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Helmholtz Young Investigator Group: Functional Nanoscale Structure Probe and Simulation Laboratory (Funsilab)



„Research is fun but asks for large efforts. This has been true since I was a PhD student, postdoc or head of a research group. My goal is to continue and realize many of the novel ideas and projects that resulted from my actual activities.“

Research project:

The group is dedicated to the theoretical treatment of tunneling spectroscopy features and explores solid-state phenomena that are determined by small dimensions of nanoscale atomic structures arranged on surfaces ranging from clusters of a few atoms to larger islands with various sizes. Our central scientific goals are the theoretical understanding, the description and prediction of their structural, dynamical, electronic, magnetic, and transport properties by developing and applying quantum

mechanical simulation tools based on the density-functional theory.

These nanostructures experience an open environment and are, thus, dynamically extremely responsive to external stimulations. The main dynamical degrees of freedom are vibrations and spin excitations that occur both in magnetic systems and are experimentally very difficult to discriminate. Therefore it is important to study both on the same footing. To

this end, a particular focus lies on the formulation and development of a first-principles methodology for investigating inelastic scattering processes, in particular magnon and vibrational excitations. We also dedicate a large part of our activities to investigate space- and time-inversion broken scattering phenomena in magnetic nanostructures and study fermiology with nanostructures at surface vicinities.

What is/has been the greatest challenge as head of a young investigators group:

„The greatest challenge was probably to hire coworkers with the appropriate profile and recently to stop performing simulations and practical code implementations myself.“

Start of funding period:

January 2011

End of funding period:

December 2015 or December 2016

Budget:

~ € 250.000

Staff:

4 Post-docs, 3 PhD students (co-financed by third-party funds)

Cooperations:

University of Hamburg (Germany), Federal University of Fluminense in Niteroi, RJ (Brazil), Mouloud Mammeri University in Tizi-Ouzou (Algeria) (Selection of important cooperation partners)

Further information:

[Young Investigator Group Dr. Lounis](#)