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Campus Universitário de Santiago
3810-193 Aveiro
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phone [+ 351] 234 372 571
fax [+ 351] 234 370 004

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Luísa Sal
Tatiana Costa
Vera Fernandes

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PAULO JORGE FERREIRA
University of Aveiro

A WORD FROM THE RECTOR

"In the midst of a digital revolution, the social responsibility of universities is becoming more important and cannot be limited to the task of training qualified professionals, providing services to communities and contributing to the advancement of knowledge.

Faced with the impacts of the technological advances of this new era, it is also up to the universities to promote and contribute to the debate of their economic, social and cultural implications as a way of ensuring a socially equitable sustainable development.

Education for citizenship and for active intervention and the training of competent but also socially responsible professionals should therefore play an increasingly important role in the purpose of these institutions."

MESSAGE FROM THE VICE-RECTOR

ARTUR SILVA
University of Aveiro

A brief analysis of the research-related numbers in 2017 clearly shows that UA has kept on its track and keeps working towards a more innovative and internationally recognized institution. In fact, it was a year marked by the start of the 6 interdisciplinary research lines, aligned with the strategy of the region; by the start of the project Smart Green Homes, which demonstrates the strong link between UA and one of the most important regional industry representatives (Bosch Termotecnologia SA) and also by the beginning of the work in the frame of the TEAMING approved project – "The Discoveries Center for Regenerative and Precision Medicine". Furthermore, there were 26 EU-funded projects (H2020, Erasmus+, Interreg Atlantic Area) that started during 2017 and 26 national projects. 2017 was also a challenging year marked by outstanding number of UA applications to the FCT call for projects in all Scientific Domains, 388 as proponent and 122 as partner. Also of relevance were the several protocols and projects with the Portuguese Speaking Countries.

UA consolidated, as well, its position on the different rankings (e.g. 501-600 position on Times Higher Education; 81 on THE 100 Under 50 Universities, 280 on the CWTS Leiden Ranking, PP_top10%; 403 on Sir Global, and the first time on QS world ranking, etc.) and accomplished the goal of having 10 scientific areas on ISI Web of Knowledge – essential indicators.

These numbers are important as they furthermore reflect the concerns and impact of Academia UA at different levels, namely in what social responsibility is concerned. In fact, the new economic and social reality in a global and globalized World imposes a reflection on the role of regional, national and international institutions in the development of a more sustainable and responsible World. In this context, the Universities/Higher Education Institutions (HEIs) role is of major relevance as they can and should create socially responsible spaces and dynamics, promote a fair development and act as a catalyst for change in the field.

Our University has been aware of its importance in this context and since its early beginning defines itself as a socially responsible institution committed to the global sustainable development. Its mission encompasses three major areas – teaching, research and cooperation with society, – strengthened by four major cross-cutting themes: quality, internationalization, attractiveness, heritage. Thus, UA seeks to promote excellence in higher education, in basic and applied education and research, in the formation and transfer of knowledge and technology to society, as well as in the promotion of cultural and humanistic activities. Strongly linked to the region, UA recognizes the need for universities and society to strengthen ties and focus their efforts in fostering regional and national development.

This means that UA has been making its path but there still is a long way to go and its commitment to social responsibility needs to be and should be strengthen. UA, as a university, has in hands the great challenge of providing the future professionals with an education based on the pillars of social responsibility, that they will implement, hopefully, in their lives – big changes in the way how we teach and train our young (and elder) professionals are needed, as Universities of XXI cannot teach as they did it in the past. This necessarily materializes in the management of the relations with its students, employees, suppliers, and all the organizations they interact with and a different concept campus more broad, beyond the traditional vision associated with infrastructures and physical characteristics, valuing the involvement of all members of the Academic Community and integrating concerns of social responsibility in a transversal way.

New governing models, more transparent and democratic, ethics, the development of inclusiveness politics based on social justice, gender balance, non-discrimination, conciliation of personal and professional life, life-long training, policies to overcome any constraints posed by social factors, need to be set in place.

Making our campi environmentally sustainable, secure and healthy, new and innovative measures to promote employability and life-long training, measures to fight university drop-out, new teaching models, based on a project approach, stimulating volunteer work, strengthening mobility and national and international collaboration, promoting the relation with alumni, Open Science and Responsible Research and Innovation (RRI) implementation are some of the issues and challenge that UA needs to address in a structured and strategic way in order to boost its place both at the national and international panoramas.

Ultimately, the goal is that UA will become each time more an actor that builds bridges and social spaces to improve mechanisms to promote the social responsibility, contributing to a more sustainable society. I count with the contributions of all to achieve this goal!


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RESEARCH UNIVERSE

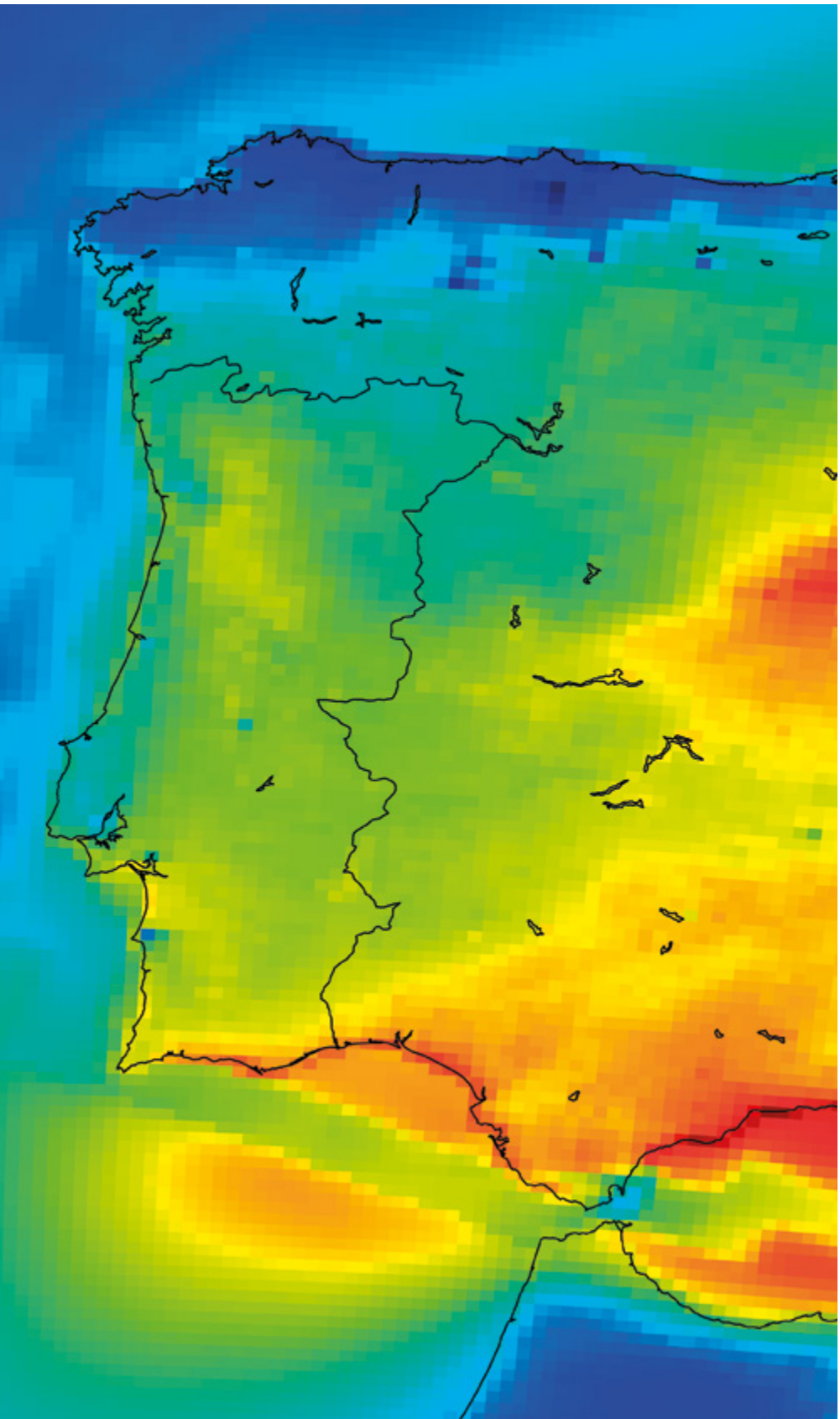
Interdisciplinary research centres and facilities

Excellence in research is one of the hallmarks of the University, where the pursuit of diverse scientific topics of an interdisciplinary nature promotes a closer integration and collaboration of the different disciplines and scientific areas, such as Engineering, Exact and Natural Sciences, Arts and Humanities, Business and Economics, Life Sciences and Medicine, among others.

Dealing with pioneering emerging research areas of global and societal relevance enhances the need of a truly integrated inter-and intra-disciplinary research-oriented strategy. High-level researchers, post-doctoral fellows and PhD students, from a wide range of disciplines and scientific areas, populate our campus, constituted by departments, research centres, polytechnic schools, interface units and a vocational education network.

This integrated structure permits the articulation and harmonization of the teaching and research environments, as well as the association with innovative science outreach activities. In 2017, the existence of 19 research centres, from which 7 are poles, sharing infrastructures and know-how at the campus fortified this reality of a multidisciplinary and collaborative research environment.

Research centres at the campus



CESAM
Centre for Environmental and Marine Studies

CESAM interdisciplinary team has expertise on natural and social sciences, crosscutting coastal and marine biosphere, atmosphere, hydrosphere, lithosphere and anthroposphere transdisciplinary research.

Unit coordinator: Ana Lillebø

Research areas: Atmospheric Processes and Modelling, Environment Processes and Pollutants, Functional Biodiversity, Ecotoxicology, Stress Biology, Adaptation Biology and Ecological Processes, Marine and Estuarine Ecology, Oceanography and Marine Geology, Coastal Zone Planning and Management

http://www.cesam.ua.pt

CIC.DIGITAL
Center for Research in Communication, Information and Digital Culture

Interdisciplinary research centre focusing on innovation in the design of new interaction approaches for human-centered digital media applications.

Pole coordinator: Fernando Ramos

Research areas: Media and Technology, Society, Culture and Arts, Information and Communication

http://www.cicdigital.org

CICECO
Aveiro Institute of Materials

Its mission is to develop the scientific and technological knowledge necessary for the innovative production and transformation of materials for a sustainable development and the benefit of society (from ceramics to soft matter and hybrids).

Unit coordinator: João Rocha

Research areas: Inorganic Functional Nanomaterials and Organic-Inorganic Hybrids, Multifunctional Ferroic Ceramics and Nanostructures, Materials for Energy and Functional Surfaces, Biorefineries, Biobased Materials and Recycling and Biomedical and Biomimetic Materials

http://www.ciceco.ua.pt

CIDTFF
Research Centre for Didatics and Technology in Teacher Education

Founded in 1994, CIDTFF has a mission anchored in the responsibility of research in education: to contribute to educated, qualified and critical citizens.

Unit coordinator: Helena Araújo e Sá

Research areas: Education, Didatics, Supervision, Evaluation, Society and Training

https://www.ua.pt/cidtff

CINTESIS
Center for Health Technology and Services Research

CINTESIS.UA is a multidisciplinary research unit mostly focused on Ageing Issues and Health Care Provision. Includes researchers from the Department of Education and Psychology and School of Health Sciences.

Pole coordinator: Carlos Silva

Research areas: Clinical & Health Services Research, Ageing & Neurosciences Research, Diagnosis, Disease & Therapeutics Research and Data & Methods Research

http://www.cintesis.eu

CIDMA
Center for Research and Development in Mathematics and Applications

CIDMA is a R&D unit hosted at DMat-UA with the main goal of carrying out fundamental and applied research in Mathematics and to prepare new researchers through post-graduate and advanced education.

Unit coordinator: Luís Castro

Research areas: Algebra and Geometry, Complex and Hypercomplex Analysis, Functional Analysis and Applications, Gravitational Geometry and Dynamics, History of Mathematics, Optimization, Graph Theory and Combinatorics, Probability and Statistics, and Systems and Control

http://cidma.mat.ua.pt

CLLC
Centre for Languages, Literatures and Cultures

The Centre for Languages, Literatures and Cultures,, based in the Department of Languages and Cultures, is an intercultural research unit in the Humanities, with a strong inter and transdisciplinary orientation.

Unit coordinator: Teresa Cortez

Research areas: Literary and Cultural Studies (Poetics of Mobility in Literature and Culture; Cultural Flows and Literary Mediations); Language Sciences (Linguistic Variation; Translation and Terminology)

https://www.ua.pt/cllc

CIPES
Center for Research in Higher Education Policies

CIPES's mission is to engage in scholarly research in order to advance critical thought and promote informed understanding about the vital policy issues confronting higher education at both the national and international arenas.

Pole coordinator: Teresa Carvalho

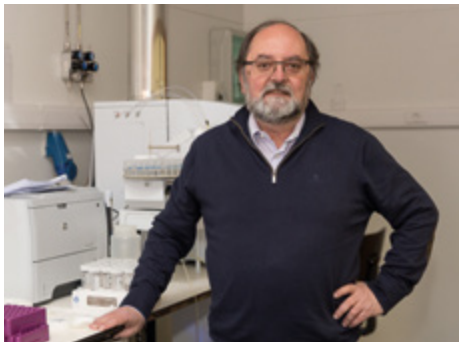
Research areas: Higher Education, System Level Policies, Institutional and Organisational Analysis and Resources, Performance and Human Capital

http://www.ua.pt/cipes/

GEOBIOTEC
GeoBioSciences, GeoTechnologies and GeoEngineering

Focusing on Geo-Resources/Geo-Environment, Geobiotec works with the most important national mining projects, with skills and resources on industrial minerals, geostatistics, geochemistry, geophysics, mineralogy, medical geology and geomaterials.

Unit coordinator: Fernando Rocha



Research areas: Lithospheric Evolution, Complex Environmental Systems, Georessources, Geotechnics and Geomaterials

http://www.ua.pt/geo/PageText.aspx?id=17534

IBIMED
Institute of Biomedicine

IBiMED´s mission is to improve life quality and reduce health care costs through advanced biomedical and clinical research focused on personalized medicine and biomarkers of healthy aging.

Unit coordinator: Manuel Santos

Research areas: Human ageing, protein aggregation, epigenome, ageing related diseases, systems biomedicine, clinical studies

http://www.ua.pt/ibimed

IEETA
Institute of Electronics and Informatics Engineering of Aveiro

IEETA is mainly a Computer Science and Engineering RU, with a strong multidisciplinary character, organized in three groups: Biomedical Informatics and Technologies; Intelligent Robotics and Systems; Information Systems and Processing.

Unit coordinator: Armando Pinho

Research area: Information Processing, Information Systems, Biomedical Informatics, Biomedical Tecnologies, Intelligent Robotics, Intelligent Systems

www.ieeta.pt

GOVCOPP
Governance, Competitiveness and Public Policies

GOVCOPP's mission is to produce research and knowledge that contribute to economic efficiency and good governance practices in specific territorial contexts, with a particular focus on the Centro region.

Unit coordinator: Eduardo Anselmo

Research areas: Public Policies, Competitiveness, Local and Regional Innovation Systems, Territory, Development and Tourism

http://www.ua.pt/govcopp

Research Institute for Design, Media and Culture [ID+]

ID+ is a multidisciplinary R&D consortium that aims to develop, legitimise and communicate design and artistic research and practices in academic, social, cultural and economic contexts.

Unit coordinator: Vasco Branco

Research areas: Design, Art, Media and Culture

http://www.idmais.org/pt-pt

INET-Md
Institute of Ethnomusicology – Research Centre on Music and Dance

INET-Md is a transdisciplinary center that carries out research on music and dance by using current perspectives from ethnomusicology, historical musicology, cultural studies, popular music studies, ethnocoreology, education, music theory, analysis, performance studies, composition, artistic research, music acoustics and sound studies.

