RIBO-ICE: Ribosomes and Translation.
Protein biosynthesis in cold, a study of Antarctic bacteria.

Protein synthesis (translation) is an essential process in every living cell. Translation machinery can adapt to various environmental conditions such as temperature or presence of antibiotics. Organisms have developed various strategies how to process translation of mRNAs effectively, for example specialised translation factors to aid protein synthesis, or adaptation of 5'UTRs. For a long time, studies of translation focused on commonly used laboratory strains such a *Escherichia coli* and *Bacillus subtilis*, or on a thermophilic *Thermus thermophilus*. However, little is known how translation machinery evolved to adapt to extremely low temperatures. Here, we will conduct the first comprehensive study of protein biosynthesis process in bacteria isolated in Antarctica.

The focus of the RIBO-ICE project will be on characterization of translation machinery of bacteria isolated in Antarctica from glaciers which have already melted. We envision finding translation factors, paralogs of ribosomal proteins, amino acids sequence adaptations of ribosomal proteins or ribosomal rRNA modification implicated in regulation of translation during temperature downshift. Specifically, we will address three scientific goals: (1) characterization of translation machinery; (2) characterization of transcriptome and translatome; and (3) *in vitro* characterization of translation apparatus in the Antarctic bacterial strains.

This project is of fundamental importance for three reasons: (1) due to an increase in global temperature, we must study organisms which may not survive new living conditions; this may be the last call to preserve information on these organisms; (2) translation is a fundamental process in every living cell and this study will broaden our understanding of protein biosynthesis; (3) study of the genomes of bacterial isolates from Antarctica may reveal not only unique translation adaptation mechanisms, but may also unveil new features in various other aspects of biology of these immensely interesting bacteria.