The steppe biome is a belt of grasslands covering a vast area in Eurasia. It stretches from Hungary in the west, through Ukraine, Kazakhstan, Central Asia to Mongolia and China in the east. In Central-Western Asia, steppe vegetation occurs in both lowland and mountain areas. Whereas, in the highest elevations, in the Pamir and Tian-Shan, the steppes fluently transit into cold (criophytic) steppes and semi-deserts occurring on highland plateaus and mountain slopes. Although the area of Central-Western Asia was not covered with ice during the Quaternary climatic turmoil, the plants occurring there experienced successive periods: cool and dry during glaciations and hot and humid during interglacials. Undoubtedly, climate changes and changes in the distribution of habitats had a major impact on the diversity of steppe species, their distribution both in time and space, demographic history and the genetic structure of the population. One of the most picturesque types of steppe vegetation are those dominated by *Stipa* (feather grass steppes), considered the flagship type of vegetation of the steppe biome. Feather grass steppes are also often documented in photos illustrating the extraordinary beauty and uniqueness of this type of vegetation with fields of flowering and fruiting feather grasses with awns waving in the wind in the foreground. However, the share of *Stipa* species in particular plant communities is very diverse and depends on the climatic and edaphic conditions occurring within the horizontal and vertical range. It should also be emphasised that the genus *Stipa* is one of the most taxonomically difficult genera of grasses and, at the same time, one of the richest in species. It includes about 160 species in the Old World, of which over 100 occur in Central-West Asia, mainly in mountain areas.

Bearing in mind that genetic diversity is the evolutionary basis for adaptation to a changing environment, its estimation is of fundamental importance in assessing the sensitivity of species to ongoing climate change. However, this knowledge in relation to *Stipa* is still largely unavailable. Therefore, in this project, by integrating environmental, morphological, cytological, and molecular data, we will focus on the elucidation of the evolutionary history of the genus and spatio-temporal genetic diversity of its representatives. Realisation of this project allows us to answer the following questions: (1) What are the phylogenetic relationship, species diversity and species limits within the genus *Stipa*, as well as what is the value of morphological characters for *Stipa* systematics in reference to molecular ones? (2) How many *Stipa* taxa are 'pure' species and how many of them are of hybrid origin? (3) What is the genetic diversification, divergence time, geographic distribution and demographic history of particular genetic lineages within the *Stipa caucasica* complex? (4) Do particular genotypes adapted to different environmental conditions within the species' range differ in ploidy level and sensitivity to climate change? (5) What is the frequency and scale of interspecific hybridisation and introgression events within sympatric populations of feather grasses along the elevation transect starting from lowlands in Kazakhstan and ending in the highest elevations of Pamir in Tajikistan (from 300 to 5000 m a.s.l.)? (6) Do hybrids exhibit reduced genomic vulnerability to climate change in comparison with parental taxa?

Global climate warming, observed since the end of the 20th century, results in changes in the ranges of species and, consequently, affects the biodiversity of individual regions of the Earth. An increase in temperature causes organisms to move to more favourable areas, i.e. those at higher latitudes (horizontal range changes) or those located higher (vertical range changes). Because the range shift will affect species from all climatic and plant zones, an important aspect of our work will also be forecasting the threat to vegetation and Stipa species in the context of climate change.

By implementing this project, we will contribute to understanding both the patterns and drivers of genetic diversity among feather grasses and provide new insights into the processes shaping their distribution during the Quaternary climatic turmoil. The results of this project will also enable an understanding of the spatial distribution of adaptive and neutral genetic variation across the horizontal and vertical range of the steppe biome. Currently, we lack detailed knowledge about these processes and are far away from an all-embracing synthesis of the evolutionary history of Asian mountain steppes. This project also responds to an international call to intensify research in the world's biodiversity hotspots exposed to rapid climate change.