Pole coordinator: Susana Sardo

Research areas: Ethnomusicology and Popular Music Studies, Historical and Cultural Studies in Music, Dance Studies, Creation, Theory and Music Technologies, Performance Studies and performance as Artistic Research, Education and Music in Community.

http://www.fcsh.unl.pt/inet

IT
Instituto de Telecomunicações

Instituto de Telecomunicações (IT) is a research unit that is in the front line fostering (nurturing) new ideas and emerging technologies for increasingly agile and easy ways to access ubiquitous information.

Pole coordinator: José Neves

Research areas: Wireless Communications, Optical Communications, Networks and Multimedia and Basic Sciences and Enabling Technologies.

https://www.it.pt

QOPNA
Organic Chemistry, Natural Products and Agro-food Stuffs

Founded in 1992, its mission consists in the development of scientific and technological knowledge for the discovery, preparation, transformation, structural and functional characterization and valorization of functional molecules and materials in a sustainable way.

Unit coordinator: Artur Silva

Research areas: Organic Chemistry, Natural Products, Food Science /Biochemistry and Mass Spectometry.

https://www.ua.pt/qopna

TEMA
Centre for Mechanical Technology and Automation

TEMA follows the natural evolution of the mechanical engineering for the future, developing research on two mobilizing projects: sustainable manufacturing solutions and technologies for the wellbeing.

Unit coordinator: António Bastos

Research areas: Advanced Mechanical Engineering and Fracture Mechanics, Applied Energy, Biomechanics, Nanoengineering, Transportation Technology and Simulation Software Research and Development.

https://www.ua.pt/tema

I3N – FSCOSD
Institute for Nanostructures, Nanomodelling and Nanofabrication – Physics of Semicondutors, Optoelectronics and Disordered Systems

The i3N/Aveiro develops top quality science and innovation in advanced micro/nano materials and nanotechnologies, and exploits, supported by computer modelling, their multi-functionalities integration in (opto)electronics and photonics devices and systems.

Pole coordinator: Armando Neves

Research areas: Modelling of materials behaviour, Nanofabrication and micro-technologies, Nano and microstructured polymer-based systems and Physical characterization of self-assembled nanostructures.

https://www.i3n.org

RISCO
Aveiro Research Centre of Risks and Sustainability in Construction

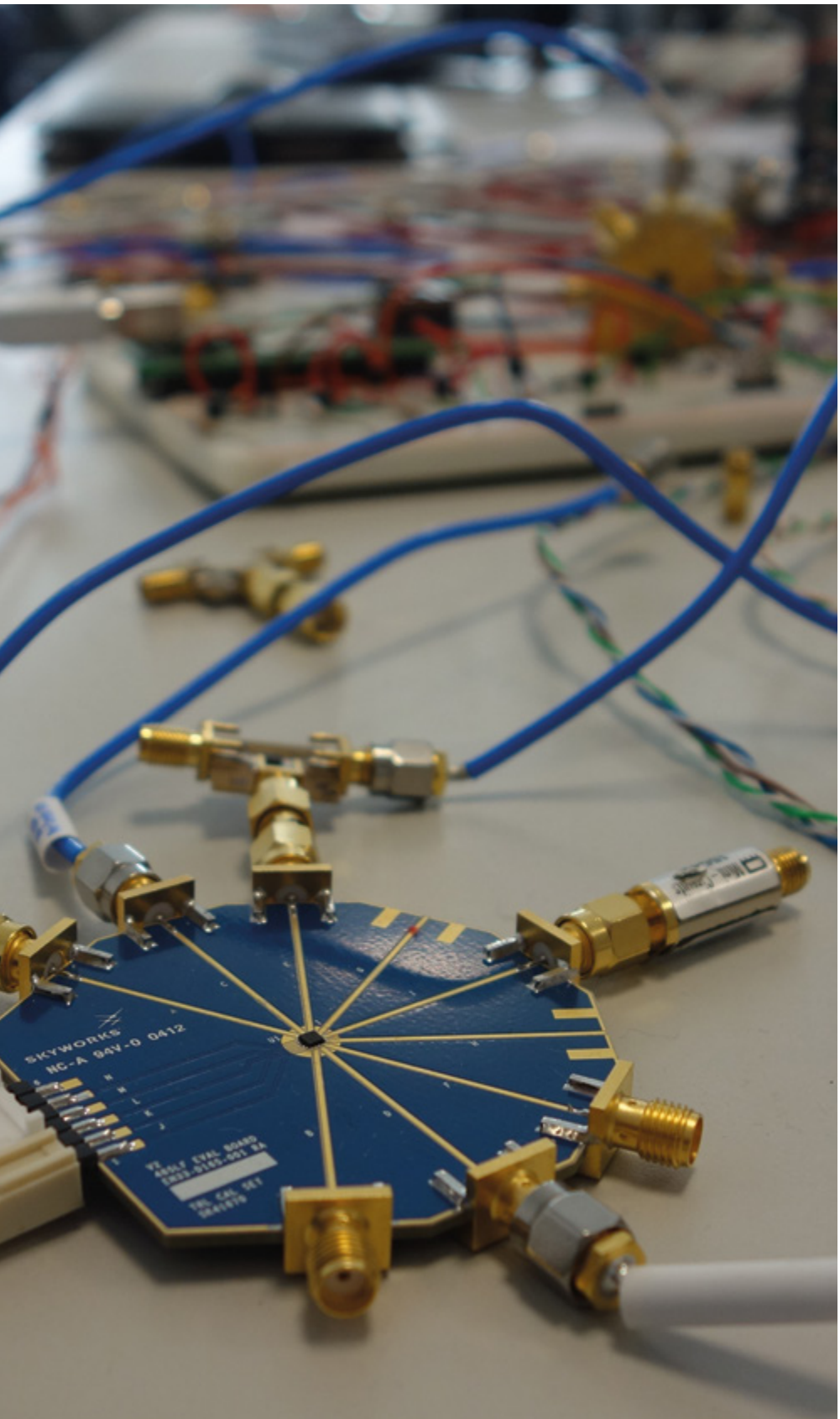
RISCO aims to promote the development of sustainable and resilient cities through safe, environmentally friendly, efficient and durable constructions, and through built heritage conservation.

Unit coordinator: Paulo Cachim

Research areas: Risks in the Built Environment, Construction Sustainability, Built Heritage Conservation and Restoration.

http://www.ua.pt/risco

Research infrastructures at the campus



The University of Aveiro recognizes the importance of cooperation and sharing of research infrastructures among higher education and research institutions, contributing to cutting edge research and innovation, by bringing together human and material resources to tackle complex problems across all scientific fields.

The term "research infrastructure", strictly associated to the National Science Foundation (FCT) and European Strategic Forum on Research Infrastructures (ESFRI), refers to facilities, resources and related services that scientific communities use to develop cutting-edge research and innovation in specific fields, from social sciences to engineering and life sciences. It encompasses large-scale research installations, arrays of scientific equipment, collections, archives and databases, computational systems, communication networks for open access. These may be single-sited, distributed over several locations, cities or countries, or virtual, that is, provided electronically.

9 out of the 39 research infrastructures of the Portuguese Roadmap of Research Infrastructures (2014-2020) are at the University of Aveiro, either coordinated by UA researchers (GenomePT and TEMA) or as participant institution (C4G, EMSO-PT, EngageSKA, ORCIP, Porbiota, PPBI, RNEM and PTNMR), promoting the scientific and technological advances, strengthening the capacity of the University of Aveiro to be an active member in European and international projects and providing services to national and international scientific and educational communities, as well as to businesses and industry.

GenomePT

GenomePortugal is a distributed genome sequencing and analysis RI for basic/applied genome research and advanced services, which aims to potentiate the participation of Portuguese scientists in national and international genome projects, and to promote genome research in important fields such as healthcare, drug discovery, environment, marine and freshwater resources, agro-food biotechnology and green chemistry. GenomePortugal congregates researchers and technical personnel from several national research centres, will put Portugal on the map of the countries with technological capacity and expertise to sequence and analyse complex genomes and will engage the Portuguese research community in the genome revolution.
Coordinator: Manuel Santos

TEMA

The study and development of new materials and new processing techniques allows for more efficient and sustainable use of resources. TEMA helps companies to transform knowledge into products, processes and services. TEMA develops projects in the areas of mechanics, materials, bioengineering and nanotechnology, e.g., the use of cork in protective helmets, new protheses for the human body, or production of fuel cells.
Coordinator: António Bastos

C4G

The Collaboratory for Geosciences (C4G) is a distributed research infrastructure (RI) that promotes networking of researchers and sharing of equipment, data, collections and tools in Solid Earth Sciences (SES). C4G comprises the disciplines of geology, hydrogeology, geochemistry, geodesy, geophysics, geomechanics and geomathematics. It provides services in the crosscutting areas of georesources, natural hazards and the environment, for the Portuguese territory, both onshore and offshore.

EMSO-PT

EMSO is a large-scale European Research Infrastructure (RI). It is a network of fixed point, deep sea multidisciplinary observatories, with the scientific objective of real-time, long-term monitoring of environmental processes related to the interaction between the geosphere, biosphere and hydrosphere. It is a geographically distributed infrastructure to be located atkey sites in European waters, spanning the Arctic, the Atlantic and the Mediterranean, up to the Black Sea. Portuguese participation is focused on the Azores and Cadiz nodes. EMSO is coordinated with similar initiatives in the US, Canada and Japan.

Engage SKA

ENGAGE SKA implements an action plan coupling frontier research and technological development in close collaboration with the Portuguese industry, promoting the participation of Portugal in the Square Kilometer Array, the largest radio telescope of the XXI century, to be installed in Southern Africa and Australia. This platform will stimulate technological development by bringing together Advanced Training and ICT, Renewable Energy and Space Innovation, including the testing of prototypes on national soil.

Orcip

ORCIP is an open infrastructure that will allow the scientific community and industry to test, characterise and certify future optical and radio systems. This will allow companies to pursue activities centered on innovation and knowledge, freeing them of the expenditure required for the acquisition of expensive equipment. The infrastructure will be an instrument to lower the barrier of entry of SMEs into innovation activities in next generation telecommunications.

RNEM

The Portuguese Mass Spectrometry Network is the reference infrastructure representing Portugal in the fields of Mass Spectrometry and Proteomics. It is a major service provider for academia and industry and plays a pivotal role in training activities. This network is key for the development of Proteomics strategies within H2020.

Porbiota

PORBIOTA is a RI which aims to collect, store and manage all kinds of biodiversity data from the entire Portuguese territory. It will be connected to LIFEWATCH, which is its European counterpart. PORBIOTA will promote a national agenda on biodiversity survey and research, providing services to public administration, the scientific community, and society. The consortium includes top national research centres, natural history museums, the Portuguese node of GBIF, the LTER Portugal network, ICOS Portugal, the Azorean Biodiversity Portal, and the Institute for Nature Conservation and Forestry (ICNF).

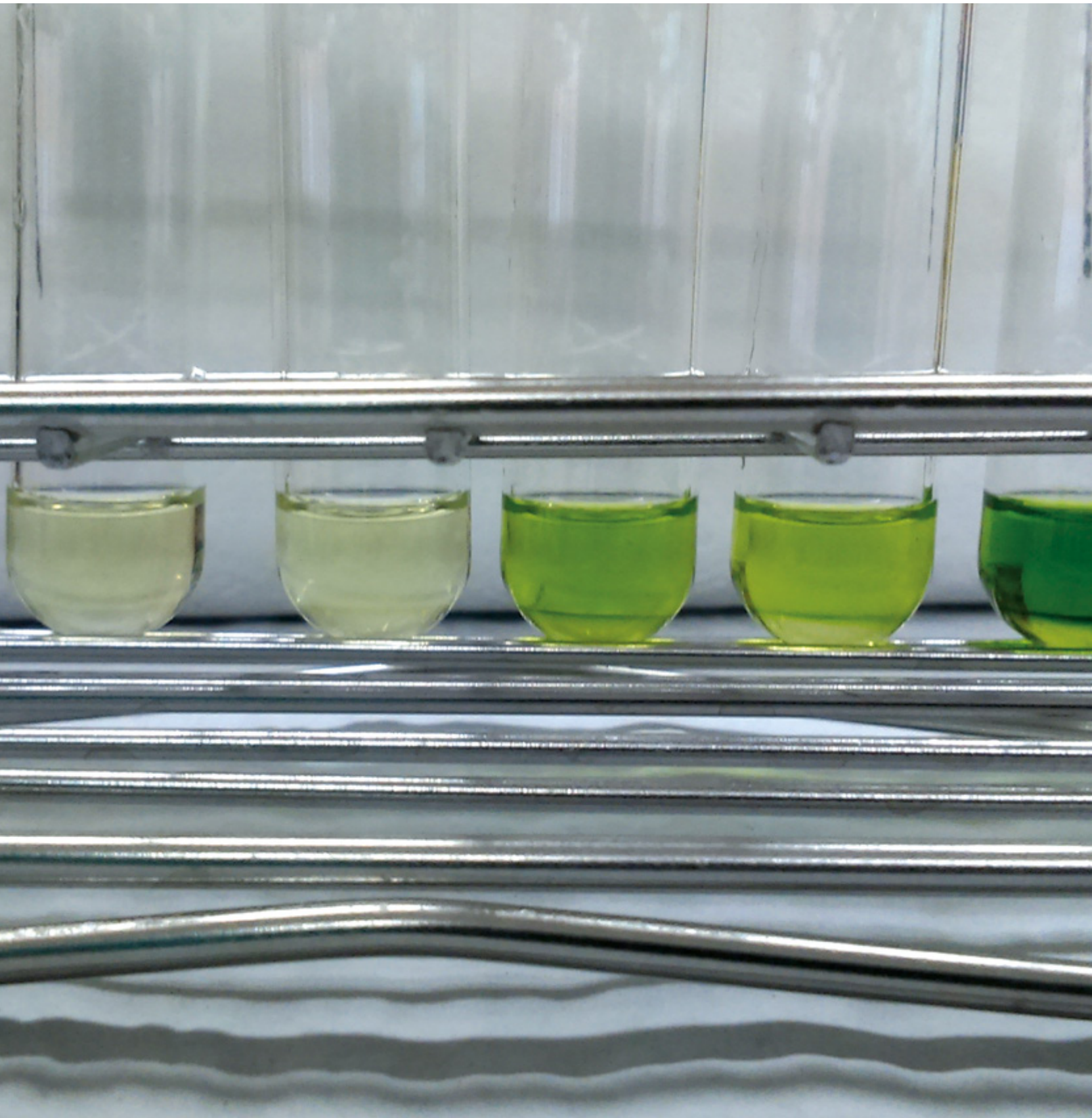
PPBI

PPBI will boost collaboration between researchers, institutions and industry to strengthen both basic and applied research, matching high-impact R&D projects with state-of-art bioimaging resources and expertise. Through shared coordination, strategic investments, and efficient allocation of resources, PPBI wants to give national researchers access to cutting-edge technological resources, create conditions to attract international researchers and integrate Portugal in the international BioImaging roadmap.

PTNMR

PTNMR provides coordinated access to a national platform of equipment, resources, services and skills in Nuclear Magnetic Resonance (NMR) for participating institutions and the scientific community, from both national and international R&D industry and academia. The main goal is the maintenance of a single platform that supports the technical integration, sharing of resources and a combined management of the NMR infrastructure, enabling access to modern and fully operational NMR spectrometers and to support of R&D initiatives.

