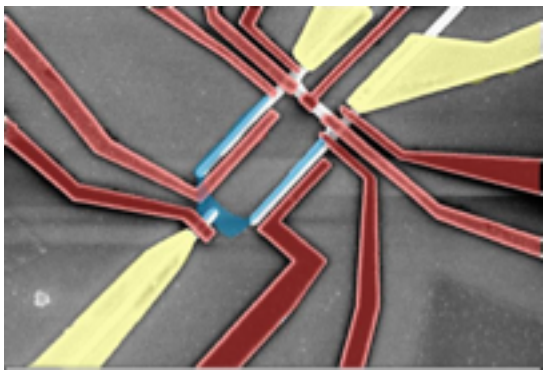
Bachelors and Masters Student Projects:

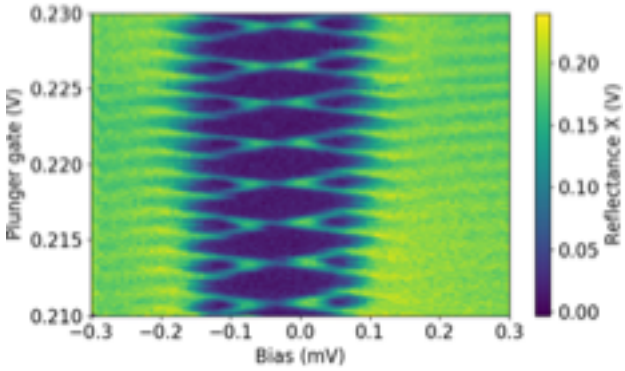
Majorana zero modes in SAG nanowires

Center for Quantum Devices or Microsoft Quantum Copenhagen

The physics of **Majorana modes** have been the subject of intense experimental research at the Center for Quantum Devices. Majorana modes exist in the **topological phase** of one-dimensional semiconductor-superconductor nanostructures and hold the promise to enable quantum computing. Thus, they are a hot research topic in solid-state physics with strong relevance for future computer hardware.

The material we work on are semiconducting **InAs nanowires** proximitized by superconducting Al. This combines a conventional superconductor and a semiconductor with strong spin-orbit interaction. In our particular approach, we use nanowires produced by **selective area growth** (SAG). This allows for two-dimensional nanowire networks that can be used to build novel device





Left: False color scanning electron micrograph of an InAs-Al interferometer device that incorporates Majorana zero modes and quantum dots. **Right:** Measurement of coulomb diamonds in an InAs-Al quantum dot using RF reflectometry.

We would like to encourage motivated master students to join us. You can explore the physics of Majoranas with us and help in engineering novel quantum devices on our way towards a topological quantum bit. Your tasks may include nanofabrication, data analysis, characterization and electronic measurements of devices. Typical techniques we apply are electron beam lithography, dilution refrigeration, RF and DC electronics as well as programming in Python.

Please contact Charlie Marcus (marcus@nbi.ku.dk) in order to get further information or discuss possible projects in more detail.