

ERC GRANTEES

@ U.Porto



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ERC Grantees @ U.Porto

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European Research Council

Created in 2007 to foster the highest quality research, the **European Research Council** (ERC) provides attractive funding to support researchers across all fields of science with innovative ideas to form a team and pursue high-risk/high-gain frontier research in every domain in Europe.

ERC @ U.Porto

The quality of the research carried out by U.Porto's R&D ecosystem translates into **23 ERC grants awarded** so far - 10 Starting Grants, 8 Consolidator Grants, 4 Advanced Grants and 1 Synergy Grant. This publication aims to acknowledge the work and present an overview of our ERC grantees and their disruptive research projects.

ERC GRANT SCHEMES

ERC Starting Grants (StG)

for early-career, emerging research leaders (2-7 years after PhD - up to €1.5M for a period of 5 years)

ERC Consolidator Grants (CoG)

for researchers who are already independent (7-12 years after PhD - up to €2M for a period of 5 years)

ERC Advanced Grants (AdG)

for established researchers (up to €2.5M for a period of 5 years)

ERC Proof of Concept (PoC)

for ERC Grant holders only. Bridging the gap between research - earliest stage of marketable innovation (up to €150.000)

ERC Synergy Grants (SyG)

for teams of 2-4 established leading scientist PIs (up to € 10M for a period of 6 years)

AWARD YEAR	NAME	HOSTING INSTITUTION	FUNDING SCHEME	
2009	Nuno Santos	CAUP	STARTING GRANT	➤
2011	Helder Maiato	IMBC	STARTING GRANT	➤
2012	Manuel Alves	FEUP	STARTING GRANT	➤
2013	Adélio Mendes	FEUP	ADVANCED GRANT	➤
2014	Reto Gassmann	IBMC	STARTING GRANT	➤
2015	Ana Carvalho	IBMC	STARTING GRANT	➤
2015	Nuno Alves	IBMC	STARTING GRANT	➤
2016	José Bessa	IBMC	STARTING GRANT	➤
2016	Helder Maiato	IBMC	CONSOLIDATOR GRANT	➤
2018	Manuela Gomes	ICBAS	CONSOLIDATOR GRANT	➤
2018	Pedro Leão	CIIMAR	STARTING GRANT	➤
2020	Rita Covas	BIOPOLIS	CONSOLIDATOR GRANT	➤
2021	Miguel Carneiro	BIOPOLIS	CONSOLIDATOR GRANT	➤
2022	Susana Soares	LAQV/REQUIMTE	STARTING GRANT	➤
2022	André Tavares	FAUP	CONSOLIDATOR GRANT	➤
2022	Nuno Santos	CAUP	ADVANCED GRANT	➤
2022	Rita Lado	FEUP	STARTING GRANT	➤
2022	Salomé Pinho	i3S	SINERGY GRANT	➤
2023	Pedro Leão	CIIMAR	CONSOLIDATOR GRANT	➤
2024	Pedro Camanho	INEGI	ADVANCED GRANT	➤
2024	Sidh Losa Mendiratta	FAUP	CONSOLIDATOR GRANT	➤
2024	Helder Maiato	i3S	ADVANCED GRANT	➤
2024	Clara Pereira	LAQV/REQUIMTE	CONSOLIDATOR GRANT	➤

FUNDING SCHEME
Starting Grant (StG)

PROJECT ACRONYM
EXOEARThS

RESEARCH DOMAIN
Physical Sciences & Engineering

HOSTING INSTITUTION
CAUP

TIMEFRAME
2009-2014

FUNDING AWARDED
928 090,00€



NUNO SANTOS

**P
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T** **EXtra-solar planets and stellar astrophysics:
towards the detection of Other Earths**

The detection of more than 300 extrasolar planets orbiting other solar-like stars opened the window to a new field of astrophysics. Many projects to search for Earth-like planets are currently under way, using a huge battery of telescopes and instruments. New instrumentation is also being developed towards this goal for use in both ground- and space-based facilities. Since planets come as an output of the star formation process, the study of the stars hosting planets is of great importance. The stellar-planet connection is strengthened by the fact that most of the exoplanets were discovered using a Doppler radial-velocity technique, where the gravitational influence of the planet on the star and not the planet itself is actually measured. This project aims at doing frontier research to explore i) in unique detail the stellar limitations of the radial-velocity technique, as well as ways of reducing them, having in mind the detection of Earth-like planets and ii) to develop and apply software packages aiming at the study of the properties of the planet-host stars, having in mind the full characterization of the newfound planets, as well as understanding planet formation processes. These goals will improve our capacity to detect, study, and characterize new very low mass extra-solar planets. EXOEArths further fits into the fact that I am currently Co-PI of the project for a new high-resolution ultra-stable spectrograph for the VLT. The results of this project are crucial to fully exploit this new instrument. They will be also of extreme importance to current state-of-the-art planet-search projects aiming at the discovery of other Earths, in particular those making use of the radial-velocity method.



HELDER MAIATO

FUNDING SCHEME
Starting Grant (StG)