Strategic projects



Integrated projects

2017 marked the start of 6 strategic projects for UA, of particular relevance both because of the research themes and because they reinforce the UA's role and relationship with the Centro region. These are interdisciplinary, basic research-oriented projects, aiming the development of research lines aligned with the strategy of the region and to potentiate UA's research capacity in pivotal research areas (Energy; Agrofood; Sea; Health; IT and Territorial Innovation). These IC&DT integrated programmes are expected to have profound impact in terms of attraction and fixation of highly skilled researchers. They represent 7.5 M€ of funding and 68 new hirings to the university.

cENTER – Community-led Networks for Territorial Innovation

3 years; 1.2 M€; 11 Human Resources hired

The main idea behind "CeNTER – Networks and Communities for Territorial Innovation" Integrated Program is that regions are considered as engines of innovation through their communities and local networks, which should be fostered and encouraged. cENTER will contribute to research in the area of Territorial Innovation Systems by studying and analyzing the dynamics between the different regional actors (public institutions, companies and communities) involved in regional development, and propose a new framework for assessing territorial innovation capacities at regional level. It evolves on three main themes: Territory; Mediation and valuation; and Employment and quality of life. The first is focused on people, practices and resources, which means that the study to be conducted in this project will contribute to the identification, characterization and systematization of a wider knowledge of regional innovation practices and resources. The second focus on the analysis of three (selected) vectors of innovative action: public policies, social innovation and digital mediation, which will be considered in the context of this proposal as "mediating platforms". The third explores the impact of innovation on the territory, particularly in areas such as employment, tourism and health, and quality of life. The Program will take advantage of the amplifying potential of digital media, which will be conceived and validated in a Portuguese NUTS II region – with the support of a major regional partner in the TICE sector (Altice Labs, formerly PT Inovação). In addition, the Human Capital Observatory and Performance of Regional Innovation will be created at UA, which will provide a better understanding of the engines and innovation barriers and their support for better policies. The objective is to assist public policy makers and economic operators in the third sector to contribute to the development objectives identified for CENTRO Region, taking into account this specific programming period of European funding.

SmartBioR – Smart Valorization of Biological and Marine Resources

(in collaboration with Leiria Polytechnic Institute – IPL); 3 years; 1.1 M€; 11 Human Resources hired (UA)

Coordinated by UA and developed in partnership with IPL, the SmartBioR program aims at the sustainability, preservation and valorization of endogenous marine resources, using scientific knowledge of excellence and technological innovation for its monitoring and integrated management. The main objective of SmartBioR is to contribute to the enhancement of scientific research skills, technological development and innovation in Portugal Centro-Region, through the recruitment, at national and international level, of highly skilled human resources holding scientific knowledge that complements that already consolidated at UA and IPL. This approach also enhances technology transfer to regional companies in order to promote competitiveness and penetration in new markets. Research and innovation activities are organized according to the two ecosystems corresponding to the territorial action of the members of the consortium: Ria de Aveiro, site of the Natura 2000 Network and Special Protection area of the EU, and Berlengas, UNESCO Biosphere Reserve, and coastal areas along the Midwest region of Portugal. In each ecosystem, specific lines of action are addressed. For instance, at Ria de Aveiro, these lines include 1) Preservation and Sustainability of Endogenous Natural Resources, 2) Monitoring and Integrated Management of Endogenous Natural Resources, and the fostering of more sustainable production practices in line with the principles of circular economy and 3) Development of Products, Processes and Services Targeting the Promotion of Value Chains Associated with Endogenous Natural Resources. SmartBioR will act as a driver that can stimulate a technological based economy, with inherent high added value, promoting an upgrade in the modernization of research units along with the skills of its human resources. By privileging excellence and fostering cooperation, it will be possible to join and/or reinforce the position of the research units enrolled in SmartBioR in international networks for R&D&I.

AgroForWealth – Biorefining of agriculture and forest byproducts

3 years; 1.2 M€, 10 Human Resources hired

AgroForWealth aims to develop a strategy for the valorization of a multitude of agrofood and forest residues within the emerging circular economy concept, calling upon a well-defined set of common and integrated biorefinery approaches implementable in a single unit, and easily extended to any type of by-product, and to create new products with nutraceutical added value, contributing to add value to these key sectors of the Portuguese economy. To achieve this global objective, the project focus on a number of specific objectives related to i) agricultural and forest by-products resources inventory; ii) characterization, biological evaluation, processing and product development technologies; iii) organization/human resources; iv) scientific productivity and intellectual property and v) economic impacts. Strategies that allow by-products valorization using sustainable and environmentally friendly extraction/fractionation processes, (bio)chemical processing techniques, their biological evaluation, followed by formulation/product design methodologies will be used. Also, process design and simulation tools will be used, applied to the knowledge generated with the case study by-products, proceed to the pilot scale demonstration of most promising concepts, and, of utmost importance in a long-term perspective, and In the establishment of the fundamental requirements for the exploitation of any other type of agrofood and forest by-products in a globally integrated process. The progamme brings together expertise in key areas as: a) biomass characterization and fractionation using environmentally friendly processes, b) improvement of potentially valuable fractions/compounds, c) assessment of their biological/nutritional properties, d) product design, and process modelling and scale-up. It will have a strong impact both at national and international level, since its easy application to any agrofood and forest by-product is one of the targets of the project. Nevertheless, it will have a much quicker impact in Centro Region as the development of the project will be based on by-products with regional relevance.

SusPhotoSolutions – Sustainable Photovoltaic Solutions

3 years; 1.2 M€, 10 Human Resources hired

The objective of this integrated program is the development of sustainable solutions for photovoltaic energy conversion, including new solar cells based on non-critical materials with low toxicity. The project also addresses the variability and the intermittence of the solar energy through the transformation of green electricity in hydrogen and the energy efficiency of the proposed solutions will be estimated through life-cycle analysis. A large interdisciplinary team of scientists (physicists, chemists, material and environmental engineers) are involved in a common effort to foster the internal cooperation between the three Associated Laboratories (CICECO, I3N-Aveiro and CESAM) and between the University and regional and national industries from the solar energy and agro-industry sectors. The project develops around 5 scientific work packages, related to 1) innovative solar cells with less toxic component layers, 2) extraction and purification of chromophore-containing proteins from algal resources, 3) lightweight and flexible luminescent solar concentrators based on chromophore–containing proteins mimicking natural photosynthesis, 4) variability and intermittence and 5) life-cycle assessment supporting sustainable photovoltaic solutions. SusPhotoSolutions will consolidate the role of UA as an international leading centre in renewable energies (namely solar energy).

SOCA – Smart Open Campus

3 years; 1.2 M€, 14 Human Resources hired

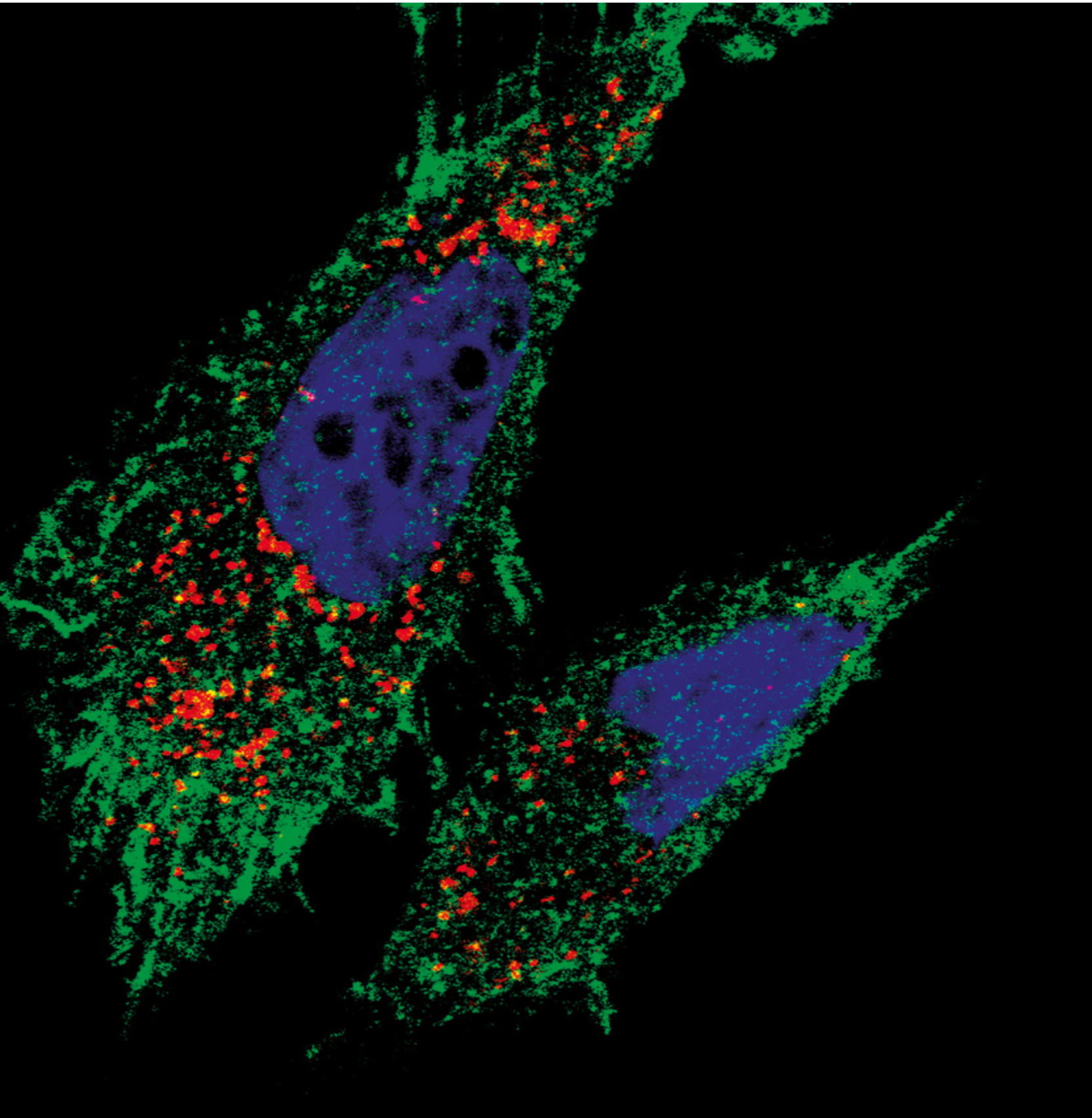
SOCA wants to explore the physical reality of UA Campus, as the substrate to potentiate this living environment. The sensing of the person in physical context enables personalized and predictive responses, and is a major step towards a smarter and safer environment. SOCA's main objective is to create a living environment based on an open innovation ecosystem where data is gathered from multiple sources, processed, integrated, and made available for applications and users, and that is able to create a service sphere able to assist every individual inside it, while supporting continuous innovation. The project borns from the assumption that sensing (the environment and the individual), data transfer (a telecommunications and networking problem), extracting value from the data (a big data problem) and finally services (consuming the data) have to be developed with a dual objective: on one hand assessing and evolving "real" services and on the other promoting the development of technologies and devices for novel systems and services. More specific aims, namely related to 1) sensing the environment: to deploy sensors for environmental data gathering, allowing local and remote processing, classification, storing and alarm generation without intrusion and privacy invasion; 2) sensing the individual: health monitoring by means of wearable systems, allowing automatic alarm generation and/or direct and unattended call for help without human intervention; 3) data transfer: supported by a high-performance communications infrastructure, enabling the transport of large amounts of data to/from the users as well as from diverse sensing devices. Moreover, it will serve as a testbed for most of the concepts and technologies that are currently being developed by the research groups of DETI, as well as an integrated showcase for most of what is DETI's research and high-end training; 4) assistance: deployment of autonomous cooperative robots able to interact with humans in different ways, such as providing several services, assistance in specific (elderly, emergency) situations or even human and space monitoring, while connected to a network of information and processing technologies to assist in autonomous decision counseling. The long-term goal would be to have a multiagent, multidevice integrated system, able to provide different levels of assistance not only to the UA community (e.g., students, teachers, administrative and technical staff) in their studying and/or working environment, but also to visitors and eventually to other members of the society and 5) learning: develop learning methods and strategies that allow the above systems to adapt over time.

pAGE – LifeLong Protein Aggregation

4 years; 1.6 M€, 12 Human Resources hired

The overarching goal of pAGE is to elucidate the role of protein aggregation on aging and aging related diseases. It will also develop sensors and highly sensitive pre-clinical PET technology for early detection of protein clumps and drugs with protein disaggregation activity. To achieve these ambitious objectives, pAGE assembles scientists from 4 multidisciplinary research centers and associated laboratories of the UA: iBiMED, CICECO, QOPNA and I3N. In doing so, pAGE gathers together expertise in Physics, Biomedical, Medical and Chemical Sciences and Engineering to promote translation of knowledge into clinical applications. In particular, the program will develop cell and animal models of aging related protein aggregation (ARPA) and disease associated protein aggregation (DAPA), characterize these protein clumps in humans and mice across the lifespan, develop new technologies for early detection of ARPA/DAPA and chemical chaperones to erase these disease-induced clumps from aging cells. pAGE will advance knowledge on aspects of ARPA and DAPA where existing expertise, technology, research facilities and research context allow us to make progress and will provide multiple opportunities of advanced training to young researchers, trying to answer to specific research questions: 1) when does ARPA start in humans and mice?; 2) which proteins aggregate the most during aging and how? Which biological processes are affected?; 3) which diseases are affected the most by ARPA? 4) what is the impact of ARPA/DAPA on physiology, stress response, genome and epigenome?; 5) can ARPA/DAPA be useful to determine tissue aging and therapeutic outcomes in chronic diseases? 6) can ARPA/DAPA be detected early and controlled by chemical chaperones? pAGE is strategically aligned with Horizon 2020 and the regional intelligent specialization (RIS) strategy.

Discoveries Center for Regenerative and Precision Medicine



The Teaming instrument represents a major European Commission initiative to stimulate Europe's research and innovation potential under the Horizon 2020 Framework Program. Its mission is creating “centers of excellence” and to foster new collaborations between highly innovator countries and those with weak performance at this level, in particular to create new scientific networks and to take advantage of new market opportunities. The "Discoveries Center for Regenerative and Precision Medicine” ("Discoveries CTR"), an independent multi-campi research centre, was born in the frame of this program and was launched in 2017. It is an initiative from 5 top-ranked Portuguese Universities including University of Minho (UM), University of Aveiro (UA), University of Porto (UP), University of Lisbon (UL), NOVA University of Lisbon (UNL), and a university of research and innovation excellence from the UK, the University College of London (UCL).

The 'Discoveries CTR' has a clearly translational, patient-oriented approach and is focused on the development of innovative diagnostic technologies and therapies. Its main goal is to perform world-leading research in regenerative and precision medicine, by promoting excellence, advanced training, increasing performance, translational research outputs and commercialization strategies.

The Center is organized into 7 Thematic Research Units (RU): RU1-Biology and Stem Cell Engineering, RU2-Advanced molecular therapies, biomarkers and advanced medical products, RU3-Biomaterials and tissue engineering, RU4-Nanomedicine and drug delivery, RU5-Screening, bioimaging and microtechnologies, RU6-Systems medicine for cardiovascular, neurodegenerative and musculoskeletal diseases and RU7-Tissue and disease models. The University of Aveiro was chosen by the consortium to lead the development of systems medicine for cardiovascular, neurodegenerative and musculoskeletal diseases (RU6). Systems Medicine is an interdisciplinary field of study that looks at the systems of the human body as part of an integrated whole, incorporating biochemical, physiological, and environment interactions. It arises form systems science and systems biology, and considers complex interactions within the human body in light of a patient's genomics, behavior and environment interactions, and the use of methods ranging from omics-based science, systems biology, bioinformatics and network theory to clinical practice, digital and mobile health. It is closely related to personalized, stratified or precision medicine in that it is the approach that involves the tailoring of prevention, diagnosis and treatment, based on individual patient characteristics.

It is expected that Discoveries CTR generates an important economic impact, as well as a positive social effect by contributing to the increase of the quality of life of an ageing European population affected by neurodegenerative, cardiovascular and musculoskeletal diseases.

Furthermore, the Center will foster knowledge-based economy aligned with national and regional strategic priority areas and European societal challenges, thus reinforcing Portugal’s scientific capabilities and to create critical mass in this field of research, as well as social and economic development.

