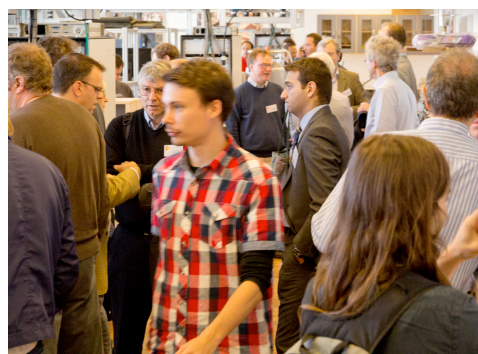


### Center Highlights: Creating the QDev Labs

2012 was the inaugural year for the Center for Quantum Devices (QDev). Among our first tasks was the construction of new laboratories and associated support space. QDev comprises two main laboratory spaces, the second and fourth floors of Building D of the H. C. Ørsted Laboratory at the University of Copenhagen. There are additional spaces that are part by QDev within Building D, including offices for theory staff and students, and two basement rooms housing vibration-sensitive equipment.

What we were aiming to create—a joint research activity that combines theory, materials synthesis, device nanofabrication, and advanced quantum measurement under one banner—had no precedent for us to imitate.



**Fig. 1** QDev kick-off, September 2012.

Beyond these challenges, the forefront of cryogenic technology, used for all experiments in QDev, is advancing rapidly, with cryogen-free cooling to 4K growing from 10% of the market 90% in the past five years. Our aim in creating QDev facilities was to defined the state of the art. This meant not only replacing all existing dilution refrigerators—the unique technology for cooling below 0.3 K—with cryogen-free units, but also moving to systems in which experimental samples could be loaded without warming the whole apparatus, and could be swapped between cryostats. Swapping load-locked samples between cryogenic systems did not exist when QDev was conceived, and was first implemented in this lab.

### Center Highlights: Publications & People

Since June 2012, QDev has published 22 scientific papers in peer reviewed journals, with the Center for Quantum Devices in the address line of the paper. This does not include papers now under review nor papers posted online at ArXiv.org, where most papers in Physics appear prior to publication. Particularly notable among these publications are a series of papers by M. Leijnse and K. Flensberg involving the interaction of confined single electrons in quantum dots with topological excitations in semiconductor-superconductor hybrid electronics. These papers have set a path for experimental work in QDev for the next several years and will stimulate further theory and experiment worldwide.

We have created two other web-based information tools. The first is a web site for QDev, <http://qdev.dk>, which lists position openings, publications, staff and students, and research projects. The second is a QDev wiki, <https://wiki.nbi.ku.dk/qdevwiki>, which contains information for researchers in QDev, ranging from ordering and travel procedures to nanofabrication recipes.

As a new Center, an essential part of our success is hiring a cohort of talented scientists. QDev was integrated into the Niels Bohr Institute's Condensed Matter Physics group. Theory post-doctoral fellows and PhD students working with Karsten Flensberg as well as experimental/materials post-doctoral fellows and PhD students working with Jesper Nygård became affiliated with QDev. In addition, two Ph.D. students and a new Associate Professor, Ferdinand Kuemmeth, as well as the Center Coordinator, Jess Martin, moved with Marcus from Harvard to Copenhagen. Building off of this base, QDev has recruited another 12 new staff members, 11 academic and one administrative.

QDev has also been influential in expanding condensed matter physics at the Niels Bohr International Academy (NBIA). A prominent new member of NBIA is Mark Rudner (Associate Professor), who left a tenure track position at Ohio State University to join NBIA and QDev. Jeroen Danon is another NBIA hire who is now closely affiliated with QDev. While Rudner and Danon are supported by NBIA, their primary research activity is within QDev, and hence they are QDev members.

