

## DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Post-glacial landscape, exposed by retreating (sometimes very fast) glaciers, is very heterogeneous concerning morphotypes i.a. moraine systems, dead ice, exposed bare rocks, post-glacial rivers and lakes. The retreating glacier leaves behind sorted materials, which are subjected to physical and chemical (weathering, cryogenic processes, aeolian accumulation) and to biological processes (succession of microorganisms and plants, organic matter decomposition), that initiate soil development. Currently, many researchers explore specialized ecological group of relatively simple organisms which colonize ecosystems of hot and cold deserts, post-glacial areas, high mountain slopes and oceanic beaches. Due to ability to assimilate atmospheric nitrogen and to accumulate carbon, these organisms play crucial role in formation of soil organic matter and influence early stages of pedogenesis. These organisms are called **biological soil crusts (BSCs)** and comprise various ecological groups, including bacteria (including autotrophic cyanobacteria), fungi, algae, lichens and bryophytes.



*Rys. Biological soil crusts: cyanobacterial biofilm (a), lichens (b), and pioneer vascular plant( cushion plants), (c) mosses (d). (Photos: M.Suska-Malawska)*

The latter two groups, just like microorganisms, are pioneer species that are first to colonize areas currently inhabitable for vascular plants, and, together with cyanobacteria, are primary producers in extreme habitats. Taxonomic composition and ecological and functional morphotypes of BSCs are highly differentiated and depend on climatic factors, micro-topography, type of weathered material, stage of soil development and soil type, stage of BSCs succession, type and density of plant cover. Most of the BSC-forming organisms are cosmopolitan species, adapted to extreme environmental conditions. They play an important role in nutrient-poor ecosystems, comparable to ecosystem functions of vascular plants in richer habitats.

**The aim of the proposed project is to advance knowledge on soil forming processes at the early stages of pedogenesis in postglacial landscapes of the Mongolian Altay Mts., with a focus on biological soil crusts and pioneer symbiotic vascular plants.**

Our research will be conducted in forefields of the Potanin glacier, in the valley of the Tsagaan-gol river, located in the Tavan Bogd Mountains, in the narrowing between the ranges of Russian and Mongolian Altay. This region is a current centre of glaciations, that comprises the biggest post-glacial valley in the whole Altay region. The main part of our project comprises studies on (1) characterization of areas differentiated in terms of space and time, (2) assessment of functional, morphological and taxonomic diversity of BSCs and pioneer species of vascular plants. The obtained results will help to prepare a model of C and N sequestration in soils in the mountainous glacier forefields and to assess initial pedological transformations (morphological, mineralogical, physical and chemical) under BSCs and other pioneer species. Our research will create a new perspective on interpretation of BSCs role in ecosystems, taking into consideration their relations to mezo- and micro-topography, parent material, climate, pedogenesis and soil functions in semi arid climate. In context of advancing global warming, research on BSCs can be applied to assess ecosystem budget of C and N and predict climate-bound transformation of high mountain ecosystems. This knowledge can be used for management and conservation of sensitive high-altitude ecosystems, prone to overgrazing and/or exploitation for industrial resources.