



## Press Release

### European Research Council Starting Grants for two Tübingen researchers

#### Coveted grants for projects in Mathematics as well as in Physical and Theoretical Chemistry

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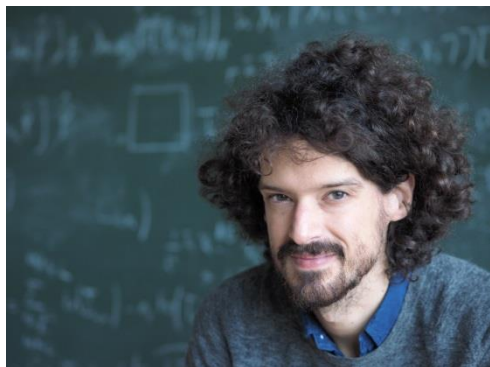
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Two University of Tübingen researchers have received Starting Grants from the European Research Council (ERC). Professor Marcello Porta of the Mathematics Department receives a 1 million euro award for the MaMBoQ project, investigating the analysis of large quantum systems. Dr. Marcus Scheele of the Institute of Physical and Theoretical Chemistry receives just under 1.5 million euros for the COINFLIP project, in which the goal is to develop a fast optical transceiver for silicon technology. ERC Starting Grants are paid over a period of five years. They are meant to help promising younger researchers to start their own research units.



Marcello Porta Photo: Friedhelm Albrecht/University of Tübingen

Marcello Porta's MaMBoQ project – Macroscopic Behavior of Many-Body Quantum Systems – is divided in two parts: The first part focuses on the transport properties of interacting lattice models, while the second part concerns the derivation of effective evolution equations for many-body quantum systems. The common theme is the concept of emergent

effective theory: simplified models capturing the macroscopic behavior of complex systems. Different systems might share the same effective theory, a phenomenon called universality. A central goal of mathematical physics is to validate these approximations, and to understand the emergence of universality from first principles.

Porta aims at developing new mathematical methods for the rigorous analysis of complex quantum systems. The first part of the project focuses on the transport properties of two-dimensional quantum systems, such as graphene and topological insulators. These ultrathin materials have attracted enormous interest in physics in the last decade. One of the

main goals of the project is to understand the quantization of charge and spin transport for realistic models, taking into account disorder effects and many-body interactions among the electrons. The second part is devoted to the derivation of effective evolution equations for interacting fermions, in suitable scaling regimes. The projects aims at proving the mathematical validity of celebrated effective theories such as Hartree-Fock and BCS theory for mean-field fermionic systems, and the quantum Boltzmann equation for weakly interacting Fermi gases.

Marcello Porta studied Physics at La Sapienza University in Rome, where he completed his doctorate in 2011. He did postdoctoral work at the ETH Zürich, the University of Bonn and the University of Zürich, where he became an assistant professor of Mathematics in 2016. Since October 2017 Porta has been a professor at the University of Tübingen's Department of Mathematics.



Marcus Scheele Photo: Friedhelm Albrecht/University of Tübingen

Marcus Scheele's project COINFLIP – Coupled Organic Inorganic Nanostructures for Fast, Light-Induced Data Processing – is motivated by the ongoing transition from cable to optical fiber data communication technology. The main objective of COINFLIP is to design very fast optical transceivers that can be used to control the interface between optical fibers and electronic computer chips in consumer end-stations. Since data transfer across this interface is slow, optical transceivers are the bottleneck in the internet of tomorrow when all data communication will progress by fiber technology. Scheele aims to synthesize hybrid nanostructured materials by combining inorganic nanocrystals and organic semiconductor molecules which exhibit new electronic and photonic properties due to charge transfer at the organic/inorganic interface. With these materials, optical transceivers with data communication rates beyond the current 100 Gbit/s are within reach.

Marcus Scheele studied Chemistry at Universität Hamburg, where he completed his doctorate in 2011. He conducted postdoctorate work at the University of California, Berkeley, USA, and returned to Hamburg in 2012 as a research fellow. He has been a junior research group leader at the University of Tübingen's Institute of Physical and Theoretical Chemistry since 2013.

Marcus Scheele studied Chemistry at Universität Hamburg, where he completed his doctorate in 2011. He conducted postdoctorate work at the University of California, Berkeley, USA, and returned to Hamburg in 2012 as a research fellow. He has been a junior research group leader at the University of Tübingen's Institute of Physical and Theoretical Chemistry since 2013.

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