

MAR09-2008-002757

Abstract for an Invited Paper
for the MAR09 Meeting of
the American Physical Society

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].

[1] I.A. Balabin, D.N. Beratan, and S.S. Skourtis, *Phys. Rev. Lett.*, 101, 158102 (2008).

[2] J. Lin, I.A. Balabin, and D.N. Beratan, *Science*, 310, 1311-1313 (2005).