SmartGreenHomes

Thermotechnology solutions for a sustainable and connected home

The Smart Green Homes project aims to strengthen research, technological development and innovation. It is developed in copromotion between Bosch Termotecnologia S.A. and the University of Aveiro. It is financed by Portugal 2020, under the Competitiveness and Internationalization Operational Program, and by the European Regional Development Fund.

In the last decades there has been a growing awareness on shortage of resources associated with the increasing of the energy consumption, as well as to the problems inherent to these facts, which are known to have a negative impact on the environment and even to the current society. Thus, profound changes in the behavioral patterns of society have been identified, leading to new consumer trends and market offers. The present project was created in order to provide answers to the mentioned problems, aiming to develop innovative solutions for the household environment, with an improved comfort perception in addition to a higher sustainability and lower environmental impact. In this sense, we intend to take advantage of the continuous developments in materials science and energy, combined with innovative strategies for technology integration, process control and automation incorporated in the products to be developed. Potential synergies between the different devices that are part of the household environment will also be explored, in order to improve ease of use, promote operation benefits, synchronize and complement the different functions provided by them.

The implementation of this project is focused on six lines for the development of products and services, mainly based on: 1) heat pumps & air purification systems, 2) heating by gas combustion, 3) electric heating, 4) water treatment, 5) interface and communication for equipment comfort and, 6) integrated control of residential systems. The main goals of SmartGreenHomes is to achieve the increase of more than 20% of energy efficiency in housing; the reduction of CO2 emissions by more than 20% per residence; the reduction of water consumption by more than 50 L per day in each residence and the increase in the home comfort índex.

All these product & service lines are integrated into four main research areas, namely: materials, energy, environment and EICT (electronic, information and communication technologies). As a leading supplier of hot water heating solutions and a manufacturer of a diversified range of residential products, Bosch is in a unique position to contribute to the challenges identified in the project, which will be complemented by the excellent research carried out by the University of Aveiro.


4

SPOTLIGHT ON RESEARCH DISSEMINATION

Research Day 2017

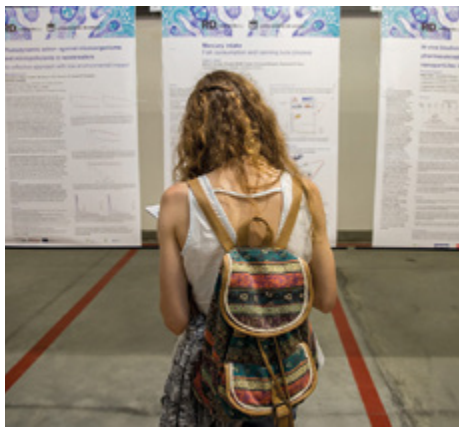
The 7th edition of Research Day@UA, an opportunity to foster the interdisciplinary sharing of good practice in research as well as for promoting effective collaboration among researchers and departments, happened on the 13th june 2017 and developed around the sustainability theme.

The programme included 4 keynote talks by **Carlos Borrego**, Full Professor of Environmental Engineering at the University of Aveiro with more than 40 years' experience on working on environmental problems; **Asad J. Khattak**, Beaman Distinguished Professor in the Department of Civil & Environmental Engineering at the University of Tennessee with vast experience on Transportation Research; **Soumodip Sarkar**, the Director for the Institute for Advanced Studies and Research and of the Doctoral School of the University of Évora, and **Humberto Delgado Rosa**, the Director for mainstreaming adaptation and low carbon technology in DG Climate Action, European Commission. The invited speakers also participated on a round-table guided by Ricardo Calado (CESAM, UA).

In the afternoon, the participants heard from the Vice-President of FCT, who discussed with the audience the Portuguese context for Research and the hot-topics of the moment.

His intervention was followed by 5 short-talks, that showed some of the most promising research themes from 5 different research units of the University: IBIMED represented by Ana Raquel Soares, with the talk "Identification of new aging biomarkers"; CESAM represented by Ana Isabel Lillebø who spoke about "CESAM's Contribution to Environmental Sustainability: From Atmosphere to Deep-Sea"; IT represented by Armando Pinto with a talk on "Quantum Communications: an Experimental Approach"; CLLC represented by Joana Mestre Costa who led the audience on "Rediscovering Portuguese scientific literature from the Renaissance to the Age of Enlightenment: an interdisciplinary approach" and ID+ represented by Joana Quental with a talk on "Health and well-being. What's design got to do with it?"

The talks were followed by a poster session, which counted with 180 posters, and a concert. The ResearchDay 2017 was attended by more than 300 persons (post-graduation students, researchers and professors, industry representatives).



Academia de Verão

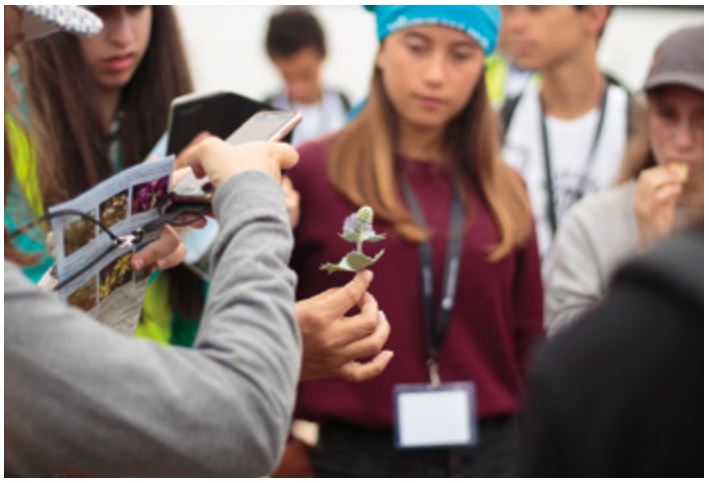
TWENTY-NINE DIFFERENT THEMATIC PROGRAMS OFFERED TO 490 PARTICIPANTS

The "Academia de Verão" (Summer Academy) is an initiative organized by the University of Aveiro every July. The Summer Academy is the most intense scientific dissemination activity aimed at pre-university public. Either during one or two weeks, the university provides these young participants the opportunity to explore interesting scientific projects, integrating a handful of projects totally organized by the departments that accepted this annual challenge. It can be enjoyed in a residential model, in which participants are integrated in campus life 24/ 24 hours.

The 2017 edition welcomed 490 participants, aged between ten and nineteen years old, which joined one of the twenty-nine different thematic programs offered by the sixteen departments and schools involved.

The promotion of public understanding of science, the concern in communicating the scientific outreaches to the society, the development of "science to all" initiatives is a strong focus of the UA organizational culture. Since its foundation the UA promoted an open Day, lately transformed in an open Week, dedicated to strengthen the ties between the society and the scientific world and promoting the scientific areas and the different offer of study cycles. The creation of a dedicated structure to communication in the UA, in the mid-90s of the XX century, and the Fábrica – Live Science Centre in 2004 were very innovative and pioneer enterprises in the context of the Portuguese universities. Nowadays, the efforts of these structures are permanent and the commitment was strengthened to the global university community.

The UA concern about science outreach and public engagement with scientific and technological issues is also seen as an opportunity of improvement of the citizenship and welfare of our society. This is an all-year round premise that is also true during Summer Academy. Children and young people are welcome to join and get involved in the scientific and cultural activities, promoted especially for them, during the Summer as well as throughout the year.




5

RESEARCH HIGHLIGHTS

A cost-efficiency and health benefit approach to improve urban air quality

Ana Miranda[1], C. Alves, H. Relvas[1], C. Borrego[1], M. Cerqueira[1], J. Ferreira[1], C. Gama[1], M. Lopes A. Monteiro[1], T. Nunes[1], C. Pio, P. Roebeling[1], C. Silveira[1], A. Vicente[1]

1 — Department of Environment and Planning & CESAM, University of Aveiro

When ambient air quality limit values established by the Directive 2008/50/EC are exceeded, Member States are obliged to develop and implement Air Quality Plans to cost-efficiently define and assess emission abatement measures and their associated costs and benefits on air quality and human health.

Residential wood combustion (RWC) has been recognised as a major air pollution source in many regions worldwide. In Porto, for example, RWC was found to contribute to 33% of the particulate matter (PM) levels in the air during exceedance days. This PM emission source has been extensively characterised (Fig. 1) and it was concluded that traditional equipment largely exceeds the emission limits (25-50 mg MJ^{-1}) stipulated in countries where the certification process is mandatory. It was also verified that the application of depollution technologies (e.g. catalysts or electrostatic precipitators) to the flue gas of traditional RWC equipment is ineffective.

Based on the relevance of RWC to urban air pollution levels an Integrated Assessment Modelling approach was used to evaluate the effects on air quality and health of replacing/reconverting 50% of the fireplaces in the Porto Urban Area by more efficient equipment. The application of an air quality model allowed to estimate the impact of this emission abatement measure on the PM levels in the air and then health impacts were analysed through morbidity and mortality indicators, which were converted to monetary benefits (Fig. 2). The comparison between the total investment costs and the health benefits (or avoided external costs) indicates that acting on fireplaces to reduce PM concentrations is greatly beneficial from a socio-economic point of view. To cost-efficiently protect human health, emission requirements for the eco-labelling of small-scale combustion appliances for wood logs and pellets should be mandatory. A quality certification scheme for pellets should also come into force. The creation of weatherisation and financial incentives for old stove changeouts by national governments and regional authorities is recommended.

FIGURE 1
Particulate matter emission factors (mass emitted per MJ of energy produced) for different RWC devices.

FIGURE 2
Human health benefits (€/year) of the RWC emission abatement measure.

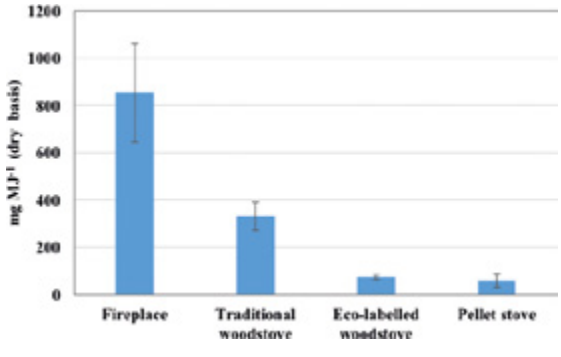


Figure 1

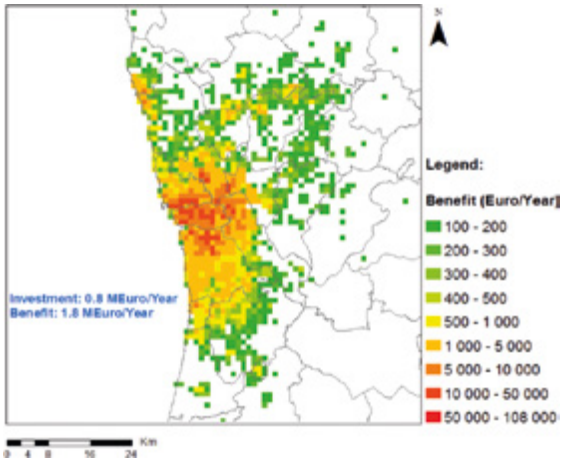


Figure 2

Effects of multi-walled carbon nanotube materials on *Ruditapes philippinarum* under climate change: the case of salinity shifts

Lucia De Marchi[1], Victor Neto[2], Carlo Pretti[3], Etelvina Figueira[1], Federica Chiellini[4], Andrea Morelli[4], Amadeu M.V.M. Soares[1], Rosa Freitas[1]

Due to their increased commercial production and use, carbon nanomaterials (CNMs) will inevitably be released into the environment, with scarce information on their adverse effects, namely towards inhabiting organisms. The toxicity of carbon nanotubes (CNTs), one of the most important CNMs, is related to their physico-chemical characteristics as well as the physico-chemical parameters of the media where they are dispersed, including salinity of the aquatic systems where they may reach after release. The present research evaluated the impacts of carboxylated multi-walled carbon nanotube (MWCNT-COOH: f-MWCNTs) and unfunctionalized MWCNTs (Nf-MWCNTs), in the clam *Ruditapes philippinarum*, under control (28) and low salinity (21) conditions. Our findings demonstrated: i) a concentration-dependent toxicity in clams exposed to both MWCNT materials and both salinities, with higher metabolism, higher oxidative stress and neuro-toxicity along the increasing exposure gradient; ii) for each salinity and for each exposure concentration greater impacts were observed in clams exposed to f-MWCNTs compared to Nf-MWCNTs due to the presence of amorphous carbon fragments which can induce higher levels of toxicity to biological systems; iii) both Nf-MWCNTs and f-MWCNTs under salinity 28 generated greater alterations compared to individuals maintained under salinity 21, demonstrating that the alterations induced by salinity 28 on the chemical behavior of both MWCNTs and consequent fate in exposed clams caused major toxicity in comparison to alterations induced in organisms sensitivity due to low salinity (21).

1 — Department of Biology & CESAM, University of Aveiro
2 — Department of Mechanical Engineering & TEMA, University of Aveiro
3 — Department of Veterinary Sciences, University of Pisa, Italy
4 — Department of Chemistry and Industrial Chemistry, University of Pisa, Italy

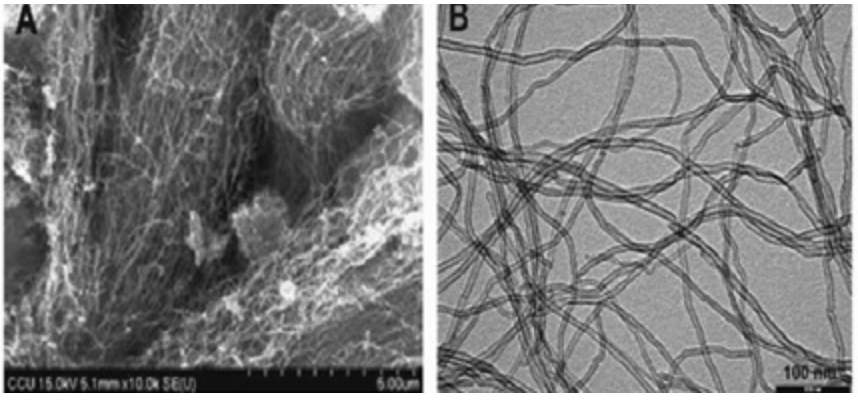


FIGURE 1
A: Scanning Electron Microscopy (SEM) of the functionalized form MWCNTs-COOH (f-MWCNTs) produced via the catalytic carbon vapor deposition (CCVD) process;

B: Transmission Electron Microscopy (TEM) of the powder form of MWCNTs produced via the catalytic carbon vapor deposition (CCVD) process

Marine biological value along the Portuguese continental shelf; insights into current conservation and management tools

Inês Gomes[1,2], Sergi Pérez-Jorge[3], Laura Peteiro[4], Joana Andrade[5], Juan Bueno-Pardo[1], Victor Quintino[1], Ana Maria Rodrigues[1], Manuela Azevedo[6], Ann Vanreusel[2], Henrique Queiroga[1], Klaas Deneudt[7]

1 — Department of Biology & CESAM, University of Aveiro
2 —Marine Biology Research Group, Ghent University, Belgium
3 — MARE – Marine and Environmental Sciences Centre and Institute of Marine Research (IMAR), Azores University
4 —Departamento de Ecoloxía e Bioloxía Animal, Facultade de Ciencias do Mar, Vigo University, Spain
5 — Sociedade Portuguesa para o Estudo das Aves (SPEA) Lisboa
6 — Instituto Português do Mar e da Atmosfera (IPMA) Lisboa
7 — Flanders Marine Institute (VLIZ) InnovOcean site, Ostend, Belgium

Background

The valuation ("attributing importance/weight") of nature is an inbuilt component of environmental management decisions, based on ecological, economic and/or ethical values. In this study, marine biodiversity was valued using an ecological approach based on the intrinsic value incorporated in biodiversity per se, regardless of any human association.

