Electrons tunneling through fluctuating water and proteins

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We have analyzed the characteristics of electron tunneling through thermally-fluctuating water and protein media [1]. A metric is defined that indicates when the tunneling propagation is well described by the average donor-acceptor tunneling interaction, as opposed to being dominated by medium fluctuations. Indeed, there is a transition distance that establishes a change in mechanism, and this distance is different for water-mediated compared to protein-mediated tunneling. Even in the fluctuation-dominated regime, we find that the three-dimensional protein fold controls the tunneling interactions. We also find that pairs of proteins in near contact may establish particularly strong water-mediated tunneling routes [2].