Hector Fellow Academy

Doctoral Project on Engineering Artificial Magnetic Chains in Molecular Assemblies

Project description:

Simulating phases of matter by creating designer quantum structures can be achieved by assembling individual building blocks, such as electrons and atoms, in a controlled manner. These artificially designed systems are crucial to gain a profound understanding of collective quantum phenomena and harvest their advantages for novel quantum materials and, ultimately, future devices.

One new, but still unexplored platform, to build artificial quantum structures and to simulate magnetic interactions, are networks of interacting molecules. These molecular spins promise to be here versatile building blocks, since their magnetic properties can be chemically engineered and allow for large-scale self-assembly in a molecular framework.

In this PhD project, we aim to utilize such self-assembled molecular structures to construct quantum model systems, in particular spin chains of different length and width. By using a scanning tunneling microscope (STM) in combination with electron spin resonance (ESR), we aim to create these artificial structures by spatial molecule manipulation and we will subsequently probe their energy levels with high-energy resolution. Thus, we will be able to access emergent magnetic phenomena of multi-spin systems. The project connects several cutting-edge areas of research in physics, including molecular magnetism, atom manipulation, spin resonance as well as topological condensed matter physics.

Keywords
Scanning Tunneling Microscopy, Spin Resonance, Low Temperature Physics, Spin Physics

Entry requirements
- Master's degree in physics or related fields including a final thesis project.
- Prior experience in low-temperature STM/AFM, work with molecular or atomic systems, working with UHV and radiofrequency equipment, electron spin resonance, programming skills (Matlab/Python) will be preferred
- High proficiency in spoken and written English.

Location
Physikalisches Institut/ Karlsruhe Institute of Technology/ Karlsruhe

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Interdisciplinary Network for Cutting-Edge Research

Hector Fellow Academy

Starting date
June 2023 or later

Funding

Four years of funding (3+1, three years with the possibility to extend for one year)

How to apply

Please apply via the HFA application portal **until March 31, 2023**.

From April 1st, 2023, please send applications via e-mail to application@hector-fellow-academy.de.

Philip Willke will arrange interviews (via skype or if feasible in-person) with the most promising applicants.

Enquiries

TTProf. Dr. Philip Willke is the supervisor of this doctoral project. He is available for further information on details of the project.

For questions related to making your application, please contact the Hector Fellow Academy Office: application@hector-fellow-academy.de or www.hector-fellow-academy.de

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