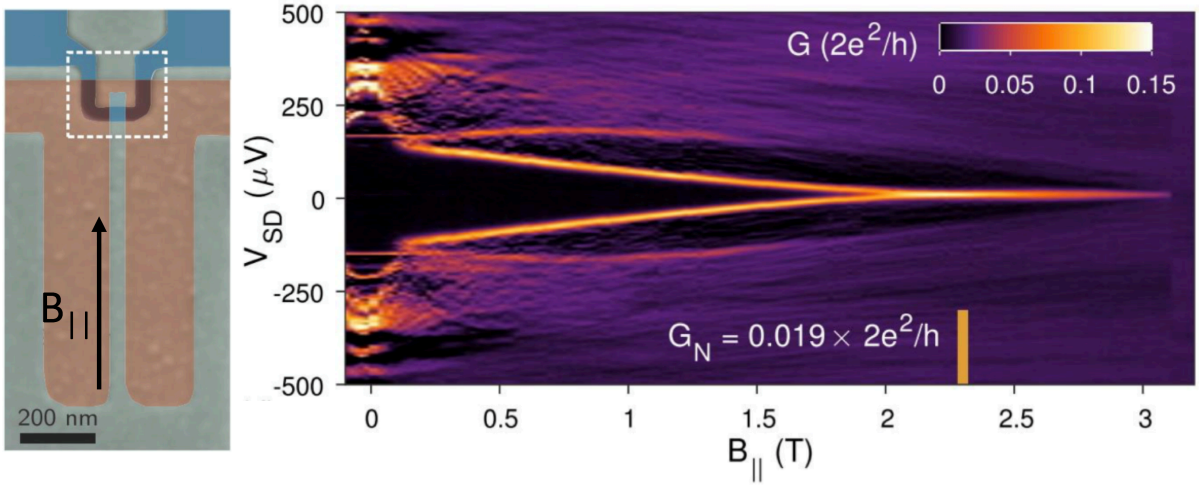
Bachelors and Masters Student Projects:

Topological Superconductivity in 2D Electron Gases

Center for Quantum Devices or Microsoft Quantum Copenhagen

Classifying materials by topology rather than symmetry is the condensed matter paradigm of the century. **Topological superconductors** are a new class of materials, expected to hold a superconductive gap in their bulk and protected states at their boundaries. These states are called **Majorana modes**, and are attracting an enormous experimental and theoretical interest. So far, the main building block for Majorana modes experiments have been 1D nanowires.



Left. False color scanning electron micrograph of a superconductor-2DEG device used to study Majorana modes. **Right.** Differential conductance measured at the end of the device as a function of the source-drain voltage bias and the magnetic field parallel to the hybrid conductor. A robust zero-bias conductance peak compatible with a Majorana state is observed at high fields.

Our research objective is to take topological superconductors to the new dimension by developing a 2D platform for creating, studying and manipulation Majorana modes. Our playground is two-dimensional electron gases (2DEGs) embedded in materials with very strong spin-orbit interaction, strongly coupled to superconducting metals.

We are looking for motivated bachelor and master students to side us in our research. During your stay you will be involved in nano fabrication of devices, electrical measurements at cryogenic temperatures, data analysis and much more. Our interest ranges from studying fundamental properties of matter to using Majorana modes for quantum computation.

If you are interested in getting involved with our research, or if you want to know more, do not hesitate to contact Charles Marcus (marcus@nbi.dk).