RESEARCH PROJECTS OFFERED **EXPERIMENTAL AND HEALTH SCIENCES DEPARTMENT**

PROJECT 1-
Structural Bioinformatics Laboratory
Principal Investigator: Dr. Baldo Oliva

Protein-protein interactions play a relevant role among the different functions of a cell. Identifying the protein-protein interaction network of a given organism (interactome) is useful to shed light on the key molecular mechanisms within a biological system. A paradox in protein-protein binding is to explain how the unbound proteins of a binary complex recognize each other among a large population within a cell and how they find their best docking interface in a short time-scale. We interrogate protein structure to unveil its function, generate the network of interactions and to relate genes/proteins with diseases by means of exploiting the topology of the network.

Current Projects
On the study of the relationship between sequence, structure and function of proteins: Characterization of the structural motifs involved in the function and interactions between proteins. Development of statistical potentials and analysis of physico-chemical potentials helping to describe the fold and function of proteins and its interactions with other macro-molecules.
On the prediction of protein-protein and protein-DNA interactions: Structural analysis of docking approaches and development of new techniques towards the prediction of binding sites and the mechanisms of interface selection of protein-protein and protein-DNA interactions.
On the analysis of protein interaction networks and its use on bio-medicine, helping to detect potential targets and prioritization of candidate disease-genes. Development of methods to study and integrate information for different types of networks and application on the study of metastasis. Prediction of signalling networks, such as the phosphorylation network and other post-transcriptional modifications, and integration with genomic data, such as microarrays.
http://sbi.upf.edu

PROJECT 2-
Laboratory of Molecular Virology
Principal Investigator: Dr. Juana Díez

Virus-cell interactions in emerging virus infections
A challenge of the extensive mobility that characterizes current societies is the spreadof viral pathogens out of their endemic environment. Key examples are the mosquitoborne
Chikungunya virus (CHIKV), West Nile virus (WNV), Dengue virus (DENV) and the Zika virus (ZIKV). All of them belong to the large group of positive-strand RNA viruses and because of their genetic simplicity, they completely depend on the cellularmachinery for expansion. The identification of crucial virus-cell interactions is thus essential to understand their biology. In addition, these studies may provide novel strategies for therapeutic interventions.
Upon entry into the cell, a crucial common step in positive-strand RNA virus life cycle

is the translation of their genomes. How do they manage to efficiently compete with thousands of cellular mRNAs? How do they change the translational environment of their host to their benefit? How these emerging viruses adapt to human and mosquito cells? Are there host factors used by CHIKV, WNV, DENV and ZIKV that can be targeted to develop broad-spectrum antivirals? The proposed project will be related to these fundamental questions.
file://localhost/Website/ http/::www.upf.edu:virologyunit:

PROJECT 3-
Laboratory of Dynamical Systems Biology
Principal Investigator: Dr. Jordi Garcia-Ojalvo

Our lab is interested in the dynamics of living systems, from unicellular organisms to human beings. We use dynamical phenomena to identify the molecular mechanisms of cellular processes, such as bacterial stress responses, spatial self-organization in bacterial biofilms, cellular decision making in stem cells, and the immune response to cytokine signaling. Using a combination of theoretical modeling and experimental tools such as time-lapse fluorescence microscopy and microfluidics, we investigate dynamical phenomena including biochemical pulses and oscillations, and study how multiple instances of these processes coexist inside the cell in a coordinated way. For more information,
http://dsb.upf.edu

PROJECT 4-
Laboratory of Oxidative Stress and Cell Cycle Group
Principal Investigators: Dr. Elena Hidalgo and Dr. Jose Ayte
The long term goal of our laboratory is the study of cell cycle control. The exact knowledge of how a normal cell divides is required to understand what is wrong on a cancer cell. However, despite the efforts in many labs to understand the molecular mechanisms that govern cell cycle progression, there are still many aspects that are unknown. We are offering a position aiming to the characterization of how the transcription factor MBF controls the G1/S transition in the mitotic cycle of the model organism Schizosaccharomyces pombe.
http://www.upf.edu/osccg

PROJECT 5-
Laboratory of Developmental Biology
Principal Investigator: Dr. Berta Alsina
Our lab is interested in understanding how during development, specific cell-types are originated from undifferentiated progenitors. We investigate questions related to differential gene activation, cell identity, tissue organization and cell communication. In particular, we focus on the inner ear and by combining 4D live-imaging, genetic perturbations and genomic analysis we are currently studying how neurons are born at the precise location and moment, how the inner ear organ is assembled and the mechanisms of hair cell regeneration.

https://www.upf.edu/devbiol/projectes/Alsina_laboratory.html

PROJECT 6-
Laboratory of Neurobiology of Behaviour
Principal Investigator: Dr. Olga Valverde
Our research is focused in behavioral neuroscience using animal models. We investigate pathophysiological questions related to neuropsychiatric disorders, including the neurobiological substrate of drug addiction, affective disorders, cognitive alterations, pain and co-morbidity between drug addiction and depression. For our research, we combine classical behavioral and pharmacological strategies with neurochemical, molecular and genetical approaches, including the use of genetically modified mice.
https://www.upf.edu/grenec/description/

PROJECT 7-
Laboratory of Computational Biology of RNA Processing
Principal Investigator: Dr. Roderic Guigó

The overarching theme of the research in our group is the understanding of the information encoding in genomic sequences, and how this information is processed in the pathway leading from DNA to protein sequences. More specifically, we are interested in the regulation of the primary production (transcription) and post-processing (splicing) of RNA, and how this regulated production relates to cell, tissue and organism phenotypes.
http://big.crg.cat/computational_biology_of_rna_processing

PROJECT 8-
Laboratory of Myogenesis, Inflammation & Muscle Function
Principal Investigator: Dr. Joaquim Gea
Our research is mainly addressed to lung diseases such as Chronic Obstructive Pulmonary Disease (COPD) and lung cancer, but also muscle problems in aging, fibromyalgia and scoliosis. Our research includes clinical assessment, in vivo and in vitro physiological studies, and molecular biology procedures. The studies, which are mainly performed in humans, are complemented by animal models. The strategic outcome is to identify potential molecular targets of therapies against muscle dysfunction andmuscle cachexia.