PROJECT ACRONYM
PRECISE

RESEARCH DOMAIN
Life Sciences

HOSTING INSTITUTION
IBMC

TIMEFRAME
2011-2015

FUNDING AWARDED
1 485 097,00€

P R O J E C T

Spatiotemporal regulation of chromosome segregation fidelity

At any given moment, 250 million cells are dividing in the human body through an essential process known as mitosis. Inaccuracy of mitosis leads directly to aneuploidy (gain or loss of chromosomes), a hallmark of several cancers and birth defects. Mitotic fidelity is controlled by the spindle assembly checkpoint (SAC), a signaling pathway that delays the progression of mitosis to ensure that all chromosomes are attached to mitotic spindle microtubules (MTs). Central to this activity, the kinetochore (KT), a minute structure on each replicated sister-chromatid, promotes the rapid turnover of MTs to correct potential attachment errors during early mitotic stages. Upon anaphase onset, the KT then switches to bind MTs with higher affinity, so that the energy derived from their depolymerizing plus ends helps driving chromosome motion to the poles. While the molecular basis of the KT-MT interface is only now starting to be elucidated, how the multiple KT activities are regulated throughout mitosis remains unknown. Here we propose to dissect from a molecular perspective how the interaction between spindle MTs and KTs controls chromosome segregation fidelity in space and time. For this purpose we will combine the power of biochemical analysis and genome-wide RNAi screens with the detailed functional investigation of already identified candidate genes using state-of-the-art live cell microscopy and pilot laser microsurgery tools in animal cells. Additionally, we have in place all the necessary conditions to investigate the physiological significance of chromosome segregation errors and evaluate respective outcomes using unique mammalian model systems. With this synergistic approach we aim to unveil the molecular routes of aneuploidygenesis and their implications to human health.



FUNDING SCHEME
Starting Grant (StG)

PROJECT ACRONYM
ELASTIC-TURBULENCE

RESEARCH DOMAIN
Physical Sciences & Engineering

HOSTING INSTITUTION
FEUP

TIMEFRAME
2012-2018

FUNDING AWARDED
994 110,00€



MANUEL ALVES

P **P** **R** **O** **J** **E** **C** **T** **Purely-elastic flow instabilities and transition to elastic turbulence in microscale flows of complex fluids**

Flows of complex fluids, such as many biological fluids and most synthetic fluids, are common in our daily life and are very important from an industrial perspective. Because of their inherent nonlinearity, the flow of complex viscoelastic fluids often leads to counterintuitive and complex behaviour and, above critical conditions, can prompt flow instabilities even under low Reynolds number conditions which are entirely absent in the corresponding Newtonian fluid flows. The primary goal of this project is to substantially expand the frontiers of our current knowledge regarding the mechanisms that lead to the development of such purely-elastic flow instabilities, and ultimately to understand the transition to so-called “elastic turbulence”, a turbulent-like phenomenon which can arise even under inertialess flow conditions. This is an extremely challenging problem, and to significantly advance our knowledge in such important flows these instabilities will be investigated in a combined manner encompassing experiments, theory and numerical simulations. Such a holistic approach will enable us to understand the underlying mechanisms of those instabilities and to develop accurate criteria for their prediction far in advance of what we could achieve with either approach separately. A deep understanding of the mechanisms generating elastic instabilities and subsequent transition to elastic turbulence is crucial from a fundamental point of view and for many important practical applications involving engineered complex fluids, such as the design of microfluidic mixers for efficient operation under inertialess flow conditions, or the development of highly efficient micron-sized energy management and mass transfer systems. This research proposal will create a solid basis for the establishment of an internationally-leading research group led by the PI studying flow instabilities and elastic turbulence in complex fluid flows.





ADÉLIO MENDES

FUNDING SCHEME
Advanced Grant (AdG)

PROJECT ACRONYM
BI-DSC

RESEARCH DOMAIN
Physical Sciences & Engineering

HOSTING INSTITUTION
FEUP

TIMEFRAME
2013–2018

FUNDING AWARDED
1 989 300,00€

P R O J E C T

Building Integrated Dye Sensitized Solar Cells

In the last decade, solar and photovoltaic (PV) technologies have emerged as a potentially major technology for power generation in the world. So far the PV field has been dominated by silicon devices, even though this technology is still expensive. Dye-sensitized solar cells (DSC) are an important type of thin-film photovoltaics due to their potential for low-cost fabrication and versatile applications, and because their aesthetic appearance, semi-transparency and different color possibilities. This advantageous characteristic makes DSC the first choice for building integrated photovoltaics. Despite their great potential, DSCs for building applications are still not available at commercial level. However, to bring DSCs to a marketable product several developments are still needed and the present project targets to give relevant answers to three key limitations: encapsulation, glass substrate enhanced electrical conductivity and more efficient and low-cost raw-materials. Recently, the proponent successfully addressed the hermetic devices sealing by developing a laser-assisted glass sealing procedure. Thus, BI-DSC proposal envisages the development of DSC modules 30x30cm², containing four individual cells, and their incorporation in a 1m² double glass sheet arrangement for BIPV with an energy efficiency of at least 9% and a lifetime of 20 years. Additionally, aiming at enhanced efficiency of the final device and decreased total costs of DSCs manufacturing, new materials will be also pursued. The following inner-components were identified as critical: carbon-based counter-electrode; carbon quantum-dots and hierarchically TiO₂ photoelectrode. It is then clear that this project is divided into two research though parallel directions: a fundamental research line, contributing to the development of the new generation DSC technology; while a more applied research line targets the development of a DSC functional module that can be used to pave the way for its industrialization.



FUNDING SCHEME
Starting Grant (StG)

PROJECT ACRONYM
DYNEINOME

RESEARCH DOMAIN
Life Sciences

HOSTING INSTITUTION
IBMC

TIMEFRAME
2014-2019

FUNDING AWARDED
1 367 466,00€



RETO GASSMANN

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Cytoplasmic Dynein: Mechanisms of Regulation and Novel Interactors

The megadalton cytoplasmic dynein complex, whose motor subunit is encoded by a single gene, provides the major microtubule minus end-directed motility in cells and is essential for a wide range of processes, ranging from the transport of proteins, RNA, and membrane vesicles to nuclear migration and cell division. To achieve this stunning functional diversity, cytoplasmic dynein is subject to tight regulation by co-factors that modulate localization, interaction with cargo, and motor activity. At present, our knowledge of the underlying mechanisms remains limited. An overarching goal of this proposal is to gain an understanding of how interactions with diverse adaptor proteins regulate dynein function in space and time. We choose the nematode *C. elegans* as our model system, because it will enable us to study the biology of dynein regulation in the broad context of a metazoan organism. The nematode's versatile genetic tools, its biochemical tractability, and the powerful molecular replacement technologies available, this makes for a uniquely attractive experimental system to address the mechanisms employed by dynein regulators through a combination of biochemical, proteomic, and cell biological assays. Specifically, we propose to use a biochemical reconstitution approach to obtain a detailed molecular picture of how dynein is targeted to the mitotic kinetochore; we will perform a forward genetic and proteomic screen to expand the so-far limited inventory of metazoan dynein interactors, whose functional characterization will shed light on known dynein-dependent processes and lead to novel unanticipated lines of research into dynein regulation; we will dissect the function and regulation of the most important dynein co-factor, the multi-subunit dynactin complex; and finally we will strive to establish a novel *C. elegans* model for human neurodegenerative disease, based on pathogenic point mutations in a dynactin subunit.