Methods

The marine biological valuation protocol (MBV, Derous et al., 2007) was drawn upon the methodology of the terrestrial valuation maps, to fulfill the emergent need on solid spatial information to support European environmental status assessment and marine spatial planning approaches.

The method was applied on the Portuguese continental shelf, a large area with great topographic and oceanographic variability, representing 13% of the Portuguese economic exclusive zone. We compiled data on the distribution and abundance for a wide taxonomic range of ecosystem components (seabirds, demersal fish, cephalopods and crustaceans, macrobenthos, marine mammals and sea turtles) and evaluated according to a set of assessment questions related to species abundance, rareness and ecological significance on a grid of 9 x 9 km subzones.

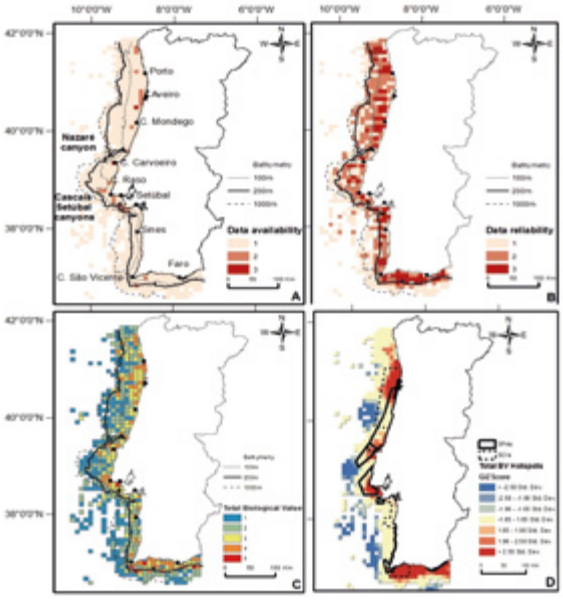


FIGURE 1
A, B: Total data availability and reliability scores (1 = Low, 2 = Medium, 3 = High);

C: Total biological value (1 = Very Low, 2 = Low, 3 = Medium, 4 = High, 5 = Very High);

D: Hotspot classification showing z-scores using 95% confidence levels to determine the areas of spatial significance ("hotspots" in red) and spatial overlap with Natura 2000 Special Protection Areas (SPAs) and recently proposed marine Sites of Community Importance (SCIs).

Results

The application of the MBV to the Portuguese continental shelf waters resulted in the recognition of four major biologically valuable regions "hotspots" (Myers et al 2000), despite temporal and spatial data limitation; off Aveiro and expanding to the north, off Cabo Carvoeiro, the region off Cabo Raso and Setúbal bay, and covering the majority of the south region (Figure 1). These areas matched topographic and physical oceanographic attributes known to influence biodiversity, such as coastline orientation, prominent capes, submarine canyons, large estuaries, habitat type and wind-induced upwelling areas.

The hotspots confirmed previously identified areas for protection (particularly Natura 2000 marine conservation areas in the northern and central regions), and drew attention to currently unprotected sites, mainly in the southern region.

Discussion and Conclusions

The rise of the blue growth economy is rushing countries to make smaller scale decisions on the spatial allocation of maritime human activities. This is particularly true in the Portuguese case, having one of the largest continental shelf areas in the European Union. MBV maps can provide a useful multi-metric indicator, suitable to assist appropriate-scale management decisions in the context of the increased maritime exploitation.

POTI – Personal Objects as Adaptable Tangible User Interfaces

Mário Vairinhos[1], Óscar Mealha[1], José Nunes[1], Patrícia Oliveira[1]

Personal Objects as Adaptable Tangible User Interfaces – POTI – research project puts forward a model of interaction for the domestic environment in which users freely convert a day-to-day physical object into a tangible interface able to control or represent digital information. At the heart of this technology is a small wireless electronic tag that can be attached to everyday objects. The small tag is able to process movement and recognize gestures, and the labels are the mechanism by which the member of the home environment can transform any daily object into a digital function or a digital entity.

Case Study – SIX.
SIX is a particular aplication of the POTI conceptual framework and technology in a real interaction environment (TV and home environment), and it was funded by Altice.Labs. It consists of a customized tangible interface, with the shape of a cube, to select TV channels. One of the aims of the SIX is to abolish seniors' difficulties when they interact with a TV remote control, namely selecting channels. In order to understand the expectations and needs of seniors while they are using the SIX, an empirical study was performed, which characterized the affordance of the SIX.

The user activates the desired channel on TV by manipulating the cube and putting the corresponding face turned upwards. The object is also physically customizable by the user who can write the channel name or draw on each of its faces through paper labels. Therefore, instead of associating buttons with numbers to TV channels, the user can move the cube and this action results in a channel change (causal reasoning), which makes their interaction experience more natural.

The empirical study was conducted at the "Patronato de Nossa Senhora de Fátima de Vilar" in Aveiro, Portugal with 15 senior users who attend the Adult Day Care Centre, aged between 76 and 99 years.
All seniors quickly realized what SIX's main functionality was, taking a mean of 28 seconds to select a channel for the first time.

Another important aspect to note is that seniors, who did not use autonomously the TV remote, were able to select a TV channel without the help of others by using SIX. Thus, we believe that the autonomy of seniors can be clearly enhanced by the use of this artifact.

1 — Department of Comunication and Art & CIC.Digital & DigiMedia, University of Aveiro

NOTE
The authors would like to acknowledge AlticeLabs@UA for funding this project and Patronato de Nossa Senhora de Fátima de Vilar (Aveiro) for their partnership in the evaluation of the SIX

Molecular Electronics with Novel Flexible NanoWires

Marco Carini[1], Marta P. Ruiz[2], Imanol Usabiaga[3], José A. Fernández[3], Emilio J. Cocinero[3], Manuel Melle-Franco[4], Ismael Diez-Perez[2], Aurelio Mateo-Alonso[1]

1 — University of the Basque Country UPV/EHU and Ikerbasque Foundation, Donostia-San Sebastian, Spain
2 — University of Barcelona and Institute for Bioengineering of Catalonia (IBEC), Barcelona Universidad del País Vasco (UPV/EHU), Bilbao, Spain
3 — Universidad del País Vasco (UPV/EHU), Bilbao, Spain
4 — Department of Chemistry & CICECO, University of Aveiro

It is the end of miniaturization as we know it, we are reaching the intrinsic, atomic, limit for current materials and technologies. Yet, there is a growing demand for increasingly smaller devices which asks for circuits whose components are as small as possible. Molecular electronics has sparked great interest because the manufacture of electronic circuits with molecules might potentially entail a maximum reduction in size.

We have made a new class of nanowires that are not only flexible but highly efficient electron conductors. These new nanowires are molecules synthesized and characterized by the group of Aurelio Mateo-Alonso, an organic chemist from San Sebastian (Spain), and were studied in Barcelona (Spain) with an electron microscope that measured, one molecule at a time, their electrical properties. Manuel Melle-Franco, using applied computer modelling, complemented these studies in Aveiro. Several models had to be produced and were fundamental to rationalize the experimental findings in these new molecules, as their intrinsic flexibility made understanding their properties a formidable task.

Modelling allows studying virtually the folded and unfolded forms this flexible nanowire might adopt, Figure 1. Extended nanowires cannot conduct electricity, as the electrons are in localized areas of the molecules and cannot move over long distances. Conversely, in the folded nanowire, different sections of the molecule "touch" allowing for the electrons to jump from one section to the next opening a channel for electricity flow.

Technologically, each of these folded molecules may act as a tiny cable that transports electric currents in very small dimensions, showing high potential for nanoelectronic circuits. In addition, if the folding might be controlled or triggered externally, they might also function as electrical nanoswitches. More details can be found in "High conductance values in π-folded molecular junctions" in Nature Communications, 2017.

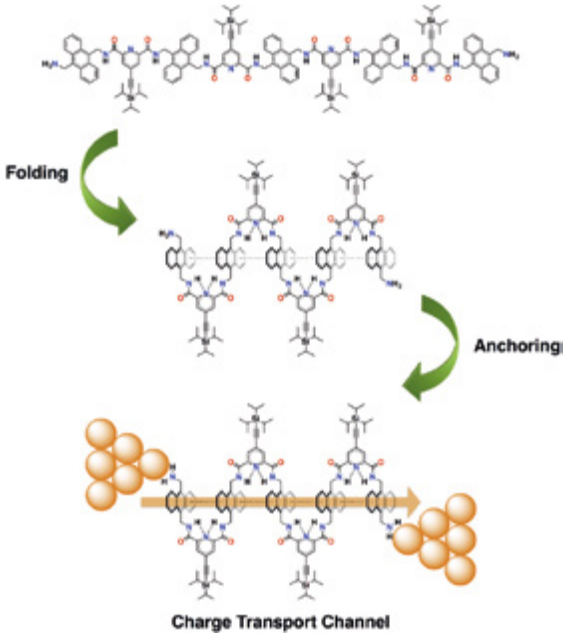


FIGURE 1
Folded molecular junctions. Schematic representation of the folding and anchoring processes needed to obtain folded molecular junctions that act as nanowires.

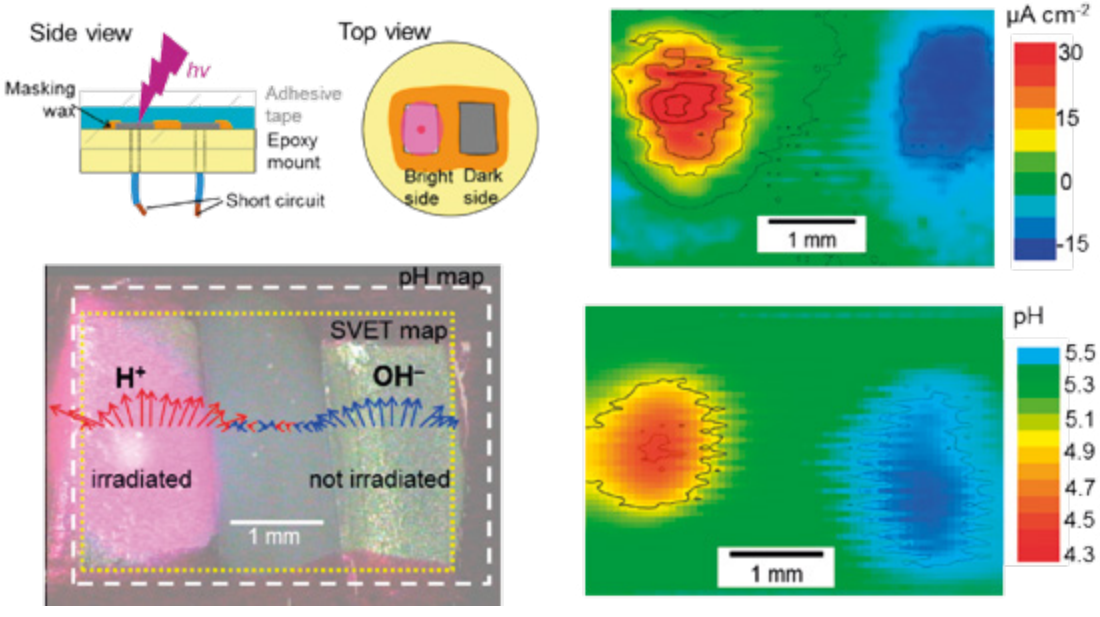
Light-Induced Proton Pumping with a Semiconductor: Vision for Photoproton Lateral Separation and Robust Manipulation

Hanna M. Maltanav[1], Sergey K. Poznyak[1], Daria V. Andreeva[2], Marcela C. Quevedo[3], Alexandre C. Bastos[3], João Tedim[3], Mário G. S. Ferreira[3], Ekaterina V. Skorb[4,5]

In the work we focus, for the first time, on the possibility of efficient transformation of electromagnetic radiation energy into local pH shift simulating a proton pump in biological cells. Under ultraviolet illumination of mesoporous TiO2 films a series of photocatalytic reactions was shown to result in a local change in pH of solution. The efficiency of proton generation was monitored by in situ ion selective microelectrode technique (SIET) for mapping the activity of protons over the surface under local irradiation. Imaging and localization of the positions of hole or electron-induced reactions across the TiO2 surface relative to the irradiation spot were also measured with the scanning vibrating electrode technique (SVET) (Figure below). In general, the developed nano-engineered systems represent a generic technological tool, which opens numerous applications in chemical technology, biotechnology and bioanalytical chemistry, including:

· addressable microsamplers and microdispensers well-compatible with laboratory-on-chip;
· light-healing dynamic surfaces;
· anti-fouling surface;
· stimuli-trigged nanocapsule arrays and membranes;
· 'smart' supports for growing cells and tissues;
· controlled implant coatings;
· drug delivery;
· (bio-)sensors.

1 —The Research Institute for Physical Chemical Problems, Belarusian State University, Belarus
2 — Center for Soft and Living Matter, Institute of Basic Science Ulsan, National Institute of Science and Technology, Republic of Korea
3 — Department of Materials and Ceramic Engineering & CICECO, University of Aveiro
4 — Laboratory of Solution Chemistry of Advanced Materials and Technologies (SCAMT), ITMO University, St. Petersburg, Russian Federation
5 — Department of Chemistry and Chemical Biology, Harvard University, USA



Rubrene–Graphene Phototransistors in the Visible Regime

G. F. Jones [1], R. M. Pinto [2], A. De Sanctis.[1],V. K. Nagareddy[1], C. D. Wright[1], H. Alves[3],M. F. Craciun[1], S. Russo[1]

1 — University of Exeter, UK
2 — INESC-MN, Lisbon
3 — Department of Physics & CICECO, University of Aveiro

The planar interfaces formed between monolayer graphene and semiconductor materials present unique opportunities for amplified detection of weak light signals. Phototransistors that combine graphene with organic semiconductors are particularly desirable owing to the gamut of complementary properties found in these systems.

Atomically thin materials such as graphene are uniquely responsive to charge transfer from adjacent materials, making them ideal charge-transport layers in photo-transistor devices. Effective Implementation of organic semiconductors as a photoactive layer would open up a multitude of applications in biomimetic circuitry and ultra-broadband imaging but polycrystalline and amorphous thin films have shown inferior performance compared to inorganic semiconductors. In this work, the long-range order in rubrene single crystals is utilized to engineer organic-semiconductor–graphene phototransistors surpassing previously reported photogating efficiencies by one order of magnitude. Phototransistors based upon these interfaces are spectrally selective to visible wavelengths and achieve responsivity as large as 10^7 A W^{-1} and a detectivity of 9 × 10^{11} Jones at room temperature. These findings point toward implementing low-cost, flexible materials for amplified imaging at ultralow light levels.

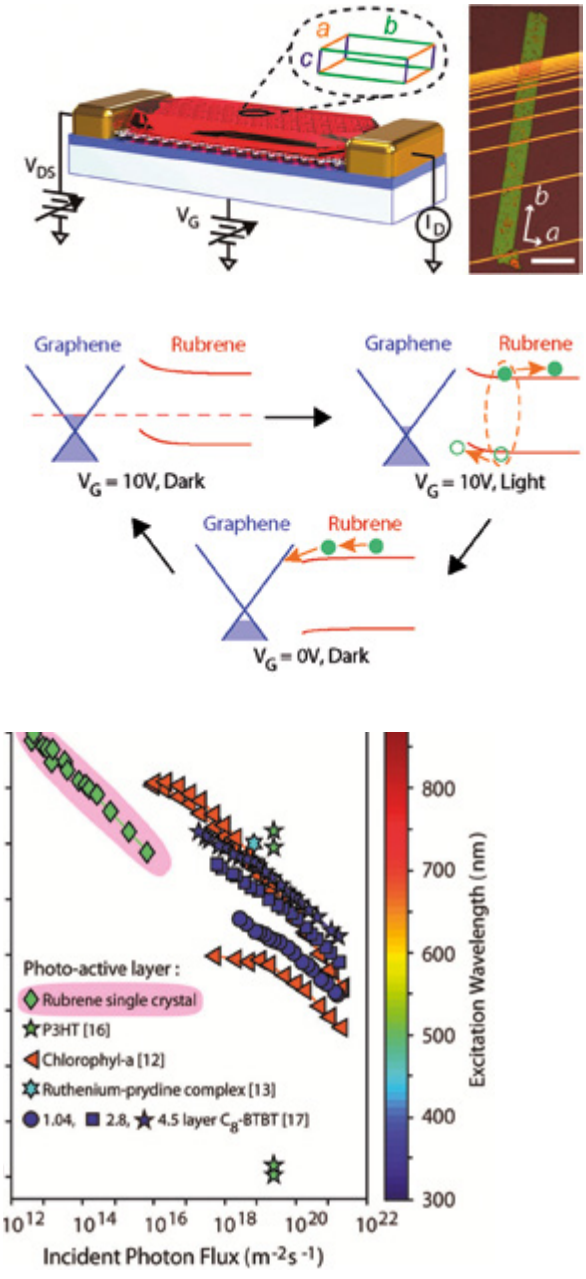


FIGURE 1
Schematic and optical image of a rubrene–graphene phototransistor on SiO2/Si. Schematic band diagrams illustrate the charge-transfer dynamics across at each stage of the light modulation cycle. Performance responsivity metrics of organic-semiconductor–graphene phototransistors.

