used to define a tunneling flight time which is found to vanish for an Eckart barrier and a rectangular barrier, irrespective of the barrier width and height. This generalizes the Hartman effect. Yet, as shall be shown, special relativity is not violated.

Biography

Eli Pollak, Ph.D., is currently a full professor in the Chemical Physics Department of Weizmann Institute of Science. He completed his Ph.D. Dissertation themed "New Methods of Calculating Transition Probabilities in Chemical" in the year 1976 from the Hebrew University. Prof Pollak has his reasearh thrust in the fields of Time in quantum mechanics, Quantum dynamics in real time, Heavy atom-surface scattering & Quantum thermodynamics. He has over 250 publications in these concerend fields. He has been awarded with many honors with Meitner-Humboldt Research Award and APS- Outstanding referee some of them.

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