ANA CARVALHO

FUNDING SCHEME
Starting Grant (StG)

PROJECT ACRONYM
ACTOMYO

RESEARCH DOMAIN
Life Sciences

HOSTING INSTITUTION
IBMC

TIMEFRAME
2015–2021

FUNDING AWARDED
1 499 989,00€

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Mechanisms of actomyosin-based contractility during cytokinesis

Cytokinesis completes cell division by partitioning the contents of the mother cell to the two daughter cells. This process is accomplished through the assembly and constriction of a contractile ring, a complex actomyosin network that remains poorly understood on the molecular level. Research in cytokinesis has overwhelmingly focused on signaling mechanisms that dictate when and where the contractile ring is assembled. By contrast, the research I propose here addresses fundamental questions about the structural and functional properties of the contractile ring itself. We will use the nematode *C. elegans* to exploit the power of quantitative live imaging assays in an experimentally tractable metazoan organism. The early *C. elegans* embryo is uniquely suited to the study of the contractile ring, as cells dividing perpendicularly to the imaging plane provide a full end-on view of the contractile ring throughout constriction. This greatly facilitates accurate measurements of constriction kinetics, ring width and thickness, and levels as well as dynamics of fluorescently-tagged contractile ring components. Combining image-based assays with powerful molecular replacement technology for structure-function studies, we will 1) determine the contribution of branched and non-branched actin filament populations to contractile ring formation; 2) explore its ultra-structural organization in collaboration with a world expert in electron microscopy; 3) investigate how the contractile ring network is dynamically remodeled during constriction with the help of a novel laser microsurgery assay that has uncovered a remarkably robust ring repair mechanism; and 4) use a targeted RNAi screen and phenotype profiling to identify new components of actomyosin contractile networks. The results from this interdisciplinary project will significantly enhance our mechanistic understanding of cytokinesis and other cellular processes that involve actomyosin-based contractility.



FUNDING SCHEME
Starting Grant (StG)

PROJECT ACRONYM
TEC_Pro

RESEARCH DOMAIN
Life Sciences

HOSTING INSTITUTION
IBMC

TIMEFRAME
2015-2021

FUNDING AWARDED
1 491 749,00€



NUNO ALVES

**T
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T** **Molecular control of self-renewal and lineage specification in thymic epithelial cell progenitors in vivo**

The development of vaccines for the treatment of infectious diseases, cancer and autoimmunity depends on our knowledge of T-cell differentiation. This proposal is focused on studying the thymus, the organ responsible for the generation of T cells that are responsive against pathogen-derived antigens, and yet tolerant to self. Within the thymus, thymic epithelial cells (TECs) provide key inductive microenvironments for the development and selection of T cells that arise from hematopoietic progenitors. As a result, defects in TEC differentiation cause syndromes that range from immunodeficiency to autoimmunity, which makes the study of TECs of fundamental, and clinical, importance to understand immunity and tolerance induction. TECs are divided into two functionally distinct cortical (cTECs) and medullary (mTECs) subtypes, which derive from common bipotent TEC progenitors (TEPs). Yet, the genetic and epigenetic details that control cTEC/mTEC lineage specifications from TEPs are unsettled. My objectives are to identify TEC progenitors and their niches within the thymus, define new molecular components involved in their self-renewal and lineage potential, and elucidate the epigenetic codes that regulate the genetic programs during cTEC/mTEC fate decisions. We take a global approach to examine TEC differentiation, which integrates the study of molecular processes taking place at cellular level and the analysis of in vivo mouse models. Using advanced research tools that combine reporter mice, clonogenic assays, organotypic cultures, high-throughput RNAi screen and genome-wide epigenetic and transcriptomic profiling, we will dissect the principles that underlie the self-renewal and lineage differentiation of TEC progenitors in vivo. I believe this project has the potential to contribute to one of the great challenges of modern immunology – modulate thymic function through the induction of TEPs - and therefore, represents a major advance in Health Sciences.



JOSÉ BESSA

FUNDING SCHEME
Starting Grant (StG)

PROJECT ACRONYM
ZPR

RESEARCH DOMAIN
Life Sciences

HOSTING INSTITUTION
IBMC

TIMEFRAME
2016-2021

FUNDING AWARDED
1 497 520,00€

**T
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T** **The Pancreas Regulome: From causality to prediction of non-coding mutations in human pancreatic diseases**

Several human pancreatic diseases have been characterized, being the diabetes the most common. Like others, this genetic disease is related to disrupted non-coding cis-regulatory elements (CREs) that culminate in altered gene expression. Although Genome Wide Association Studies support this hypothesis, it's still unclear how mutations on CREs contribute to disease. The translation from the "non-coding code" to phenotype is an exciting and unexplored field that we will approach in this project with the help of the zebrafish as a suitable animal model. We aim to uncover the implications of the disruption of pancreas CREs and how they contribute to diabetes in vivo. For this we will study transcriptional regulation of genes in zebrafish. The similarities between zebrafish and mammal pancreas and the evolutionary conservation of pancreas transcription factors (TF) make it an excellent model to approach and study this disease. In this project we will characterize the zebrafish insulin producing beta-cell regulome, by determining the active CREs in this cell type and their bound TFs. Then we will compare this information with a similar dataset recently available for human beta-cells, to define functional orthologs in these species. Selected CREs will be tested by in vivo gene reporter assays in zebrafish, focusing on those functionally equivalent to human CREs where risk alleles have been associated with diabetes or those regulating genes involved in diabetes. Later these CREs will be mutated in the zebrafish genome to validate their contribution to diabetes. Finally we will translate this to predict new human disease-associated CREs by focusing on the regulatory landscape of diabetes-associated genes, without the need of having countless patients to uncover them. With this project we will create a model system that will allow the identification of new diabetes-associated CREs, which might have a great impact in clinical management of this epidemic disease.