A no-go theorem for exotic alternatives to black holes as LIGO/Virgo sourcess

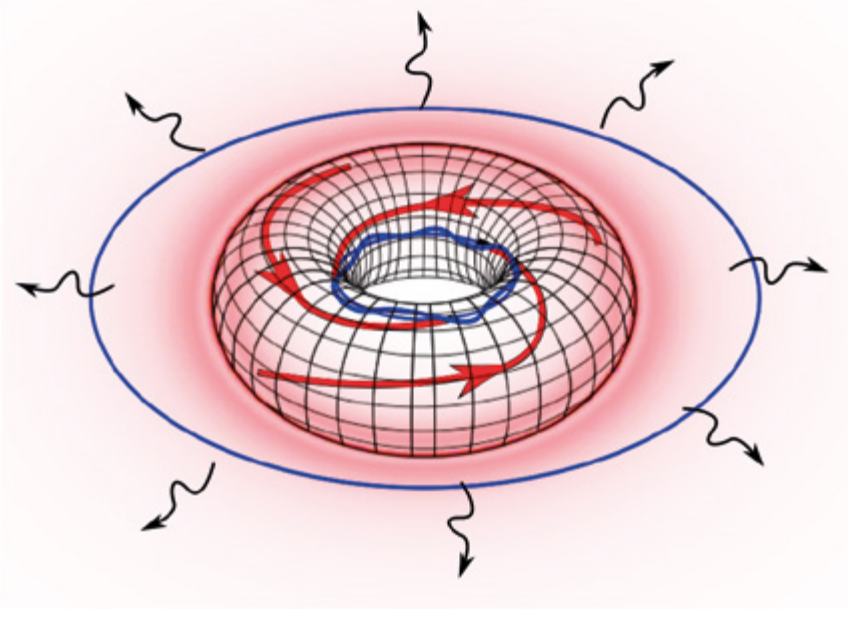
Pedro Cunha[1], Emanuele Berti[2], Carlos Herdeiro[1]

Five of the ground-breaking gravitational wave detections by the LIGO/Virgo collaboration have been interpreted as black hole collisions forming a more massive black hole. It is hard to demonstrate conclusively that these objects are indeed black holes, and there is a lively debate on the intriguing possibility that other, more exotic alternatives could explain the observations. In an article published in Physical Review Letters, P. Cunha and C. Herdeiro, from Aveiro University's physics department, together with E. Berti from the University of Mississippi, provide a generic no-go theorem for these exotic alternatives.

The remnant black hole born from black hole collisions vibrates with a characteristic signature – a "sound" similar to a ringing bell. This special signature, called "ringdown", is related to the existence of special orbits called "light rings": around a black hole, gravity bends light so much that light rays can circumnavigate the black hole (so if you were close enough to a black hole, you could see the back of your head). Some exotic alternatives to black holes can also have light rings, and therefore they can ring down just like black holes. It has been proposed that these "black hole mimickers" could have produced the events observed by LIGO/Virgo.

Applying mathematical techniques from the field of topology to black hole physics, Cunha, Berti and Herdeiro show, that if the compact object is not a black hole it must have a second light ring. This second light ring differs from the first in one crucial way: it traps radiation. The trapped radiation piles up and destabilizes the exotic compact object, making it unlikely to exist in Nature. The implication is that these exotic objects are generically unstable, and therefore that the LIGO-Virgo detections are really evidence for black holes. In fact, the generality of the argument is a strong obstacle to the existence of objects in nature that mimic black holes, but are not really black holes.

1 — Department of Physics & CIDMA, University of Aveiro
2 — University of Mississippi; IST-Lisbon

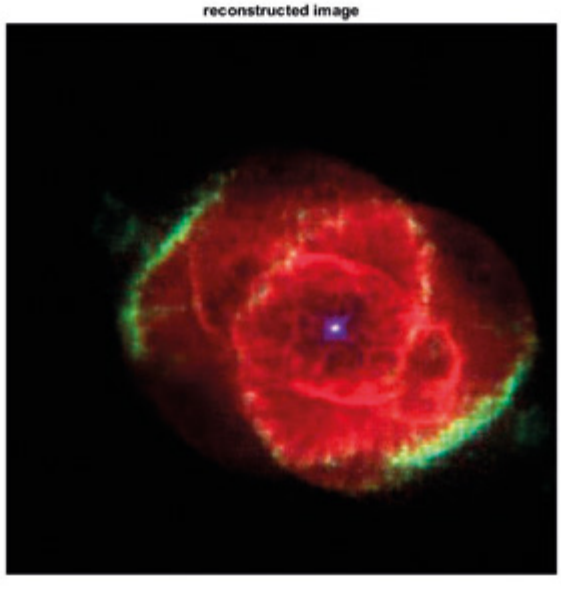


Compressed Sensing for Quaternionic Signals

Stefan Hartmann[1], Narciso Gomes[2], Uwe Kähler[1]

1 — Department of Mathematics & CIDMA, University of Aveiro
2 — Department of Science and Tehcnology, University of Cape Verde

A long lasting dream is the possibility to reconstruct signals when only few information is available. The main difficulty here is the fact that classic methods do not apply anymore in general and other methods work with only a high probability. In the last decade a new paradigm for this problem emerged, so-called Compressed Sensing. The related theory has currently a wide range of applications in many fields of *Computational and Applied Mathematics*. In the paper Compressed Sensing for Quaternionic Signals by S. Hartmann, N. Gomes, and U. Kaehler, published in *Complex Analysis and Operator Theory* in 2017, the authors show that this paradigm also works in non-commutative structures. Here, one major drawback is the fact that Linear Algebra of matrices over non-commutative structures is a tricky business. For instance, in the case of quaternionic matrices the question of left eigenvalues makes no sense while the problem of right eigenvalues is a non-linear problem. In the paper the authors demonstrated that there are classes of quaternionic matrices for which compressed sensing can be applied with a high probability while giving explicit estimates of this probability. As a direct application Compressed Sensing for quaternionic matrices arising in color representation of images are studied and implemented. Examples are given where the knowledge of only 15% or 25% of image data is enough for full reconstruction. This opens the way to applications of compressed sensing to more complicated quaternionic representations like of images where not only the position is codified but also directions (movements) as well as in other fields.



Highest rank of a polytope for An

Peter J. Cameron[1], Maria Elisa Fernandes[2], Dimitri Leemans[3], Mark Mixer[4]

An Aveiro Theorem

A polytope is a higher-dimensional generalization of a polygon in 2 dimensions or a polyhedron in 3 dimensions. Regular polytopes, those with highest degree of symmetry, can be completely described by their group of symmetries, generated by a set of reflections (the size of this set is the rank of the polytope corresponding, in nice geometric cases, to the dimension of the space in which it is embedded). An interesting question is: Given a finite group G, describe all the regular polytopes with group of symmetries G; or, at least, describe the largest possible rank of such a polytope. It is not hard to show that the largest possible rank for the symmetric group Sn is n–1. The challenge was to consider the alternating group An instead. In 2012 Dimitri Leemans, M. Elisa Fernandes and Mark Mixer made the following conjecture:

The maximal rank of an abstract regular polytope, whose group of symmetries is an alternating group An is [(n–1)/2] for n>11 (The group A11, exceptionally, is the group of a regular polytope of rank 6).

They worked during the following years trying to find a solution to this problem and firstly they constructed abstract regular polytopes for the alternating group having the hypothetic highest possible rank. This supported their belief on the conjecture made in 2012. After some years of work on this problem, with a lot of travelling between New Zealand, Belgium, the United States and Portugal, they worked with Peter Cameron, a well known Australian mathematician (https://pt.wikipedia.org/wiki/Peter_Cameron) who felt attracted by the study of abstract regular polytopes and decided to help them solving this conjecture. In September 2015, while Peter Cameron and Dimitri Leemans were visiting Maria Elisa Fernandes, a researcher from CIDMA, they were able to finish the 42 pages proof, that can now be found in the *Proceedings of London Mathematical Society* (https://doi.org/10.1112/plms.12039). Peter Cameron refers to this result as one of the deepest results of his career. In his blog he calls it "An Aveiro Theorem" (https://cameroncounts.wordpress.com/2015/10/18/an-aveiro-theorem/).

1 — School of Mathematics and Statistics, University of St Andrews, Fife, UK
2 — Department of Mathematics & CIDMA, University of Aveiro
3 — Département de Mathématique, Université Libre de Bruxelles, Boulevard du Triomphe, Brussels, Belgium
4 — Department of Applied Mathematics, Wentworth Institute of Technology, Boston, MA, USA

Adaptive Memory: The Mnemonic Value of Contamination

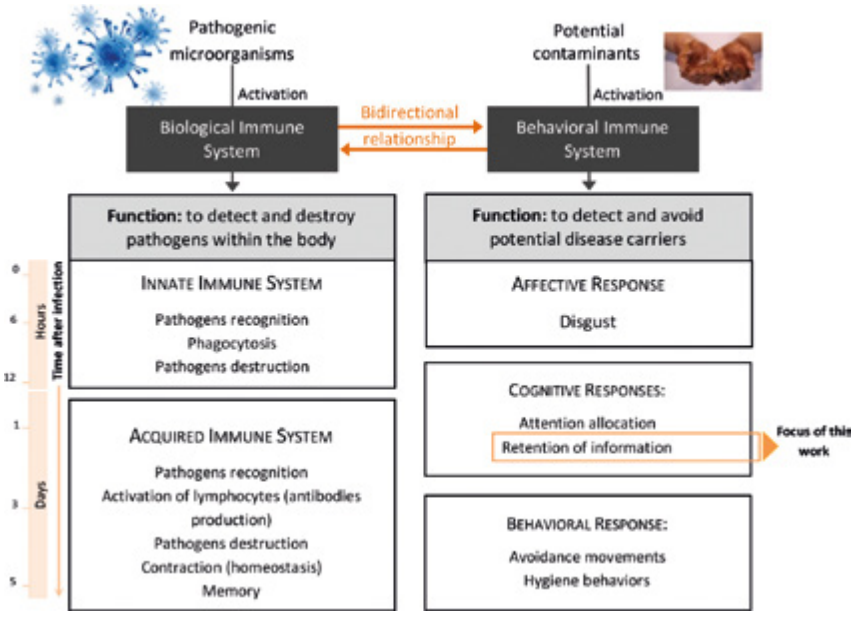
Natália L. Fernandes[1], Josefa N. S. Pandeirada[1,2,3], Sandra C. Soares[1,3,4], James S. Nairne[2]

1 — Department of Education and Psychology, University of Aveiro
2 — Department of Psychological Sciences, Purdue University, USA
3 — CINTESIS, University of Aveiro
4 — Division of Psychology, Department of Clinical Neuroscience, Karolinska Institut, Sweden

Humans evolved an adaptive disease avoidance system – the Behavioral Immune System, that is specially attuned to cues connoting infection risk. When perceived, these cues drive affective, cognitive, and behavioral responses, which work jointly to enhance the organisms' chances of survival. We investigated one of the cognitive components of this system: memory. We hypothesized that people should preferentially retain potentially contaminated items in order to adopt preventive behaviors towards those items.

In a set of studies, participants were shown pictures of objects described to have been touched by sick or healthy people. Importantly to our goals, half of the objects were accompanied with a short description of a symptom of sickness or with a face containing signals of infectious diseases (contamination condition); the other half of the objects were presented with a description of a physical characteristic of a person or with a healthy-looking face (non-contamination condition). During the encoding phase participants decided if the object had interacted with a sick or a healthy person considering the information presented with the object. Then, after a short distractor task, in a surprise a memory task, participants were asked to recall all of the previously-presented objects. The data (collected in the USA and in Portugal) revealed that participants recalled more of the objects that were presented in the contamination condition, in comparison to those from the non-contamination condition. Also, when the faces were described as being of actresses using make-up to represent the disease-connoting cues, the effect was no longer obtained, confirming the need for fitness/relevance for the effect to occur.

These results provide the first demonstration of a mnemonic 'contamination effect' and add to the growing body of evidence supporting the idea that memory works in the service of maximizing our chances of survival and of reproduction, the driving wheels of evolution.



Exploring the relationship between institutional and professional autonomy: a comparative study between Portugal and Finland

Teresa Carvalho[1], Sara Diogo[1]

Autonomy has been at the core of the University since its creation and it has always been greatly cherished by academics. Nevertheless, autonomy has been constantly redefined over time, contextually and politically, as the influence of the Sate (and even the Church) in Higher Education (HE) systems has been changing. In the last decades, all over Europe, welfare states have been reconfigured as the role of governments has been limited to supervision, leading to an increase in Higher Education Institutions (HEI) autonomy. However, this is also accompanied by an increasing institutional accountability, which is said to question academics' professional autonomy.

In this study, we analyse the relationship between institutional and academic autonomy in HE by comparing Portugal and Finland. Our interest was to analyse the extent to which political attempts to increase institutional autonomy are perceived by academics as possibly leading to changes in their professional autonomy.

By crosschecking the literature review with document analysis (mostly legislation) and conducting 47 interviews to system and institutional key actors of both Portuguese and Finnish HE systems (See Table 1) it became clear that the way both governments try to rhetorically enhance institutional autonomy is very similar. In both countries there is an increase in institutional financial and management autonomy (Law 62/2007 in Portugal and *Yliopistolaki* 558/2009 in Finland), but this comes with an increase in state steering and control mechanisms. As a result, academics tend to feel a decrease in their professional autonomy. However, internal segmentation of the profession is a relevant variable in the analysis of perceptions on professional autonomy because individual academics are affected differently. In fact, there are no homogeneous perceptions within academics group in each country concerning professional autonomy. The new organisational models are reconfiguring power relations inside academia, and that the position academics have in this new order influences their notion of being able to influence organisational decisions. In other words, this comparative approach allows the conclusion that within the context of reconfiguring universities' governance and management models, internal segmentation seems to be a relevant variable when analysing professional autonomy.

1 — Department of Social, Political and Territorial Sciences & CIPES, University of Aveiro

TABLE 1

PTM/FTM: Portuguese/Finnish Top Management (rectors, vice-rectors, pro-rectors and external members)
PMM/FMM: Portuguese/Finnish Middle Management (deans and heads of departments)
PA/FA: Portuguese/Finnish academics (full-time professors who may hold management duties)
PT/FT: Portuguese/Finnish Technostructure (administrative staff).

