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What happens to a protein in a glassy environment? VASSILIY LUBCHENKO, MIT, PETER WOLYNES, UCSD, HANS FRAUENFELDER, Los Alamos Natl Lab, ROBERT SILBEY, MIT — Several types of kinetic measurements reveal an intrinsic connection between processes within a protein imbedded in a glassy material and relaxations in the host itself. We use the Random First Order Transition (RFOT) theory of the glass transition to explain the microscopic origin of slaving of large scale protein conformational dynamics to the relaxations in the supercooled solvent. The slowing down of the protein motions relative to those of the solvent reflects the size of the conformational subspace explored by the protein relaxation. At *cryogenic* temperatures, the details of hole broadening depend on whether the chromophore is placed directly in a glass matrix, or imbedded in a protein first. We explain why spectral diffusion in proteins deviates from the usual logarithmic time dependence found in glasses.

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