



**BORDERS** **nd**

**T4EU week courses**



Funded by  
the European Union

**b** **y** **nd**

# Environmental Genomics

Environmental genomics is an exciting and rapidly evolving field that combines the principles of genomics, ecology, and molecular biology to study the genomes of organisms in their natural environments, through the analysis of the nucleotide sequence of genes, genomes, metagenomes, transcriptomes and metatranscriptomes. It provides a powerful tool to understand the diversity, functions, and interactions between organisms, which play a crucial role in maintaining the health and stability of ecosystems. Environmental genomics, when integrated with other biodiversity monitoring methods like camera traps and remote sensing, offers a comprehensive insight into various aspects of both present-day and fossilized organisms. This approach not only sheds light on the taxonomy and diversity of organisms, but also provides valuable information about their phylogeny, evolutionary history, and potential for adaptation. Moreover, it helps us understand their functional traits and interactions with the environment. This holistic understanding is crucial in today's context, especially as we face the challenges posed by climate change.

This course will introduce students to the fundamental concepts and techniques of environmental genomics and explore its applications in various areas of research..

**LANGUAGE: English**

**ECTS: 3**

**Max. participants: 20**

The course will consist of 4 modules:

1. Introduction to Environmental Genomics
2. Foundations of Genomics and different genetic monitoring approaches
3. Sampling, extraction, and processing of DNA
4. Data Analysis

**CONTACT: [elena.buzan@famnit.upr.si](mailto:elena.buzan@famnit.upr.si)**



**GREEN, DIGITAL & INCLUSIVE**  
University of Primorska  
ZELENA, DIGITALNA IN VKLJUČUJOČA  
Univerza na Primorskem  
VERDE, DIGITALE E INCLUSIVA  
Università del Litorale

**MSC and PhD students  
of  
biology,  
environmental sciences,  
and bioinformatics**

# Environmental Genomics

## Introduction to Environmental Genomics (2 hours)

Definition and scope of environmental genomics  
Significance of environmental genomics in understanding and managing ecosystems

## Foundations of Genomics (2 hours)

DNA structure and function  
DNA sequencing technologies

## Sampling, extraction, and processing of DNA (4 hours)

Methods for sampling environmental samples  
Techniques for environmental DNA extraction from water or soil  
PCR analysis and electrophoresis  
Library preparation

## Data Analysis (6 hours)

Databases for biological sequences  
Genetic markers for metabarcoding  
Identification and analysis of various taxa using metabarcoding  
Introduction to BASH command line  
Understanding data formats (FASTQ, FASTA)  
Core concept of computational pipeline for amplicon sequencing analysis  
Introduction of the QIIME2 suite  
Microbiome analysis in R

# Environmental Genomics



**Prof. Dr.  
Elena Bužan**  
University of Primorska

Elena Buzan obtained her BSc in Natural Sciences at the University of Zagreb (Croatia), she later earned her MSc at the Faculty of Mechanical Engineering of Maribor (Slovenia) and her PhD from the Biotechnical Faculty of Ljubljana (Slovenia), after a training period at the University of Hull (UK). After six years in the private sector, she turned back to Academia and, since 2011, she has been recognized as a researcher but also as a manager, first as chair of Institutes, Laboratories and Departments and, more recently, as vice-Dean at University of Primorska, Faculty for Mathematics, Natural Sciences and Information Technologies department in University of Primorska. Within her career, she established a university spin-off, led five international and two national projects, collaborated on nine national, six bilateral, and seven international additional projects, and supervised three projects connecting the University and local economy. Among current projects, she is UP leader of many H2020 projects - BEPREP / Identification of best practices for biodiversity recovery and public health interventions to prevent future epidemics and pandemics, PRO-COAST / A PROactive approach for COMMunities to enAble Societal Transformation and BGE / Biodiversity Genomics Europe. Her high interdisciplinarity is testified by the variety of topics in her 80 peer-reviewed papers, spanning from health-related topics to wildlife conservation. She has experience with environmental genomics linking with wildlife diet and spatial distribution of species and related diseases. Prof. Buzan has supervised 25 Bachelor, 7 Master, and 6 PhD students. Additionally, she has mentored 3 postdoctoral researchers. During her career, she established a network of collaborators from European, American, and African countries that led to high-ranking publications. She is also a member of the European University Association for Open Science.



Matjaž Hladnik graduated from the Biotechnical Faculty at the University of Ljubljana, Slovenia. His research at University of Primorska, Faculty for Mathematics, Natural Sciences and Information Technologies focuses on the genetics, genomics, and transcriptomics of agricultural plants, microbiota analysis, and bioinformatics. In the field of agricultural plants, he is interested in the diversity of plant genetic resources, fingerprinting, population structure, and the identification of genes responsible for important agronomic traits. In the field of microbial community analysis using a metabarcoding approach, he is primarily interested in the interactions between microorganisms and plant pathogens. He has experience in transcriptome data analysis, genome assembly and annotation, development of microsatellite markers, and metabarcoding. He possesses knowledge of using bioinformatics tools on the Linux command line and the R programming language, including several R packages essential for microbial data analysis.



**Assist. Prof. Dr.  
Matjaž Hladnik**  
University of Primorska



**Assist. Prof. Dr.  
Alenka Baruca Arbeiter**

University of Primorska

Alenka Baruca Arbeiter graduated in biology from the Biotechnical Faculty, University of Ljubljana in 2009. She has been employed at the University of Primorska, Faculty for Mathematics, Natural Sciences and Information Technologies since January 2010. In 2011, she obtained grant from Slovenian Research Agency for doctoral education and enrolled into the interdisciplinary doctoral study program Biotechnology at the University of Ljubljana, Biotechnical Faculty. Her fields of research are development and characterization of microsatellites from genomic-DNA and transcriptomic-RNA sequence (olive, immortelle), genome/transcriptome functional annotation, genetic diversity studies of Mediterranean plant species, paternity analysis and pollination biology. Currently, she is focused on in depth transcriptome sequences data generation and development of genic markers for integrated research of *Helichrysum* sp. for further metabolomics and in vitro studies.