System Level			Institutional Level				
			Top Management	Middle Management	Academics	Technostructure (Administrative staff)	Total
Portugal	6	University	6 (PTM)	4 (PMM)	6 (PA)	3 (PT)	19
Total							
Finland	6	University	4 (FTM)	5 (FMM)	3 (FA)	4	16
Total							35
Total interviewees	12		10	9	9	7	47

Granite emplacement at the termination of a major Variscan transcurrent shear zone: the late collisional Viseu batholith

B. Valle Aguado[1], M.R. Azevedo[1], J. Nolan[2], J. Medina[1], M.M. Costa[1], F. Corfu[3], J.R. Martínez Catalán[4]

1 — Department of Geosciences & Geobiotec, University of Aveiro
2 —Department of Earth Science and Engineering, Imperial College, London, UK
3 — Department of Geosciences, University of Oslo, Norway
4 — Departamento de Geología, Universidad de Salamanca, Spain

A major event of plutonic activity occurred in the Viseu region at the end of Late Paleozoic Variscan collisional tectonism (299.4 ± 0.4 to 296.0 ± 0.6 Ma). A detailed anisotropy of magnetic susceptibility (AMS) survey on the Viseu batholith suggests that pluton emplacement occurred at the extensional termination of a regional-scale, ENE-WSW trending, sinistral shear zone – the Juzbado-Penalva Shear Zone (JPSZ). A dilational opening model involving the development of transtensional jogs located along the trace of the fault, followed by progressive opening and widening of north-south trending fractures (perpendicular to the maximum stretching direction) provided the space into which the successive magma batches arriving from below were emplaced. Vertical inflation was accommodated by depression of the pluton floor. The proposed model is consistent with the asymmetric wedge-shaped geometry of the intrusion (steep root zone on the northern side, discordant subvertical walls and a shallowing pluton floor towards the south).

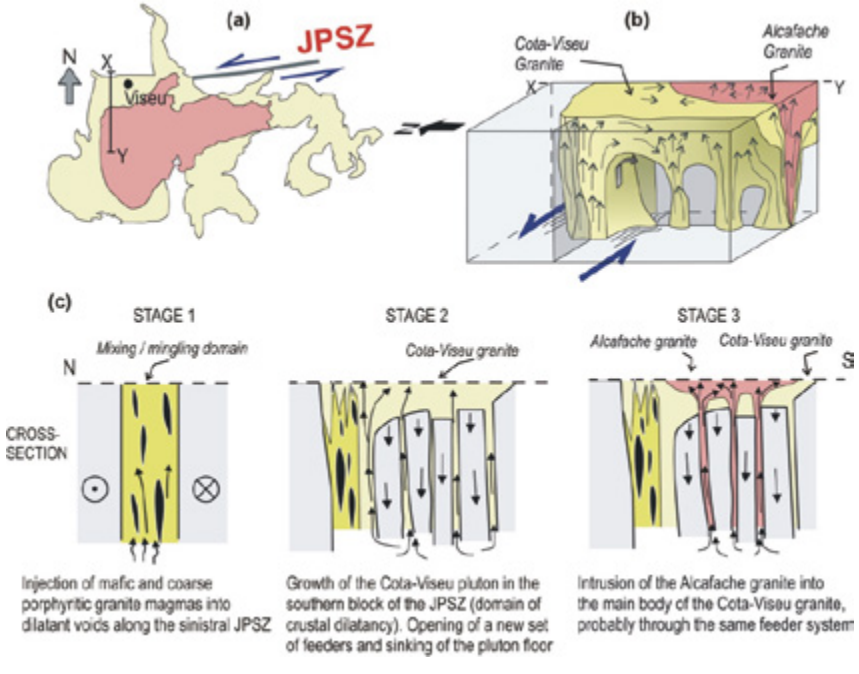


FIGURE 1
Proposed emplacement model for the Viseu Batholith. (a) General map of the batholith; (b) Three dimensional schematic representation of the batholith; (c) N-S cross section along the western side of the intrusion showing the successive stages of pluton growth. JPSZ: Juzbado-Penalva sinistral Shear Zone.

Oral and lung bioaccessibility of trace elements in dust particles under the influence of forest fires

C. Patinha[1], N. Durães[1], E. Ferreira da Silva[1]

Forest fires have been an increasingly frequent phenomenon worldwide. In 2017, the forest fires were of extreme severity in Portugal, devastating huge forest and urban areas, causing a dramatic number of deaths and high economic losses.

The fire ashes are usually characterized by its easy wind dispersion, high alkalinity (mainly composed by (hydr) oxides of base cations), and by the significant amounts of trace metal(loid)s. Therefore, they may exert harmful effects to humans and animals not only from local, but also from populations hundreds of kilometres away from the source.

The lung bioaccessibility (LB) and oral bioaccessibility (OB), defined as the metal(loid)'s solubility in alveolar lung fluids and in gastric fluids from inhaled or ingested particles, respectively, are known to be important parameters for health risk assessment. Thus, this study aims at identify and quantify the trace elements present in dusts from an area affected by forest fires, and to assess its oral and lung bioaccessibility.

Samples were collected in sidewalks (inside and outside burned area) and represent a mixture of ash (resulted from forest fires), soil, street dust and airborne particles (Fig. 1). The samples were separated in two grain size fractions (<250 µm and <10 µm) for chemical analysis. Artificial lysosomal fluid (ALF) was used to measurement the LB in the <10 µm particle size fraction (inhaled fraction), whereas the UBM method was used to assess the OB in the <250 µm fraction (hand-to--mouth ingested particles) (Fig. 2).

The concentration of metals (Cu, Ni and Zn) was higher in the <10 µm particle size fraction than in the <250 µm fraction, which is of high concern not only because these particles represent more than 1% of the total mass, but also due its importance as an exposure route. The bioaccessibility percentages (lung and gastric phases, respectively) were: 42% and 33% for Cu; 27% and 31% for Ni; 60% and 54% for Zn. The lower Ni extraction is probably related to the local geology. No spatial correlation was found between the OB and LB values and the distance to the burned area. The high variability on the bioaccessiblity data between sampling sites may indicate: (1) significant heterogeneity in the composition and in the specific surface area of dust particles; (2) the ease of transport of the fire particles by the wind promotes a rapid dispersion and mixture with the particles of unburned zones.

1 — Department of Geosciences & GeoBioTec, University of Aveiro

Towards an efficient IS service management: The internal customers' Zone of Tolerance

Hugo Ribeiro[1], Belém Barbosa[2]

1 — School of Accounting and Administration, University of Aveiro
2 — School of Accounting and Administration, GOVCOPP, University of Aveiro

This article addresses the zone of tolerance (ZOT) as a diagnosis tool for managing the quality of information systems' (IS) service delivered to internal customers. The concept of ZOT results from dividing customers' expectations into two measures:

· level of desired service, which represents what customers believe that can and should be provided; and

· the adequate service, corresponding to the minimum level of service the customer is willing to accept.

The difference between these two expectation measures results in a ZOT, which represents the interval of service performance that the customer considers satisfactory.

This article aims to contribute to a better understanding of internal customers' ZOT by considering the frequency of use and skills in IS as explanatory factors. A survey was administered to the internal users of one company's IS department. 276 valid questionnaires were obtained, representing a response rate of 70%.

The results showed that internal customers had a narrow zone of tolerance, which differed according to the users' IS skills and how frequently they used the IS support service; occasional users and skilled users were the least susceptible to heterogeneity in the service delivery.

From management point of view, a wider ZOT would be more favourable, meaning that some variability in service would not result in user dissatisfaction. So, in this case, strategies should be designed to manage the expectations regarding the adequate service. Users should be clearly informed of the benefits of the use of IS services, and the responsibilities and limits on the use thereof.

The article demonstrates the relevance of assessing the ZOT of IS services and provides insights on how to improve the effectiveness and efficiency of IS services to internal customers. In fact, the adopted model enables the assessment of the service quality and the identification of strengths and weaknesses of the service, indicating the critical aspects for urgent improvement. Managerial implications, limitations and suggestions to future research are also provided.

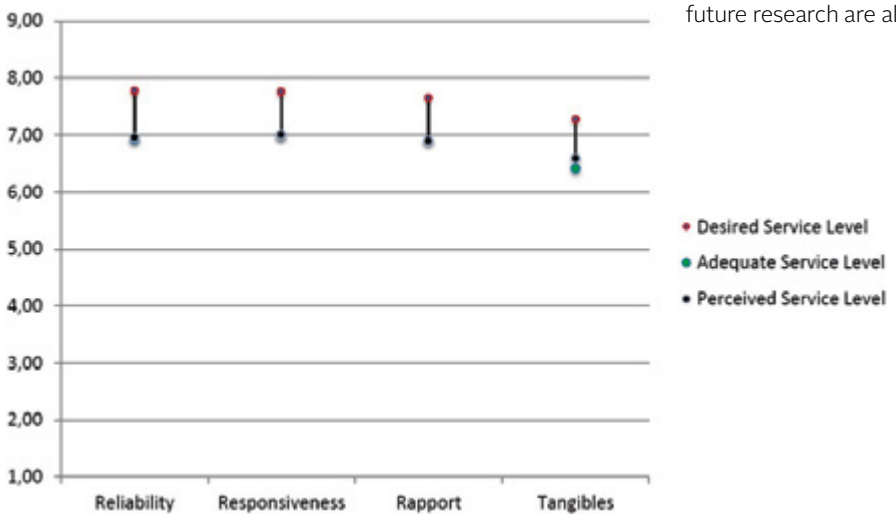


FIGURE 1
Zone of tolerance.

How economic growth affects emissions? An investigation of the environmental Kuznets curve (EKC) in Portuguese and Spanish economic activity sectors

Victor Moutinho[1], Celeste Varum[1], Mara Madaleno[1]

It is a disquieting reality that increased economic growth for many years now in the Western world is at odds with environmental degradation. In this paper the relationship between economic growth and environmental variables is analyzed under two non-linear specifications, a quadratic and a cubic specification. The study is conducted for Portugal and Spain in the period 1975-2012, using annual data for 13 sectors and the PCSE method. GVA is used as proxy for income, while energy use and carbon dioxide account for environmental degradation.

There is evidence for an inverted U-shaped EKC. However, there are also other inverted N-shaped functions that explain the relationship between economic growth and emissions. Altogether, empirical results do indicate particular differences between Portuguese and Spanish sectors. Political mitigation measures are also analyzed. We use data at sectoral level, which is a step forward in terms of data richness given the scarcity of studies in the literature linking economic growth and mitigation of emissions of greenhouse gases (GHG) at the sectoral level.

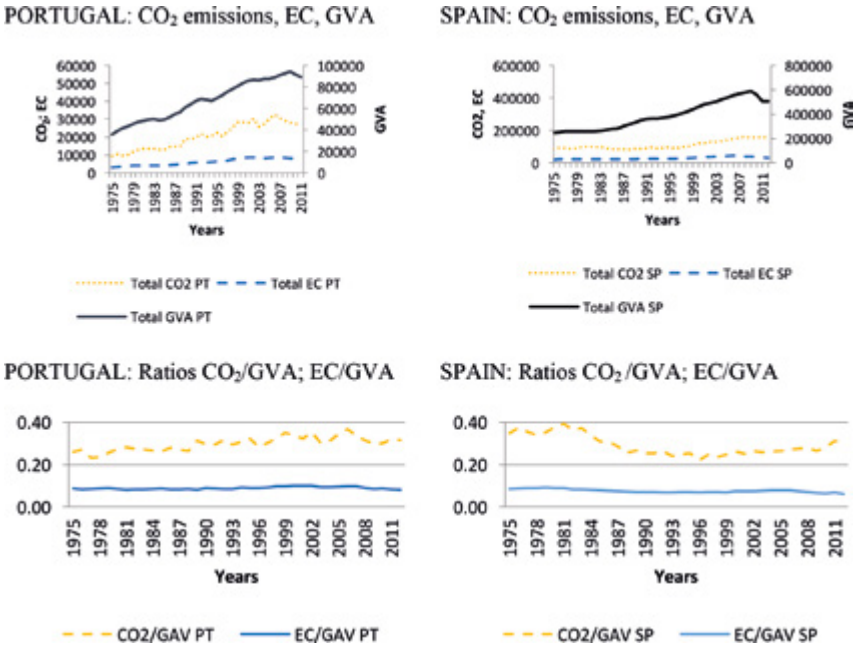
Results seem to point for the existence of an EKC relationship between GVA and sectoral environmental CO_2 emissions but which differs across Portuguese and Spanish sectors. We also found that independently of the estimation procedure Portuguese sectors reveal an N-shape EKC relationship. In Spain results point for mixed statistical evidence of an N-shaped relationship and for an inverted N-shaped relationship. Results reveal to be sensitive to model specification and country analyzed. One key finding is that key group dictate the EKC relationship.

Although there is no strong evidence that Portuguese and Spanish economic sectors have passed the EKC turning point, there is evidence of positive effects of the growing use of renewable energy since higher energy consumption and production does not necessarily translates into higher emissions. Only using the PCSE estimation our results corroborate those empirical studies showing the Kuznets validity. Under the cubic specification, results confirm an N-shaped relationship between emissions and GVA for the group of economic sectors in Portugal; while for the same group in Spain, the statistical evidence shows a mixed EKC curve, more specifically either an N-shaped or an inverted N-shaped relationship.

1 — Department of Economics, Management and Industrial Engineering & GOVCOPP, University of Aveiro

FIGURE 1

CO_2 emissions; Gross value added (GVA) and energy consumption (EC)*



Source: Own elaboration based on data from Energy Balance data, from the International Energy Agency (IEA). *CO2 emissions in millions of tons of CO2 equivalent, energy consumption in millions of TEP and values over GVA in millions of euros.

Metal Doping effects on ZnO Tetrapods with Bismuth and Tin Oxides

V. Postica[1], J. Gröttrup2, Rainer Adelung[2], O. Lupan[1,2], A. K. Mishra[3], N. H. de Leeuw[4], N. Ababii[1], J. F. C. Carreira[5], J. Rodrigues[5], N. Ben Sedrine[5], M. R. Correia[5], T. Monteiro[5], V. Sontea[1], and Y. K. Mishra[2]

1 — Department of Microelectronics and Biomedical Engineering, Technical University of Moldova, Moldov
2 — Functional Nanomaterials Institute for Materials Science Kiel University, Germany
3 — Research & Development, University of Petroleum and Energy Studies, India
4 — Department of Chemistry University College London & School of Chemistry Cardiff University, UK
5 — Department of Physics & I3N, University of Aveiro

A highly porous interconnected three-dimensional (3D) structure comprised by a network of nano- and micro-scale ZnO tetrapods (ZnO-T) possess a large surface-to--volume ratio, offering many gas diffusion channels, which is highly beneficial for sensor devices with enhanced gas sensing response. The formation of heterojunctions in these tetrapodal networks was demonstrated to be the main key feature for further improving their sensing properties. Recently, novel hybrid materials based on highly porous ZnO-T 3D networks with different types of metal oxides (Me_xO_y) and ternary alloyed systems ($Zn_xMe_{1-x}O_y$) were produced, and were found to exhibit unique properties, making them promising candidates for a wide range of applications, including gas sensing [1].

In this work, the characteristics of the hybrid ZnO-Bi_2O_3 and ZnO-Zn_2SnO_4 tetrapod networks were investigated. Detailed morphological, structural, vibrational, and optical studies of the materials were performed and discussed [1]. Raman spectra were dominated by the vibrational modes expected for the ZnO wurtzite structure. However, for the hybrid Zn_2SnO_4 tetrapod networks, additional vibrational modes were identified and assigned to the zinc stannate phase, corroborating the X-ray diffraction patterns. The correlation between photoluminescence excitation (PLE), absorption and photoluminescence (PL) results allowed to provide the necessary information to form possible configuration of *n*-Zn_2SnO_4/*n*-ZnO-T and *p*-Bi_2O_3/*n*-ZnO-T heterojunctions in the thermal equilibrium parameters necessary for the fabrication of the sensing device. The gas sensing studies reveal improved performance of the hybrid networks compared to pure ZnO-T networks: an enhancement of H_2 gas response was obtained for the ZnO-T-Bi_2O_3 network, while in ZnO-T-Zn_2SnO_4 networks, a change of selectivity to CO gas with high response was achieved [1].

