

INTERNSHIP PROPOSAL

Laboratory name: LPENS
CNRS identification code: UMR 8023
Internship director's surname: Lydéric Bocquet
e-mail: lyderic.bocquet@ens.fr, nikita.kavokine@ens.fr
Web page: www.phys.ens.fr/~lbocquet
Internship location: ENS, 24 rue Lhomond, 75005 Paris

Thesis possibility after internship: YES
Funding: YES, ERC.

Quantum friction in nanoscale water transport

Nanoscale fluid transport is crucial to a range of applications from desalination to blue energy harvesting, yet its basic molecular mechanisms are still poorly understood. Notably, there is still no predictive theory for the solid-liquid friction coefficient on an atomically smooth surface. Indeed, the solid-liquid interface is particularly challenging system as it involves coupling between fluid and electron dynamics.

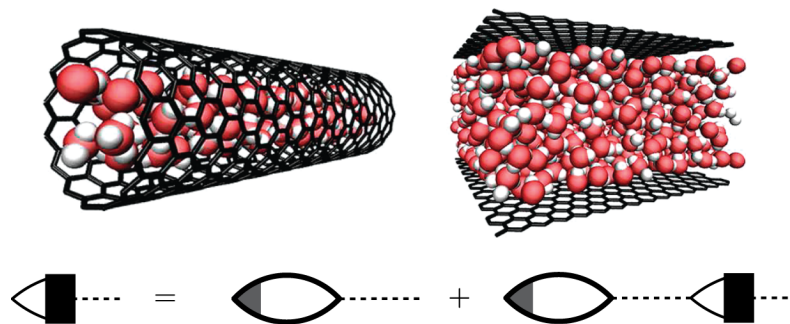


Figure: Sketch of the systems under study, and diagrammatic Dyson equation for the water-electron cross-correlation function.

We have recently developed a field theory formalism, which is able to predict the contribution of electronic excitations to the water-solid friction, with relevance in particular to the water-carbon system. The first goal of the internship is to build on this formalism to predict the electric current that may be induced by liquid flow, as this would be of direct experimental interest. Further work may include the study of quantum exchange interactions and their role in the interfacial fluid dynamics.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics:	YES	Soft Matter and Biological Physics:	YES
Quantum Physics:	YES	Theoretical Physics:	YES