FUNDING SCHEME
Consolidator Grant (CoG)

PROJECT ACRONYM
CODECHECK

RESEARCH DOMAIN
Life Sciences

HOSTING INSTITUTION
IBMC

TIMEFRAME
2016-2021

FUNDING AWARDED
2 323 468,00€



HELDER MAIATO

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CRACKING THE CODE BEHIND MITOTIC FIDELITY: the roles of tubulin post-translational modifications and a chromosome separation checkpoint

During the human lifetime 10000 trillion cell divisions take place to ensure tissue homeostasis and several vital functions in the organism. Mitosis is the process that ensures that dividing cells preserve the chromosome number of their progenitors, while deviation from this, a condition known as aneuploidy, represents the most common feature in human cancers. Here we will test two original concepts with strong implications for chromosome segregation fidelity. The first concept is based on the “tubulin code” hypothesis, which predicts that molecular motors “read” tubulin post-translational modifications on spindle microtubules. Our proof-of-concept experiments demonstrate that tubulin detyrosination works as a navigation system that guides chromosomes towards the cell equator. Thus, in addition to regulating the motors required for chromosome motion, the cell might regulate the tracks in which they move on. We will combine proteomic, super-resolution and live-cell microscopy, with in vitro reconstitutions, to perform a comprehensive survey of the tubulin code and the respective implications for motors involved in chromosome motion, mitotic spindle assembly and correction of kinetochore-microtubule attachments. The second concept is centered on the recently uncovered chromosome separation checkpoint mediated by a midzone-associated Aurora B gradient, which delays nuclear envelope reformation in response to incompletely separated chromosomes. We aim to identify Aurora B targets involved in the spatiotemporal regulation of the anaphase-telophase transition. We will establish powerful live-cell microscopy assays and a novel mammalian model system to dissect how this checkpoint allows the detection and correction of lagging/long chromosomes and DNA bridges that would otherwise contribute to genomic instability. Overall, this work will establish a paradigm shift in our understanding of how spatial information is conveyed to faithfully segregate chromosomes during mitosis.





MANUELA GOMES

FUNDING SCHEME
Consolidator Grant (CoG)

PROJECT ACRONYM
MagTendon

RESEARCH DOMAIN
Physical Sciences & Engineering

HOSTING INSTITUTION
ICBAS

TIMEFRAME
2018-2025

FUNDING AWARDED
1 999 854,00€

**T
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T** **Magnetically Assisted Tissue Engineering
Technologies for Tendon Regeneration**

The poor healing ability of tendons, which play a critical role in the musculoskeletal system, as well as the limitations of currently used therapies have motivated tissue engineering (TE) strategies to develop living tendon substitutes. However, the limited knowledge on tendon development and healing processes has hindered the design of TE procedures that more closely recapitulate tendon morphogenesis. Extending beyond the state-of-the-art, MagTendon will explore conventional and innovative tools such as multimaterial 3 dimensional (3D) bioprinting to design magnetic responsive systems mimicking specific aspects of tendon tissue architecture, composition and biomechanical properties, which, combined with adequate stem cells, will render appropriate behavioural instructions to stimulate the regeneration of tendon tissue. Stem cell bioengineering approaches based on superparamagnetic nanoparticles (SPMNs), namely cell sorting, mechanoreceptors targeting and cell programming, will be used to unveil the cellular signalling pathways that trigger the tenogenic differentiation of the widely and easily obtained human adipose derived stem cells. Simultaneously, the 3D cell-laden magnetic system shall enable sophisticated 3D tissue models to unravel mechanisms behind tendon homeostasis and repair that will support the base knowledge to establish rational design criteria for the biofabrication of living tendon substitutes with the adequate signaling and structural cues to recapitulate tendon tissue developmental patterns. Therefore, the ground-breaking nature of the research proposed relies on the development of disruptive technological concepts for obtaining unique cell-laden 3D magnetically responsive systems that recapitulate key features of the native tissue and that can be further remotely modulated both in vitro and in vivo by the application of external magnetic stimuli, offering the prospect of tendon regeneration as opposed to simple tissue repair.





PEDRO LEÃO

FUNDING SCHEME
Starting Grant (StG)

PROJECT ACRONYM
FattyCyanos

RESEARCH DOMAIN
Physical Sciences & Engineering

HOSTING INSTITUTION
CIIMAR

TIMEFRAME
2018-2022

FUNDING AWARDED
1 462 938,00€

PROJECT Fatty acid incorporation and modification in cyanobacterial natural products

