

## **Primary thermometry and electron cooling: on the way to sub-mK temperatures**

Yuri Pashkin

Many applications benefit from lower temperatures of nanoelectronic structures. However, cooling nanodevices presents extreme challenges in maintaining thermal contact between the electrons in the device and an external cold bath. It is typically found that when nanoscale devices are cooled to 10 mK the electrons are significantly overheated. We have used an array of small tunnel junctions, commonly referred to as Coulomb Blockade Thermometer, to directly measure the electron temperature. By optimizing the device design and immersing the thermometer in the  $^3\text{He}/^4\text{He}$  refrigerant of a dilution refrigerator, we measure a lowest electron temperature of 3.7 mK. We also adapted the nuclear demagnetization technique used in the ultra-low temperature cryogenics to perform on-chip cooling and aim to reach sub-mK electron temperature. Recent experimental activity undertaken in Lancaster will be covered in the talk.