



Universität  
Basel

## Research Project

Quantum coherence, quantum statistics, and superconductivity in mesoscopic systems

### Third-party funded project

**Project title** Quantum coherence, quantum statistics, and superconductivity in mesoscopic systems

**Principal Investigator(s)** [Bruder, Christoph](#) ;

**Organisation / Research unit**

Departement Physik / Theoretische Physik (Bruder)

**Department**

**Project start** 01.10.2011

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**Status** Completed

The physics of mesoscopic systems, i.e., electronic structures in the nanometer range, is one of the most active research areas of condensed-matter physics. These systems allow us to study fundamental physics questions, and their understanding is a necessary prerequisite for possible future electronic device applications. The goal of our research is to exploit and analyze quantum interference effects in such electronic circuits. In the last couple of years, new exciting areas have opened up, like nanomechanics, or the interface of ultracold atoms and condensed-matter systems.

In particular, our group (about 3 PhD students and 3 Postdocs) plans to study the interplay of electric currents through nanostructures with mechanical degrees of freedom (nanomechanics). We are also interested in fluctuation and noise phenomena: electrical currents are not exactly constant but fluctuate, and these fluctuations contain a great deal of information about the quantum nature of the electrons that carry the current. We will also investigate ultracold atoms which can be used to study quantum coherence and quantum many-body phenomena. Cold atoms can be trapped in so-called optical lattices and show similarities to electrons in a crystal lattice. The great advantage of cold atoms is that the properties of the lattice can be controlled much more easily than in the case of a crystal lattice. Finally, we are also interested in the foundations of quantum mechanics (entanglement, weak measurements in solid-state systems).

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**Add publication**

**Add documents**

**Specify cooperation partners**

<b>ID</b>	<b>Kreditinhaber</b>	<b>Kooperationspartner</b>	<b>Institution</b>	<b>Laufzeit - von</b>	<b>Laufzeit - bis</b>
97224	Bruder, Christoph	Fazio, Rosario, Professor	Scuola Normale Superiore Pisa	01.10.2009	30.09.2011
170487	Bruder, Christoph	Averin, Dima, Professor	SUNY, Stony Brook	01.10.2006	30.11.2011
170490	Bruder, Christoph	Belzig, Wolfgang, Professor	University of Konstanz	01.10.2005	31.10.2013