**Project acronym:** DarkFun

**Project title:** Resolving fungal dark matter in the Arctic thaw ponds using high-throughput single cell genomics and culturing

**Project leader:** Ali Nawaz, Technical University of Munich, Germany

**Discipline:** Earth Sciences & Environment: Ecosystems & Biodiversity

**Station(s):** CEN Whapmagoostui-Kuujjuarapik Research Station (Canada)

The applied research proposal aims to tap and resolve the fungal dark matter in thaw ponds of the Arctic regions using our newly established approach of laser-microdissection with subsequent single-cell omics and high-throughput single-cell culturing. Data from previous INTERACT projects suggested that the huge majority of fungal sequences from different research stations are classified as unknown fungi, which implies that these Arctic fungi are potentially novel that have no imprints in the already existing fungal databases. A community-based metabarcoding approach is not sufficient to resolve this issue, and the approach of "one-cell at a time" is the only way forward. Therefore, in the project, to resolve the fungal dark matter, we will apply a combination of laser dissection of fungal cells with advanced long-read sequencing and single-cell culturing. We will collect water samples from the Canadian (CEN-WK) research station. The outcome of this project will result in the correct genetic placement of so far unknown Arctic fungi into the Fungal Tree of Life (FToL), and the data will serve as a valuable genetic resource for follow-up studies. Another salient feature of this work is complementing the genomic and microscopic data of enigmatic fungal groups of Arctic regions with single-cell culturing. More importantly, this will open an entirely new avenue for looking into the genomic construction of specific fungal groups from the perspective of the Arctic environmental conditions, leading the way for follow up studies to isolate novel fungal groups with unmatched metabolic properties, which have never been targeted/identified before.