Known, but mostly novel natural products (NPs) are in high demand – these are used in drugs, cosmetics and agrochemicals and serve also as research tools to probe biological systems. NP structures inspire chemists to develop new syntheses, and NP biosynthetic enzymes add to the metabolic engineer's toolbox. The advent of next generation DNA-sequencing has revealed a vastly rich pool of NP biosynthetic gene clusters (BGCs) among bacterial genomes, most of which with no corresponding NP. Hence, opportunities abound for the discovery of new chemistry and enzymology that has the potential to push the boundaries of chemical space and enzymatic reactivity. Still, we cannot reliably predict chemistry from BGCs with unusual organization or encoding unknown functionalities, and, for molecules of unorthodox architecture, it is difficult to anticipate how their BGCs are organized. It is the valuable, truly novel chemistry and biochemistry that lies on these unexplored connections, that we aim to reveal with this proposal. To achieve it, we will work with a chemically-talented group of organisms – cyanobacteria, and with a specific structural class – fatty acids (FAs) – that is metabolized in a quite peculiar fashion by these organisms, paving the way for NP and enzyme discovery. On one hand, we will exploit the unique FA metabolism of cyanobacteria to develop a feeding strategy that will quickly reveal unprecedented FA-incorporating NPs. On the other, we will scrutinize the intriguing biosynthesis of three unique classes of metabolites that we have isolated recently and that incorporate and modify FA-moieties. We will find the BGCs for these compounds and dissect the functionality involved in such puzzling modifications to uncover important underlying enzymatic chemistry. This proposal is a blend of discovery- and hypothesis-driven research at the NP chemistry/biosynthesis interface that draws on the experience of the PI's work on different aspects of cyanobacterial NPs.



FUNDING SCHEME
Consolidator Grant (CoG)

PROJECT ACRONYM
COOPERATIVE PARTNER

RESEARCH DOMAIN
Life Sciences

HOSTING INSTITUTION
BIOPOLIS

TIMEFRAME
2020-2024

FUNDING AWARDED
1 999 335,00€



RITA COVAS

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Partner choice and the evolution of cooperation

Cooperation represents an evolutionary puzzle because natural selection poses an evolutionary problem because natural selection is thought to favour cheaters over co-operators. However, theory and studies in humans show us that co-operators are preferred over cheaters as social and sexual partners. Partner choice may therefore provide a powerful explanation for the evolution and stability of cooperation, alongside kin selection and self-serving benefits, but we lack an understanding of its importance in natural systems. Recent studies showing that animals have a preference for associating with more cooperative individuals are promising but were mostly conducted in artificial captive conditions, making the evolutionary implications of partner choice hard to assess. Manipulating cooperation in the wild to test the fitness consequences of partner choice is the leap that is required to understand whether or not partner choice provides an evolutionary explanation for cooperation. I will pursue this goal using a long-term study that I established on a highly cooperative wild bird, the sociable weaver *Philetairus socius*. New methodological developments now allow us to conduct large-scale experiments in the wild, and detailed tracking of individual for several years will allow us to quantify the fitness consequences of choice. Specifically, here I will: i) use a new conceptual framework to test whether cooperation is repeatable (a pre-requirement for partner choice); ii) use state-of-the-art technology to manipulate cooperative behaviour and measure the resulting patterns of social and sexual partner choice; iii) use physiological measures and lifetime reproductive success to examine the fitness benefits arising from partner choice and the underlying mechanisms for both co-operators and the individuals that associate with them. Ultimately, the project will provide a novel and robust evaluation of the roles of social and sexual selection for the evolution of cooperation.





MIGUEL CARNEIRO

FUNDING SCHEME
Consolidator Grant (CoG)

PROJECT ACRONYM
EYESPOT

RESEARCH DOMAIN
Life Sciences

HOSTING INSTITUTION
BIOPOLIS

TIMEFRAME
2021-2026

FUNDING AWARDED
1 998 165,00€

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Investigating the molecular mechanisms of structural colouration in birds

The ornamental eyespots on the peacock's tail are examples of structural colouration, which is responsible for some of the most extraordinary visual effects. The structural colours of bird feathers are generated by a combination of pigments and the precise arrangement of nanostructures interacting chemically and physically. However, existing studies focus on the optical and physical aspects of this phenomenon; the underlying molecular mechanisms remain unexplored. The EU-funded EYESPOT project will decipher the genetic and cellular basis of structural colouration by exploiting the exceptional diversity of peacock colour mutations that resulted from captive breeding and exploring wild species that display this phenomenon. The project will integrate techniques and expertise in genetics and genomics, cell and molecular biology, and photonics. Structural colouration is widespread in nature and generates some of the most stunning visual effects known (e.g. eyespots in a peacock tail). In bird feathers, structural colours are produced by the combination of pigments and precise arrangements of nanostructures that interact both chemically and physically. Currently, almost all published studies on structural colour have focused on the optical and physical aspects of this phenomenon, while the underlying molecular mechanisms remain almost totally unexplored. This proposal seeks to decipher the genetic and cellular basis of structural colours by: 1) exploiting the extraordinary diversity of peacock colour mutants that have emerged from captive breeding, and 2) investigating wild bird species that exhibit structural colouration. My proposal is divided across four multidisciplinary aims that integrate techniques and expertise in the fields of genetics and genomics, cell and molecular biology, and photonics.



FUNDING SCHEME
Starting Grant (StG)

PROJECT ACRONYM
BeTASTy

RESEARCH DOMAIN
Life Sciences

HOSTING INSTITUTION
LAQV/REQUIMTE

TIMEFRAME
2022 - 2027

FUNDING AWARDED
1 499 791,00€



SUSANA SOARES

P R O J E C T **New Molecular and Cell-based Approaches to assess Food Astringency and Bitterness**

Taste properties are vital to humans: they impact human survival, nutrition, health and well-being. The problem of unpleasant taste properties, namely bitter- or astringent-tasting compounds is emerging in many diverse research fields. Beyond the obvious interest in food science, nutrition, and in the improvement/selection of crops, also human taste disorders and drug discovery domains could also benefit from research on astringency and bitterness. Crossing the boundaries among different fields, BeTASTy goes beyond the current state-of-the-art of food-oriented research to respond to the prominent challenges on astringency and bitterness. This proposal will provide an in-depth mechanistic and functional understanding of the MAIN PHYSICAL-CHEMICAL-EVENTS triggering the physiological and neural perception of astringency by an innovative approach considering the main oral key pieces namely salivary proteins, epithelia and emphasizing the role of mechanoreceptors on that sensation. BeTASTy will also unveil how, for some compounds, astringency and bitterness CAN GO TOGETHER by an innovative all-in-one model. Additionally, the individual features that account for sensory differences will be deepened by a pioneering approach based on human organoids and electroencephalography. The final goal will be the creation of cutting-edge CELL-FREE BIOSENSORS based on the identified orally active mechano- and bitter taste receptors to assess astringency and bitterness, respectively, and by overcoming the main drawbacks of the existing (cell-based) ones. Endowed with a truly differentiated and disruptive character, this groundbreaking project will engage food chemistry, biochemistry, neuroscience, sensory analysis and biotechnology fields of research to outdo the state-of-the-art. Only an ambitious and multidisciplinary proposal will yield scientific breakthroughs on the BIOCHEMICAL-NEURALPERCEPTUAL TRIAD EVENTS of these taste properties which will eventually enable to tailor them.





