

**Pressemitteilung****Universität Basel****Reto Caluori**

04.03.2025

<http://idw-online.de/de/news848347>Forschungsprojekte, Kooperationen  
Chemie, Physik / Astronomie  
überregional**New WSS research center for molecular quantum systems**

**The University of Basel and the University of Bern are setting up a new research center to enable the construction of superconducting quantum units. The Werner Siemens Foundation is supporting the project with a total of CHF 15 million over the next eleven years.**

The WSS Research Center for Molecular Quantum Systems is working on a pioneering technology set to lay the foundations for reliable and powerful quantum computers. This involves what are known as topological quantum bits (qubits), computing elements in quantum computers that can store and process information according to the rules of quantum mechanics. These qubits are particularly robust against interference and could usher in a new era of data processing.

The use of materials with superconducting properties will take center stage. In superconductors, electricity is able to flow without resistance, meaning that no energy is lost. By combining superconducting materials with special molecular structures, the researchers want to develop durable and reliable qubits that will work faster and more efficiently than previous technologies.

One special feature of this new concept is “topological protection,” which means that the qubits are protected against external influences such as malfunctions or defects due to their special structure. This causes the desired quantum states to remain stable, even under difficult conditions, and enables more arithmetic operations to be performed before an error occurs.

**A disruptive approach**

“Our aim is to realize superconducting qubits using topological superconductors for the first time. Here we are pursuing an innovative approach that does not simply further advance an existing technology,” says Professor Ernst Meyer, Professor of Physics at the University of Basel and Head of the WSS Research Center. “Our project is also characterized by its interdisciplinary nature. We will be closely combining physics and chemistry with theory and experiment.”

At the WSS Research Center, chemical methods will be used to synthesize novel molecules with highly specific properties that are suitable for coating a superconductor and can be formed into qubits. Manipulating electromagnetic fields enables these qubits to interact with each other and perform logical arithmetic operations.

Another important pillar of the project is the comparison of theoretical models with experiments at extremely low temperatures. The researchers expect this to lead to a better understanding of how the synthesized molecules bind with the superconductors and which properties result.

Using their interdisciplinary approach, the researchers at the new WSS Research Center aim to create the foundations for quantum computers that are less error-prone and can work in the nanometer range – ideal prerequisites for

industrial scaling and integration into electronic components. In the long term, this research could contribute to building quantum computers that can solve complex problems such as climate modeling or medical simulations. At the same time, the project makes an important contribution to more sustainable energy use in information processing.

The Werner Siemens Foundation (WSS), based in Zug, is providing the center with CHF 15 million over 11 years. “There are various approaches to developing quantum computers in research,” says Dr. Hubert Keiber, Chairman of the Werner Siemens Foundation’s Board of Trustees. “We were impressed by the innovative approach of combining chemistry and physics to generate highly stable quantum bits.”

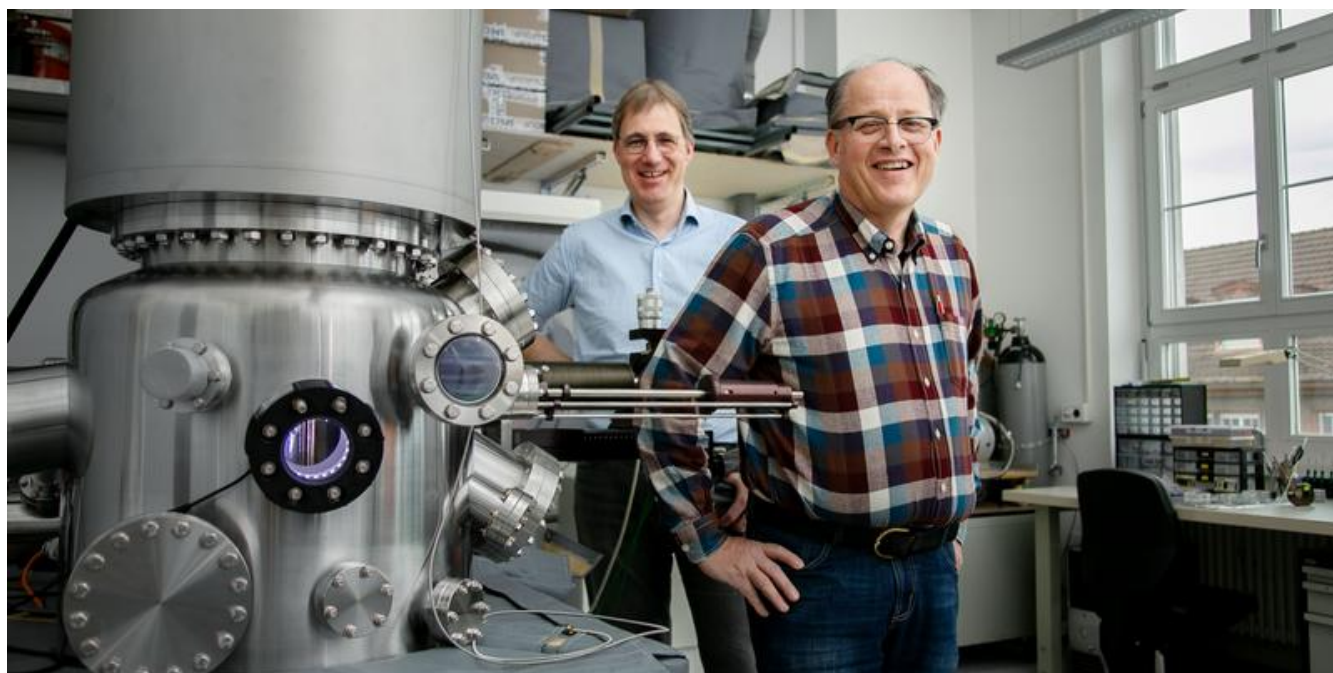
#### Partnership between Basel, Bern and Salzburg

Research groups from experimental and theoretical physics at the University of Basel, the Department of Chemistry, Biochemistry and Pharmaceutical Sciences at the University of Bern and the Department of Chemistry and Physics of Materials at the University of Salzburg are taking part in the new WSS Research Center for Molecular Quantum Systems. It will be led by experimental physicists Professor Ernst Meyer (Director) and Professor Dominik Zumbühl (Co-Director) from the University of Basel’s Department of Physics.

wissenschaftliche Ansprechpartner:

Professor Ernst Meyer, University of Basel, Department of Physics, Tel. +41 61 207 37 24, Email: [ernst.meyer@unibas.ch](mailto:ernst.meyer@unibas.ch)

PD Dr. Shi-Xia Liu, University of Bern, Department of Chemistry, Biochemistry and Pharmaceutical Sciences, Tel. +41 31 684 33 97, Email: [shi-xia.liu@unibe.ch](mailto:shi-xia.liu@unibe.ch)



The designated directors of the WSS Research Centre, Prof. Dr. Ernst Meyer (front) and Prof. Dr. Dominik Zumbühl, are delighted about the funding from the Werner Siemens Foundation.

Photo: University of Basel, Florian Moritz

