

THESIS TITLE	Theory of protein thermophoresis
RESEARCH PROJECT	<p>Thermoosmosis and thermophoresis have become standard tools for creating microflows at laser-heated gold nanostructures and self-propelling active particles, and for analyzing the binding state of proteins. If the underlying physical mechanisms are well understood for colloidal particles and DNA, this is not the case for protein thermophoresis and its intricate dependencies on temperature and salt.</p> <p>This theory project aims at a better understanding of the motion of proteins along a temperature gradient. As a part of the ERC project HiPhore [1], it will be done in close collaboration with the experimental group of Guillaume Baffou at Institut Fresnel, Marseille.</p> <p>Contrary to spherical particles and linear DNA, proteins have an irregular shape with non-uniform surface properties (positive and negative charges, hydrophilic and hydrophobic endgroups). They also show strong ion-specific interactions with salt (Hofmeister effect) and are sensitive to pH. The “surface” of a protein in a given conformation, consists of the amino acid groups of its constituents, which determine its thermophoretic mobility. We intend to study pH and charge regulation effects, the role of non-ionic interactions, and the temperature dependence. Particular emphasis will be given to thermoelectric effects, ion non-equilibrium states, and to temperatures beyond the boiling point of water.</p> <p>The project relies on non-equilibrium thermodynamics, physical chemistry of amino acids, and Stokes hydrodynamics. The approach is problem oriented, using analytical theory, and molecular dynamics and hydrodynamic simulations.</p> <p>Candidates should hold an excellent MSc in Physics or Physical chemistry and have strong interests in Soft matter theory and modelling of complex systems.</p> <p>Inquiries and applications should be sent to Alois Würger <alois.wurger@u-bordeaux.fr></p> <p>[1] http://www.fresnel.fr/spip/spip.php?article2056</p>
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FELLOWSHIP	ERC PhD position, approximate gross salary 1850 € per month