ANDRÉ TAVARES

FUNDING SCHEME
Consolidator Grant (CoG)

PROJECT ACRONYM
FISH-A

RESEARCH DOMAIN
Social Sciences & Humanities

HOSTING INSTITUTION
FAUP

TIMEFRAME
2022-2027

FUNDING AWARDED
2 001 468,00€

P R O J E C T

Fishing Architecture: The Ecological Continuum between Buildings and Fish Species

To what extent can fish produce architecture? This project sets out to trace a socioecological history of North Atlantic architecture in relation to fisheries, elucidating the relationships between marine environments and terrestrial landscapes and assessing the ecological impact of fishing constructions and the natural resources they depend upon. Fishing Architecture covers a broad spectrum in terms of both geography and time, a choice that was made to avoid deterministic analysis and engage with transnational phenomena. Thus, the focus is on the North Atlantic—its shores housing diverse architectural cultures and its waters home to a wealth of fish species—and follows a time frame that runs from the industrialization of fisheries in the early 19th century to the full globalization of the industry at the end of the 20th. The extant scholarship on marine ecology, fisheries, and fishing communities includes extensive research on fish populations, navigation systems, technology, bioeconomics, architecture, and cultural practices. Yet, comprehensive interdisciplinary analysis of the field is hindered by its own specialization. Facing the impending challenges of the environmental predicament, this project will use the material history of architecture as a powerful tool for advancing interdisciplinary research and, along with it, our understanding of the ecological impacts of human activity. The assessment will be organized along five analytical axes: (1) marine ecosystems; (2) fishing technology; (3) food processing; (4) politics; and (5) consumption habits, effectively avoiding the conventional architectural approach to understanding the built environment. This strategy allows us to identify critical knowledge gaps to be worked on and, most significantly, fosters a fresh perspective on construction in which fishing landscapes and buildings.



FUNDING SCHEME
Advanced Grant (AdG)

PROJECT ACRONYM
FIERCE

RESEARCH DOMAIN
Physical Sciences & Engineering

HOSTING INSTITUTION
CAUP

TIMEFRAME
2022-2027

FUNDING AWARDED
2 458 706,00€



NUNO SANTOS

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Finding Exo-eaRths: tackling the Challenges of stellar activity

FIERCE aims at providing the long-needed step forward to tackle the challenges of stellar activity on the search for Exoearths. The detection and characterization of other Earths, planets with the physical conditions to hold liquid water and thus potential life-sustaining environments, is a bold objective of present-day astrophysics. This goal continuously pushes the development of new ground- and space-based instrumentation. However, the quest for other Earths is severely limited by astrophysical “noise” from the host stars, whose signatures distort the spectra that are used to detect and characterize them. Existing methods usually circumvent the problem without a detailed understanding of the individual sources of variability. This is insufficient to reach the required precision levels. To enable the full scientific success of major exoplanet research facilities a new approach is clearly needed. With FIERCE, the PI will employ his competitive team, together with the strong participation in cutting-edge ESO and ESA projects and missions, to break through in this obstacle. The ultimate goal is to i) develop novel approaches to identify, model, and correct stellar spurious signals in radial velocity measurements down to 10 cm/s, and ii) obtain a comprehensive understanding of the impact of stellar granulation and activity on the detection of exoplanet atmospheres. To this end, FIERCE will approach the problem of stellar “noise” from a whole new angle, building a dedicated facility, the Paranal solar Espresso Telescope (PoET). PoET will connect to the recently commissioned ESPRESSO spectrograph and, using the Sun as a proxy, allow to unambiguously identify and understand the sources of relevant variability in solar-type stars. Ambitious, timely, and feasible, this project will provide crucial information for the success of present and future major efforts aiming at detecting and characterizing other Earths.





RITA LADO

FUNDING SCHEME
Starting Grant (StG)

PROJECT ACRONYM
ERA-ARE

RESEARCH DOMAIN
Physical Sciences & Engineering

HOSTING INSTITUTION
FEUP

TIMEFRAME
2023-2028

FUNDING AWARDED
1 499 950,00€

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A new ERA for Environmental Risk Assessment: Chirality as a tool towards environmentally safe pharmaceuticals

The detrimental effects on ecosystems and human health caused by the emerging contamination of aquatic environment by pharmaceuticals urges a disruptive prevention strategy. These drugs, their metabolites and transformation products (TPs) are stable, poorly biodegraded, and recalcitrant. Though novel mitigation measures have been proposed, they are insufficient and often risky due to the possible generation of TPs. Under this increasingly deteriorating scenario for future generations, ERA-ARE aspires to build a strong ground for the realization of an internationally leading research group dedicated to promoting environmental safety. ERA-ARE approach is based on fundamental understanding of enantioselectivity of environmental processes that can impact the fate/behaviour of pharmaceutical contaminants. Fluoroquinolones (FQs), a group of chiral fluorinated antibiotics/anti-cancer agents will be explored as a proof of concept, since most small molecules approved in the last years are either fluorinated and/or chiral, presenting a stable C-F bond and a potentially enantioselective bioactivity. To attain its goals, ERA-ARE will exploit the chirality of selected FQs as a piloting tool to: 1) realize the impact of stereochemistry on antimicrobial resistance (key innovation) by testing the hypothesis that antibiotic resistance (AR) may be acquired in (and not only spread/disseminated by wastewater treatment plants (never verified before); 2) reveal how to better select drug candidates by biodegradability; 3) pave the way for future directions of Environmental Risk Assessment (ERA); and 4) avoid ecotoxicological effects and bioaccumulation. ERA-ARE will contribute to reduce AR (expected to cause 10 million deaths/year by 2050), raising the alert level for environmental protection and sustainability. ERA-ARE will rebrand the relationship pharmaceutical industry vs environment by disrupting the ERA process and creating pioneering guidelines for the pursuit of safer drugs.



