Linking species richness, community structure and ecosystem function to support biodiversity monitoring in increasingly urbanized marine areas.
Contact: Prof. Laura Airoldi, e-mail: laura.airoldi@unipd.it

Urban and periurban ocean sprawl already impact 1.5% of the global exclusive economic zones, and the demand for ocean space and resources is increasing. As we strive for a more sustainable future, it is imperative that we better design, manage, and conserve urban ocean spaces for both humans and nature. Understanding what ecological forces and processes shape biodiversity in increasingly urbanized marine systems is therefore fundamental to guide better planning, management and design of marine urban spaces. The project focuses on quantifying gradients of physical and biotic alteration and homogenisation in marine urban areas using a combination of field sampling and controlled field and lab experiments. Focus will be on a variety of habitats potentially affected by marine urbanisation (sedimentary habitats, rocky shores, seagrasses, saltmarshes) and on the consequent homogenisation. The successful applicant will work in an international integrated team and should have a background in one or more of the following fields: marine ecology, marine urban ecology, experimental ecology. Training in Scientific Diving, or at least evidence of capability to work in the field in the sea (i.e. capability to swim) is also requested, as well as English language proficiency. Skills in either seaweed taxonomy or sedimentary benthos is regarded as an advantage, as well as data analysis proficiency with R.

Non coding RNA role in the development and progression of haematological malignancies: towards RNA-based therapies.
Contact: Prof. Stefania Bortoluzzi, e-mail: stefania.bortoluzzi@unipd.it

Thousands of circRNAs are expressed in most human cells with patterns dynamically changing during cell differentiation, maturation and in development, and altered in disease. Several circRNAs were proven to be regulatory molecules acting with different mechanisms. This project will aim to develop and apply bioinformatics methods to the study of circRNA roles in leukemias. In fact, the integration of the circRNA level in multi-omics studies has the potential to disclose new disease mechanisms and oncogenic axes and to identify new prognostic biomarkers and, most importantly, new targets for innovative RNA-based therapies.

Intrinsic and extrinsic factors affecting migratory behaviour of waterbirds.
Contact: Prof. Andrea Pilastro, e-mail: andrea.pilastro@unipd.it

The research will investigate factors influencing the movements of migratory waterbirds in the coastal lagoons of North Adriatic sea. Individual movement data collected through GPS-GSM/VHF telemetry will be integrated with visual population census and environmental information from Corine LandCover and satellite databases. Analyses will be performed using R and GIS.

Development and characterization of relevant preclinical models for arrhythmogenic cardiomyopathy (ACM).
Contact: Prof. Alessandra Rampazzo, e-mail: alessandra.rampazzo@unipd.it

Arrhythmogenic cardiomyopathy (ACM) is a genetic disease characterized by progressive cardiomyocyte loss and fibrofatty replacement, which in turn lead to the occurrence of ventricular arrhythmias and sudden cardiac death (SCD), particularly in the young and athletes. Patient-derived, multi-component cardiac microtissues will be generated and analyzed to characterize ACM-specific pathogenic features and to discover new therapeutic substrates for ACM.

RNA-based strategies to treat arrhythmogenic cardiomyopathy (ACM).
Contact: Prof. Alessandra Rampazzo, e-mail: alessandra.rampazzo@unipd.it

Since available therapy for Arrhythmogenic Cardiomyopathy (ACM) has only a marginal impact on long-term prognosis, there is both room and need for the development of innovative therapies.
MiRNAs have the ability to modulate many genes and are already used in clinical trials. The project aims to identify miRNAs and mRNAs associated with Arrhythmogenic Cardiomyopathy by exploiting RNA sequencing of patient cardiomyocytes and to test some miRNAs for their therapeutic power. To provide an in vitro proof of concept of the therapeutic efficacy of selected miRNAs, we will explore the treatment effects of patient-derived iPS-CMs with synthetic miRNAs or miRNA antisense by functional assays.

Computational approaches using hardware accelerators for high performance analysis of omics data
Contact: Prof. Gabriele Sales, e-mail: gabriele.sales@unipd.it

Recent advancements in high—throughput measurement technologies have increased the size and complexity of omics datasets. Analytical workflows relying on the use of standard CPUs are increasingly representing the major bottleneck to the interpretation of results and the generation of new hypotheses. The aim of the project is to develop novel algorithms to take full advantage of the massive parallelism provided by graphical processing units (GPUs), and to improve the performance of key steps of common pipelines used for the analysis of omics data.

Metabolic control of translation in health and diseased angiogenesis.
Contact: Prof. Massimo Santoro, e-mail: massimo.santoro@unipd.it

Endothelial cells (ECs) exhibit remarkable and unique plasticity in terms of metabolism. However, whether metabolic process can modulate EC translation affecting angiogenesis is still missing. By using advanced metabolic and imaging platforms, and innovative molecular and genetic approaches in different in vivo

animal models, we aim to shed light on the role of metabolic pathway in health and disease angiogenesis. The ultimate objective is to open the way for the development of innovative therapeutic strategies and complement the existing ones based during tumor angiogenic processes.

Role of isoprenoid metabolic pathway in melanoma progression and recurrence.
Contact: Prof. Massimo Santoro, e-mail: massimo.santoro@unipd.it

We aim to investigate novel metabolic drivers of melanoma acquired during disease progression focusing on the mevalonate pathway. We will exploit modern omics technologies to investigate transcriptomic and metabolic alteration in a heterogenous and plastic context, such as that of melanoma. The identification of the mevalonate pathway as a possible driver of Circulating Tumor Cells (CTCs) survival and metastasis, and as a source of vulnerability in therapy-resistant melanoma, would offer new therapeutic strategies to prevent tumor progression and relapse, improving the efficiency of current valuable therapeutic options.

Biogenic Gas Utilization for Sustainable Biofuel Production: Metagenomics and Metabolic Flux Balance Analysis.
Contact: Prof. Laura Treu, e-mail: laura.treu@unipd.it

The HORIZON CRONUS project is a research effort aimed at addressing the gaps in the production of biofuels. Specifically, the project focuses on the carbon waste and biogenic effluent gases generated during the production process and their related environmental problems. The project aims to develop sustainable technological solutions that can efficiently capture, utilize, and store these gases within the biofuels value chain. The PHD project will employ several technologies for the valorization of biogenic effluent gases, including enzymatic capture of CO_2, autotrophic algae cultivation, microbial electrolysis cell, syngas and in-situ biomethanation, and biological hydrogenation. To optimize the efficiency of these technologies, the microbial interactions and their associated metabolic pathways will be deeply investigated, and a computational modeling pipeline will be developed to integrate biochemical and process parameters. Next-generation sequencing will be used to evaluate the microbial composition, and gene prediction and annotation will indicate the metabolic pathways present and their association with the species. Efficiency of CO_2 utilization will be maximized through the development of technically advanced systems and control architectures based on biological resource management. Cellular metabolism will be quantitatively simulated using physicochemical constraints, which will allow for a rational design of the processes and the reduction of trial-and-error work for optimization. Nutrient and intermediate metabolic compound fluxes will also be monitored and evaluated to determine strategies for efficient recovery and the maintenance of a healthy microbial consortium. Overall, the PHD project seeks to develop sustainable and efficient solutions for the valorization of biogenic effluent gases within the biofuels

value chain, while also deepening our understanding of microbial interactions and their associated metabolic pathways.

The projects with titles "*Network and quantitative biology*", "*Biological signals*" and "*Biological processes*" will cover general topics referring to those outlined in each Curriculum.