

The University of Cyprus in ERC

Cyprus has received 9 grants from European Research Council, out of which 7 have been earned by the University of Cyprus. Since 2007 when ERC was set up, UCY, received 4 Starting Grants, 1 Consolidator Grant and 2 Advanced Grants. Plus two Proof of Concept Grants for the further exploitation of the results.

Below you can find the details of each one.

ΜΑΡΙΟΣ ΑΒΡΑΑΜΙΔΗΣ / MARIOS AVRAAMIDES (ERC Starting Grant)

Title : Multiple systems of spatial memory: their role in reasoning and action (OSSMA)

Aim: The goal of the proposed project is to examine how the locations of the objects that constitute our environments are represented in memory and how such memories are used to support our actions in space. During the last three decades of research this topic has received a lot of attention by scientists from many disciplines, and over the years a number of theories have been formulated. However, our understanding of the nature and functioning of spatial memory still continues to change. More importantly, there exist empirical findings from two concentrations of research within spatial cognition that seem conflicting at first glance. On one hand, studies examining the organizational structure of spatial memory have shown that memories are encoded using allocentric reference frames; that is reference frames that encode the spatial relations among the objects of an environment. On the other hand, studies focusing on how people stay oriented towards their surroundings during locomotion suggest that egocentric representations (i.e., representations coding self-to-object relations) are involved. Recent models of spatial cognition have attempted to reconcile these findings by proposing multiple systems for spatial memory. In this project we will carry out a series of experiments in an attempt to gather empirical data to test the predictions of various theoretical models including a biologically-plausible two-system account of spatial memory that we have recently proposed (Avraamides & Kelly, in press). Drawing heavily from the literature on Stimulus-Response compatibility, this account combines the use of egocentric and allocentric representations to account for a wealth of data from all areas of spatial cognition.

Total Budget : 0.5 million Euros

& Proof of Concept €150 000 in 2014

ΕΛΕΝΑ ΑΝΔΡΕΟΥ / ELENA ANDREOU (ERC Starting Grant)

Title: New results on structural change tests: theory and applications (CHANGE-POINT TESTS)

Aim: The research project has two broad objectives and provides novel results in the literature of structural change or change-point tests. The first objective is to provide two new methods for restoring the non-monotone power problem of a large family of structural breaks tests that have been widely used in econometrics and statistics, as well as to show that these methods have additional contributions and can be extended to: (i) tests for a change in persistence, (ii) partial sums tests of cointegration and (iii) tests for changes in dynamic volatility models. The significance of these methods is demonstrated via the consistency of the long-run variance estimator which scales the change-point statistics, the asymptotic properties of the tests, their finite sample performance and their relevance in empirical applications and policy analysis. The second objective is threefold: First, to show that ignoring structural changes in financial time series yields biased and inconsistent risk management (Value at Risk, VaR and Excess Shortfall, ES) estimates and consequently leads to investment misallocations. Second, to propose methods for evaluating the stability of financial time series sequentially or on-line which can be used as a quality control procedure for financial risk management as well as to show that monitoring implied volatilities yields early warning indicators of a changing risk structure. Moreover we show that model averaging in the presence of structural breaks as well as other model uncertainties involved in risk management estimates, can provide robust estimates of VaR and ES. New results are derived on the optimal weights for model averaging in the context of dynamic volatility models and asymmetric loss functions. Third, we propose a novel way to construct prediction-based change-point statistics that reduce the detection delay of existing sequential tests and provide a probability about the likelihood of a structural change.

**Total budget: 0.52 million Euros
& Proof of Concept €150 000 in 2014**

ΑΝΤΩΝΗΣ ΚΥΡΜΙΖΗΣ/ ANTONIS KIRMIZIS (ERC Starting Grant)

Title : Functional and regulatory protein networks of chromatin modifying enzymes (CHROMATINMODWEB)

Aim: Proper and controlled expression of genes is essential for normal cell growth. Chromatin modifying enzymes play a fundamental role in the control of gene expression and their deregulation is often linked to cancer. In recent years chromatin modifiers have been considered key targets for cancer therapy and this demands a full understanding of their biological functions. Previous biochemical and structural studies have focused on the identification of chromatin modifying enzymes and characterization of their substrate specificities and catalytic mechanisms. However, a comprehensive view of the biological processes, signalling pathways and regulatory circuits in which these enzymes participate is missing. Protein arginine methyltransferases (PRMTs), which methylate histones and are evolutionarily conserved from yeast to human, constitute an example of chromatin modifying enzymes whose functional and regulatory networks remain unexplored. I propose to use complementary state-of-the-art genomic and proteomic approaches in order to identify the protein networks and cellular pathways that are linked to PRMTs. In parallel, I will identify novel regulatory circuits and define the molecular mechanisms that control methylation of specific histone arginine residues. I will utilize the yeast *S. cerevisiae* as a model organism because it allows genetic, biochemical and genomic approaches to be combined. Most importantly, many of the pathways and mechanisms in yeast are highly conserved and therefore, the findings from this study will be pertinent to human and other eukaryotic organisms. Establishing a global cellular wiring diagram of PRMTs will serve as a paradigm for other chromatin modifiers and is imperative for assessing the efficacy of these enzymes as therapeutic targets.