FUNDING SCHEME
Synergy Grant (SyG)

PROJECT ACRONYM
GlycanSwitch

RESEARCH DOMAIN
Life Sciences

HOSTING INSTITUTION
i3S

TIMEFRAME
2023-2028

FUNDING AWARDED
10 000 000,00€



SALOMÉ PINHO

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Glycans as Master Switches of B Cell Activity in Autoimmunity

Autoimmune diseases are often life-threatening disorders with increasing disability having a negative impact on patients' quality of life. Mechanisms leading to the breach of tolerance in development of autoimmunity are still largely unknown. Protein glycosylation is an essential regulatory mechanism in the immune system. Within GlycanSwitch, we will map the glycome composition of various types of autoantibodies and autoreactive B cells. We will study the factors and underlying cellular mechanisms that regulate glycosylation of B cells and autoantibodies. We will investigate the immunological effects of glycosylation and the impact in B cells signalling and activation in the immune microenvironment. Finally, we will test in relevant mouse models how glycosylation of autoantibodies and autoreactive B cells contributes to the breach of tolerance. We expect that the obtained insights into the role of glycans as key checkpoint for the selection of autoreactive B cells and the rise of autoimmunity will provide leads for targeted therapeutic interventions as well as rationales for the early detection and prevention of autoimmune diseases.





PEDRO LEÃO

FUNDING SCHEME
Consolidator Grant (CoG)

PROJECT ACRONYM
GreasedLightning

RESEARCH DOMAIN
Physical Sciences & Engineering

HOSTING INSTITUTION
CIIMAR

TIMEFRAME
2024-2028

FUNDING AWARDED
1 995 621,00€

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Enzymatic chemistry acting on alkyl chains

As humankind sets out to move towards a sustainable future, the production of organic commodity and speciality chemicals, drugs and other small molecules of interest will gradually incorporate more biochemical processes. Some of these products may be obtained directly from engineered organisms, while others may be generated *ex vivo* – either through purely enzymatic processes or by interfacing biological chemistry with organic synthesis. Harnessing the efficiency, selectivity and diversity of enzymatic reactions found in nature is key to reaching the goal of a fully-fledged biobased economy. Some enzymes can carry out demanding reactions that have little or no equivalent in synthetic chemistry. In particular, the ability of certain enzymes to selectively act on unactivated carbon centers has attracted much attention as they can be used to functionalize typically intractable positions with high precision. A particular group of bacteria – Cyanobacteria – tend to incorporate saturated fatty acid-derived moieties into their natural products. In many such structures, we find modifications and decorations that can only be explained by the action of regio- and stereoselective enzymes, many acting on unactivated carbon centers. It is this richness of alkyl-chain modifying biocatalysts that we aim to reveal with this proposal. We will use several unusual structural motifs from acyl moieties in cyanobacterial natural products as starting points for enzyme discovery. These will include C-H bond activating enzymes as well as those acting on C-C bonds. We will bring to light an arsenal of biocatalysts that can be used to selectively functionalize or modify a variety of alkyl chain positions that would otherwise be inaccessible to conventional chemical synthesis. GreasedLightning blends discovery and hypothesis-driven research at the chemistry/biosynthesis interface, drawing on the PI's experience on the (bio)chemistry of lipidic cyanobacterial metabolites.



FUNDING SCHEME
Advanced Grant (AdG)

PROJECT ACRONYM
INELASTIC

RESEARCH DOMAIN
Physical Sciences & Engineering

HOSTING INSTITUTION
INEGI

TIMEFRAME
2024-2029

FUNDING AWARDED
3 493 788,00€



PEDRO CAMANHO

P R O J E C T

Linking the scales towards nonconventional polymer composite structures

The reduction of the environmental footprint of aviation relies on the development and fast deployment of lighter and more efficient polymer composite structures; however, the current configurations of composite aerospace structures result in a highly constrained design space. Additionally, the limitations of the state-of-the-art analysis methods result in overly conservative designs and in time-consuming certification methodologies. As a result, composite laminates have only contributed to modest weight savings in aircraft structures. Based on these observations, the main objective of the project is to unleash the full potential of composite systems to yield more efficient aerospace composite structures. The premise is that polymer composite laminates are far from being used to their full potential, and that significant performance improvements of composite aerospace structures can be obtained by developing a new system thinking methodology that will link the different scales of a composite system. The methodology relies on the combination of new experimental studies, conducted at the micro-scale of the composite material, that will guide the development of analysis methods at different spatial scales. The theoretical developments, guided by experiments and computations, will create the building blocks of a neural network that will unravel the currently hidden relations between manufacturing conditions, micro- and meso-structures of a composite material, and the performance of a composite structure. Overcoming this knowledge gap will enable the development of new, non-conventional micro-structures using different types of reinforcing fibres, and of new laminate configurations that will no longer be restrained by a limited set of fibre orientation angles. It is expected that, for the first time, the discontinuity between material design and structural design will be removed, opening new avenues for concurrent optimization of composite materials and structures.





