**Listening to proteins with EARS: Enhanced Acoustic Raman spectroscopy of information flow across the interface between proteins and their environment**

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We have built an EARS experiment that allows single proteins to be optically trapped by a gold nanostructure and exposed to the GHz frequencies that will activate their global vibrational modes. This project will investigate how proteins interact with the water that surrounds them and how that interaction is modified by the presence of various biologically relevant ions in solution. The project will further aim to demonstrate the ability of EARS to determine in a native label free way the self-assembly state and orientation of monomers create when proteins assemble into their functional form. The project will also involve collecting a range of spectra of proteins previously studied using other techniques in order to provide information for the development of more accurate elastic network models. These ENM models are used in a wide variety of applications including the prediction of binding affinities for drug discover pipelines and the search for novel protein conformations useful in the treatment of disease.