Total budget: 1.5 million Euros

ΜΑΡΙΟΣ ΠΟΛΥΚΑΡΠΟΥ / MARIOS POLYCARPOU (ERC Advanced Grant)

Title: Fault-Adaptive Monitoring and Control of Complex Distributed Dynamical Systems (FAULTADAPTIVE)

Aim: The emergence of networked embedded systems and sensor/actuator networks has given rise to advanced monitoring and control applications, where a large amount of sensor data is collected and processed in realtime in order to activate the appropriate actuators and achieve the desired control objectives. However, in situations where a fault arises in some of the components, or an unexpected event occurs in the environment, this may lead to a serious degradation in performance or to an overall system failure. This project will contribute to the development of a framework which can be applied to critical infrastructure systems (e.g., power, water, telecommunications and transportation systems). This will allow real-time local information to be integrated into a large-scale “picture” of the health of the infrastructure. The research has the potential to open up new horizons in fault diagnosis research and to instigate methods leading to a new generation of smarter critical infrastructures.

Total budget: € 2.04 million Euros

Website: <http://www.kios.ucy.ac.cy/fault-adaptive/>

TRANTAFYLLOS STYLIANOPOULOS (ERC Starting Grant)

Title: Re-engineering the tumour microenvironment to alleviate mechanical stresses and ...

(REENGINEERINGCANCER)

Aim: Current chemotherapeutic agents are potent enough to kill cancer cells. Nonetheless, failure of chemotherapies for many cancers (e.g. breast and pancreatic cancers and various sarcomas) is primarily because these agents cannot reach cancer cells in amounts sufficient to cause complete cure. The abnormal microenvironment of these tumors drastically reduces perfusion and results in insufficient delivery of therapeutic agents. Tumor structural abnormalities is in large part an effect of mechanical stresses developed within the tumor due to unchecked cancer cell proliferation that strains the tumor microenvironment. Alleviation of these stresses has the potential to normalize the tumor, enhance delivery of drugs and improve treatment efficacy. Here, I propose to test the hypothesis that re-engineering the tumor microenvironment with stress-alleviating drugs has the potential to enhance chemotherapy. To explore this hypothesis, I will make use of a mixture of cutting-edge computational and experimental techniques. I will develop sophisticated models for the biomechanical response of tumors to analyze how stresses are generated and transmitted during tumor progression. Subsequently, I will perform animal studies to validate model predictions and identify the drug that more effectively alleviates stress levels, normalizes the tumor microenvironment and improves chemotherapy. Successful completion of this research will reveal the mechanisms for stress generation and storage in tumors and will lead to new strategies for the use of chemotherapy.

Total Budget: € 1.44 million Euros

ΧΡΙΣΤΟΦΟΡΟΣ ΠΙΣΣΑΡΙΔΗΣ / CHRISTOFOROS PISSARIDES (ERC Advanced Grant)

Title: Employment in Europe

Aim: The first part of this project is about employment in Europe, including the new members of the European Union. Both the level of employment and the type of jobs created will be examined. A thorough study of institutional structures and policies is proposed, with a view to arriving at conclusions about their influence on job creation and about the best policy needed to achieve national or European-level employment objectives. Job creation is investigated at the two-digit level and male and female employment, wage inequality and the role of policy will be studied in depth. The research will build on solid theoretical microfoundations taking into account the choices available to firms and workers/consumers about working at home or in the market and buying domestic or foreign goods. The project has a second part about unemployment, with special emphasis on recession. The same emphasis on institutions and policies as for employment is given to this part. A key component of the project is new theory on the evolution of institutions and policies in markets with friction, and on the impact that the policy changes that took place after the recession of the 1980s have had on the responses of European labour markets to the recent recession. Special attention will be given to the formerly planned economies and the reasons for their slow convergence to the western economies.

Total budget: € 2.2 million Euros

Constantinos Skordis (ERC Consolidator Grant)

Project acronym: *TheMoDS*

Project full title: "Theories and Models of the Dark Sector: Dark Matter, Dark Energy and Gravity"

Modern cosmology assumes that General Relativity (GR) is the correct description of gravity on large scales. With this assumption and according to current data, the cosmological model needs in addition the existence of a Dark Sector: Dark Matter (DM) and Dark Energy (DE). We know very little about the nature of DM and it is yet to be detected experimentally. The simplest form of DE compatible with the data, a cosmological constant, has a value incompatible with our understanding of Quantum Field Theory. Given that the extrapolation of GR to cosmological scales has not been tested it is possible that the inference of the Dark Sector also needs to be revised.

I propose to (i) determine the nature of DM and DE to a level not achieved before, (ii) test gravity on cosmological scales and (iii) test the screening of new gravitational degrees of freedom in the solar system. The first two goals will require the use of my general framework to parameterize field equations [Skordis, PRD, 79, 123527 (2008); Baker, Ferreira & Skordis, PRD, 87, 024015 (2013)]. My team will use this framework to construct simple models and observations to place limits on their parameters. We will employ the Cosmic Microwave Background (CMB) observations from ESA's Planck Surveyor and the Atacama Cosmology Telescope. We will determine the sensitivity of the CMB lensing to the properties of DM and theories of gravity. To break possible degeneracies these data will be supplemented with large-scale structure data, weak lensing and red-shift space distortions. We will also perform forecasting for ESA's EUCLID mission which will give us a handle on how well we will constrain GR with cosmology in the future. For the final goal (iii) we will employ the method of [Padilla & Saffin, JHEP 1207, 122 (2012)] to construct a perturbative expansion of theories that exhibit screening, inside the screening radius. We will determine the compatibility of such theories with solar system and other strong-field data.

Total Budget: €1,150,691