FUNDING SCHEME
Consolidator Grant (CoG)

PROJECT ACRONYM
ID-SCAPES

RESEARCH DOMAIN
Social Sciences and Humanities

HOSTING INSTITUTION
FAUP

TIMEFRAME
2024-2029

SIDH LOSA MENDIRATTA

FUNDING AWARDED
1 999 493,00€

**T
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T** **Building Identity: Religious Architecture and Sacral Landscapes of Christian Minorities in India and Bangladesh**

The cultural heritage associated with India and Bangladesh's Christian minorities remains understudied and its historical significance is often contested. Many of the countries' medieval and early modern churches were built primarily for communities of newly converted Christians that came from different regions and caste backgrounds and therefore carried corresponding identities. Even today, many of South Asia's churches reflect these local identities and traditions, with factors such as caste, indigenous agency, and cultural accommodation playing a role in their social and architectural history. These contexts originated distinct regional architectural expressions in the countries' six main Christian ethnolinguistic communities (East Indians, Goans, Mangaloreans, Keralites, Tamils and Bengalis) However, most scholarly work has addressed the design of these churches against the background of European artistic tendencies - such as mannerism or baroque - while local contexts and traditions have remained overlooked. Today, as dominant groups assert hegemonic policies across South Asia, religious minorities face increasing challenges, and their cultural heritage is oftentimes at risk. Many of South Asia's churches founded before ca. 1800 have disappeared, are in ruins or have been deeply transformed, and there is a sense of urgency in documenting the churches that remain. ID-SCAPES will produce a Social History of the Built Environment of India and Bangladesh's medieval and early modern churches and sacral landscapes, uncovering the influences of diverse agencies, identities and traditions on their overall design. By producing knowledge on this body of architecture, with in-depth analysis providing vision for contested and/or endangered sites, the project will ascertain how churches are vital in framing the collective identities of Christian minorities today, thereby nurturing their resilience and contributing towards the diversity of South Asia's cultural heritage.



FUNDING SCHEME
Advanced Grant (AdG)

PROJECT ACRONYM
KAREVO

RESEARCH DOMAIN
Life Sciences

HOSTING INSTITUTION
i3S

TIMEFRAME
2025-2029

FUNDING AWARDED
2 955 225,00€



HELDER MAIATO

P R O J E C T How dividing cells adapt to karyotypic evolution

Alterations in chromosome number and size are hallmarks of cancer, and yet they are also crucial for species evolution. Recent insight on chromosome structure and segregation, together with significant advances in genomic sequencing, established previously underappreciated parallels between the mechanisms of karyotypic evolution during speciation and cancer. Importantly, alterations in chromosome number and size pose significant challenges for the cell division machinery. However, how dividing cells adapt to cope with karyotypic alterations remains an outstanding fundamental question with strong clinical implications. To address this, we propose an innovative approach that integrates super-resolution microscopy, large-scale 3D cryo-electron tomography reconstructions, computational modelling and cell fusion experiments in Indian and Chinese muntjacs, two closely related deer species with identical genomes, but extremely divergent chromosome number ($2n=6/7$ vs. $2n=46$, respectively) and size. We will focus on dissecting mechanistic aspects underlying mitotic spindle organization, chromosome dynamics, checkpoint control of mitotic progression and segregation fidelity in both muntjac species, with the goal of identifying genes differentially required for efficient mitosis in cells with karyotypic alterations. In parallel, we will exploit functional genomics in Cervidae, including telomere-to-telomere sequencing of Indian and Chinese muntjac genomes, to determine and manipulate the exact chromosome fusion sites between both species, while testing the mechanism underlying the evolution of their karyotypes. Lastly, to test the limits of karyotypic evolution for chromosome segregation, we will engineer mammalian cells with only 1 or 2 chromosomes and investigate whether and how cell division tolerates this extreme genome reorganization. This pioneer work will unveil vital cell adaptive mechanisms to karyotypic evolution relevant for speciation and cancer.





CLARA PEREIRA

FUNDING SCHEME
Consolidator Grant (CoG)

PROJECT ACRONYM
SelfEnergyDriver

RESEARCH DOMAIN
Materials Engineering

HOSTING INSTITUTION
LAQV/REQUIMTE

TIMEFRAME
2025-2030

FUNDING AWARDED
1,992,329,00€

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3-in-1 Self-Powered Hybrid Energy-Driven Wearable Technologies: Unifying Energy Harvesting and Storage

In the landscape of wearable electronics, there is a demand for self-powered systems to address the challenges posed by discontinuous and limited power supply. Low-grade heat and moisture are two ubiquitous clean energy sources with great potential for electrical energy production. 2-in-1 technologies combining thermal or moisture-induced energy harvesting (EH) with electrochemical energy storage (ES) are attractive self-charging solutions for wearables. However, their performance remains inconsistent and unsteady. The understanding of the underlying EH and ES mechanisms remains fragmented, without considering synergistic opportunities. SelfEnergyDriver proposes a PIONEER HYBRID textile technology UNIFYING moisture-triggered EH, thermal EH and supercapacitive ES. This groundbreaking 3-in-1 concept aims for the self-sustained harvesting of two clean energy sources and simultaneous in situ storage of the captured energy. Non-toxic multifunctional hybrid electrode nanomaterials with 3D porous architecture, redox-active nature and precisely engineered moisture permeability, thermal and electrochemical properties will be developed to comply with all EH/ES requirements. These hybrids will be incorporated in textiles and assembled with advanced redox-active ionic hydrogel polyelectrolytes in innovative device architectures. SelfEnergyDriver will delve into the intricacies of electrodes, electrolytes, and their interfaces, to guide the rational design of these trailblazing technologies and foster cooperative effects for synergistically-enhanced outputs. The supreme goal will be bridging the knowledge gap between electrode/electrolyte properties, interface phenomena, device architecture and performance. As a proof-of-concept, the 3-in-1 technologies will be tested under simulated real-world conditions, to showcase their potential to revolutionize the landscape of wearable energy systems. The acquired knowledge will set new landmarks in clean energy, textronics and sensing.



U. PORTO



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