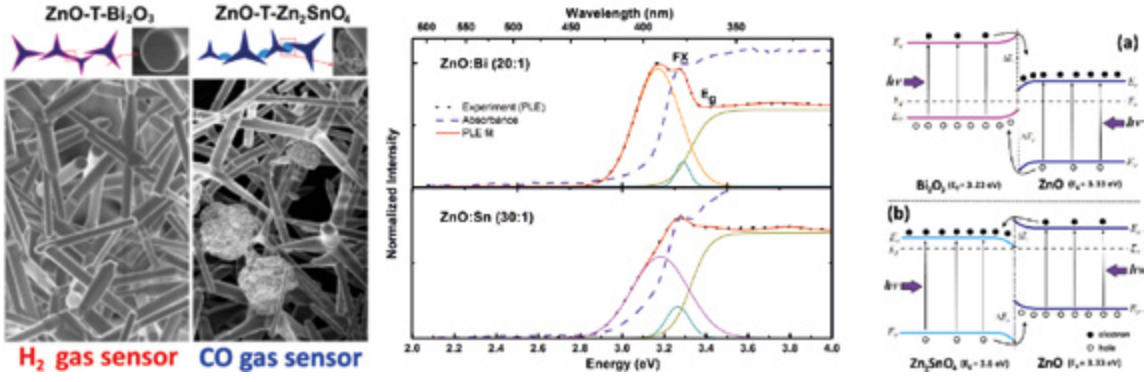


FIGURE 1
Left: SEM images of novel ZnO tetrapod with hybrid 3D networks of Bi_2O_3 and ZnO-Zn_2SnO_4. Middle: Room-temperature PLE (monitored at ~2.4 eV) and absorbance spectra of the ZnO-T with hybrid 3D networks of Bi_2O_3 and ZnO-Zn_2SnO_4. Right: Schematic energy band diagram of the heterojunctions at the thermal equilibrium (adapted from [1]).

Mapping the structure of directed networks: Beyond the bow-tie diagram

Gábor Timár[1,2], Alexander V. Goltsev[1,2], Sergey N. Dorogovtsev[1], José F. F. Mendes[1]

The majority of large directed networks (such as the WWW and Twitter) have a central core – the giant strongly connected component (GSCC) – that consists of nodes that can be reached by any other node in the core via a directed path. The nodes that can be reached from the GSCC constitute the giant out-component (GOUT) and nodes that can reach the GSCC make up the giant in-component (GIN). This is the well-known "bow-tie" picture of directed networks.

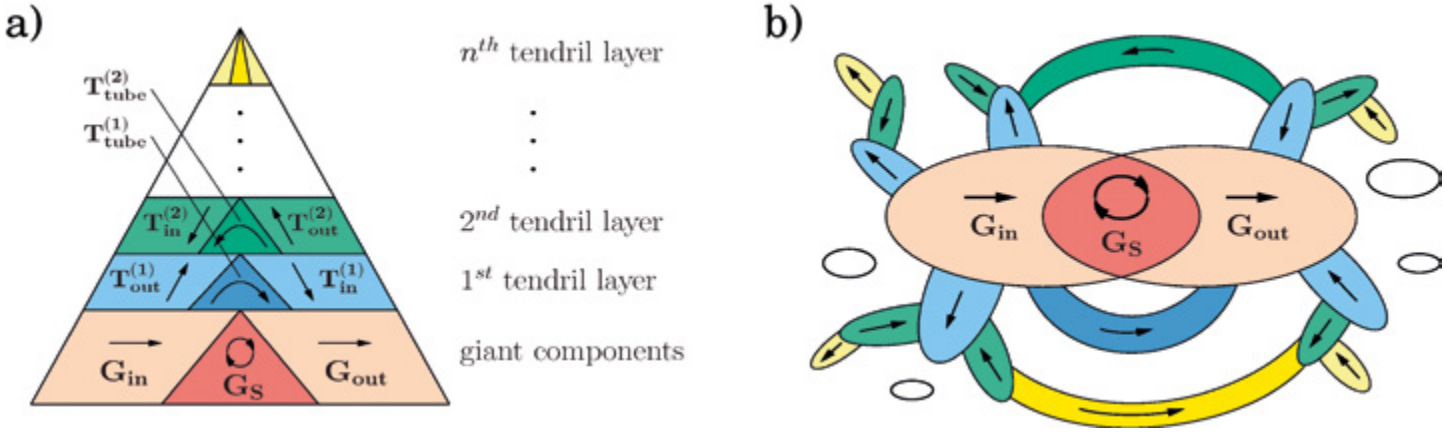
The above representation gives a very informative view of the structure of directed networks, however a large fraction of nodes in the given network is left uncategorized. We propose a scheme by which all nodes in an arbitrary directed network are categorized: a hierarchical multilayer structure of "tendril layers" connected to the giant components (Fig. 1a). We propose an efficient computational algorithm to find all these new components, thereby giving a complete characterization of the structure of an arbitrary directed network. The newly introduced components permit a much richer organization of nodes than previously noted (Fig. 1b).

We also introduce a generalized connectivity function and the related susceptibility that may be used to estimate the distance from the percolation transition in directed networks: the point where the giant components disintegrate into small directed components, or vice versa, where small components merge to form the GSCC, GIN and GOUT. We indicate that near this transition point the main contribution to the susceptibility is from the newly-categorized nodes in the tendril layers attached to the giant components.

1 — Department of Physics & I3N, University of Aveiro
2 — A. F. Ioffe Physico-Technical Institute, Russia

FIGURE 1

a) Schematic view of the complete structure of an arbitrary directed network.
b) The extension of the "bow-tie" diagram, including a hierarchy of tendril components attached to the giant components in a directed network.



Theory of the carbon vacancy in silicon carbide

J. Coutinho[1], V. J. B. Torres[1], K. Demmouche[2], S. Öberg[3]

1 — Department of Physics & I3N, University of Aveiro
2 — ISCUBB – Ain Temouchent, Algeria
3 — Luleå University of Technology, Sweden

Due to its outstanding properties, silicon carbide (SiC) is becoming the material of choice for high-voltage and high-power electronics. However, the presence of carbon vacancies in as-grown material has been the cause of device failures like low field effect mobility. Understanding the properties of this defect is a major challenge along the way to produce better material. Recently, our group performed state-of-the-art first-principles calculations using several hundreds of atoms and described with great accuracy the properties of electrons coupled to the nuclei around the defect. We were able to solve several unanswered issues raised by electron paramagnetic resonance, all of which were found to originate from a pseudo-Jahn-Teller effect driven by an internal crystal field. These results had excellent acceptance by the community. They actually stimulated other groups to design new experiments in order to verify some of our predictions.

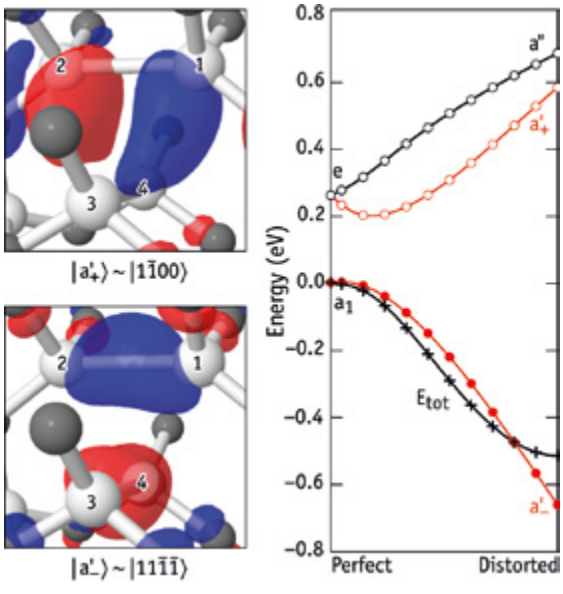


FIGURE 1
(Left) Shape of the highest occupied and lowest unoccupied Kohn-Sham orbitals of a neutral carbon vacancy in 4H-SiC. (Right) Evolution of the single-electron states in the gap as the structure changes from a perfect vacancy to the distorted ground state. Occupied and empty states are represented as solid and open circles, respectively. The total energy (E_{tot}) is shown as crosses. Figure adapted from Reference 2.

A wide and indirect band gap, high chemical and thermal stability, as well as radiation and electrical hardness, are among the merits that make silicon carbide (SiC) an outstanding material for high-voltage and high-power electronics [1]. Among several stable polytypes, the hex-agonal 4H-SiC has become the material of choice of the industry. However, the presence of carbon-related point defects in SiC, particularly carbon vacancies (V_C), has been a major cause of device failures like low field effect mobility.

José Coutinho and Vitor Torres from the Theoretical and Computational Physics group at the I3N-UA, employed quantum-mechanics within hybrid density functional theory, to unveil the optical, electronic and magnetic properties of the VC defect in 4H-SiC [2]. They found that VC exhibits a rich catalog of atomistic structures that depend on the sublattice site, charge state, crystal-field effects, and more importantly a pseudo-Jahn-Teller effect. The latter solves a long-standing argument regarding the assignment and identification of the V_C defect in 4H-SiC. As observed by electron-paramagnetic resonance [3], the defect adopts a distorted structure, despite the lack of an explanation for such distortion. José Coutinho and Vitor Torres found out that the pseudo-Jahn-Teller effect in V_C dramatically lowers the energy of the defect by changing the local bonding, accounting well for the observations (see Figure).

The resulting model is also able to explain the observed inverted order of ionization energies related to the defect. The VC defect is able to capture two electrons. For the double-minus charge state, thermal emission of the first electron immediately induces a second emission. The research carried by the authors was able to explain this phenomenon on the basis of an exchange between Coulomb repulsion between electrons and chemical bonding due to the pseudo-Jahn-Teller effect.

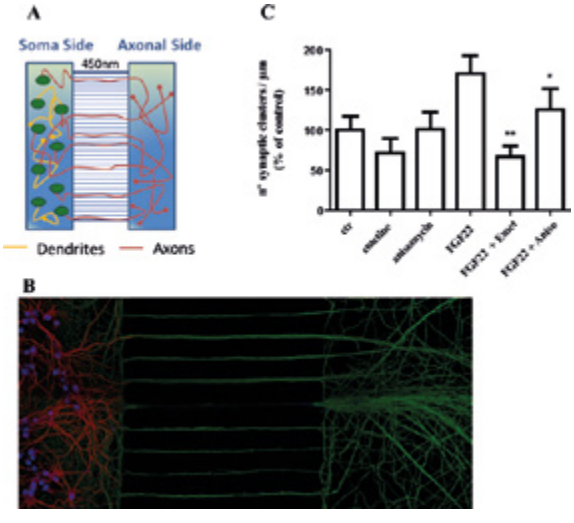
Local protein synthesis is required for synapse formation

Joana R. Pedro[1], Maria Joana Pinto[1], Rui O. Costa[1], Luís Martins[1], Pedro Alves[1,2], Samie R. Jaffrey[3], Ramiro D. Almeida[1,4]

The establishment of synapses requires the formation of a well-structured and functional presynaptic terminal. This process can be regulated by contact with the synaptic partners or by target-derived cues. The canonical model proposes that presynaptic proteins are transported from the cell body in the form of pre-assembled transport vesicles. However, the long distance between the cell body and distal axons is inconsistent with the rapid remodeling of the presynaptic terminal, suggesting that transport cannot be the sole source of new proteins that drive presynaptic differentiation. Therefore, local mechanisms might provide an additional or alternative mechanism to control the formation of new presynaptic sites.

Local mRNA translation controls the pool of proteins present in specific neuronal compartments. This mechanism provides neurons with an incredible ability to regulate dynamic events, such as synaptic plasticity, cue-induced axonal steering, axon turning, axon outgrowth and regeneration. In addition, a diverse set of mRNA species, comprising a variety of protein families, were found in recent axonal microarray screens, but the role of such a diverse array of transcripts is still elusive.

To address these questions we decided to investigate if synapse formation is dependent on local protein synthesis. We started by culturing vertebrate neurons in microfluidic devices (Fig.1A). Specific properties of these devices allow physical and fluidic isolation between both microenvironments (Fig.1B). Thus, microfluidic chambers are well suited to study the intra-axonal mechanisms that regulate synapse formation. We found that synaptogenic cues activate mRNA translation pathways in axons. In addition, we observed that adding protein synthesis inhibitors specifically to axons (but not to cell bodies) blocks the formation of synaptic clusters. Using live cell imaging we also found that a translation reporter is locally synthesized in axons during stimuli-induced synapse formation. Finally, axonal delocalization of axonal mRNA in an in-vitro neuron-muscle co-culture impairs synapse formation. Overall, our results show that axonal mRNA translation is required for synapse formation (Fig.1C) and highlight a functional of this process in nervous system development.



1 — CNC – Center for Neuroscience and Cell Biology, University of Coimbra
2 — IEC – Instituto da Educação e Cidadania, Mamarrosa
3 — Weill Medical College of Cornell University, New York
4 — Department of Medical Sciences & iBiMED, University of Aveiro

FIGURE 1
Microfluidic chambers as tool to study neuronal development and regeneration.
(A) Schematic diagram of microfluidic chambers. (B) Rat embryonic hippocampal neurons were cultured in microfluidic chambers and immunostained against an axonal marker (green), a dendritic marker (red), the nuclei are labelled in blue. The neurons are plated in the somal compartment (right) and as they develop axons extend into the axonal compartment (left). Due to the fluidic and physical characteristics of these devices, no cell bodies or dendrites cross into the opposite compartment allowing the study of axonal-specific events. (C) FGF22, a synaptogenic cue, added specifically to the axonal compartment induces the formation of new synapses and this process is dependent on local mRNA translation.

Crossroads: Collaborative Creativity as Alternative Transformative Practice of new Technologies

Paulo B. Bastos[1]

1 — Department of Communication and Art & [ID+], University of Aveiro

The technology has always been turned into perfecting the image and this may be our beliefs and wills for understanding the world through its simulations. Therefore, we try to understand the subject, how it was done, by whom, when, etc., and the interest on the image lies firstly in this possible reference to the visible world – need of placing the image and connecting with it. The result of the intersection between technology and interactivity drives us to perceive the development of the idea of shared production that spreads out as will inherent to the attitude of the creative act. The work, on being revealed in the aspiration of interactivity enounces a positioning that is linked to the technological means, on space and proceedings issues. The main leading theories of 'transformative creativity', which has emerged in the last decade, proposed by Margaret Boden (e.g. Boden 1990), gave us important notions of personal/historical-creativity, which have helped to define creativity in a much more formal context. I'm departing from the methodological approach that considers Deleuze and Guatarri's concepts of Rhizome and becoming as a theoretical and philosophical framework. By considering art practice as research we are inspecting how creativity emerges from chaos and is a participatory practice; how this phenomenon expands 'rhizomatically' in a co-authored situation and how a lead into the complexity of creation can be mapped through reflection archiving and writing – exegesis. What is this model of approach embedding? Is the best way to be creative in a specific field to gather as much knowledge about the domain as possible? Is it just a capacity of organizing retrieval processes enclosed in our cognitive capacity of memory? Consciousness, attention and motivation are considered in the formal concepts of creativity? Is transformative creativity what we as artists are searching for – a means to transcend a conceptual space? Has a co-authored situation ever been considered? This article is metaphorically crossroad of the artistic mind in a creative practice-led research considering solo and co-authored creation.

An efficient architecture to support digital pathology in standard medical imaging repositories

Tiago M. Godinho[1], Rui Lebre[1], Luís B. Silva[2], Carlos Costa[1]

Clinical pathology is facing a growing crisis caused by the combination of two factors; the reduced number of pathologists per capita, and the increasing demand for their services. Digital medical imaging workflows and telemedicine are considered an important tool to face this crisis since they have been successfully applied to other medical specialities. In recent years, digital pathology and whole-slide imaging (WSI) have been gaining momentum due to the appearance of digital scanners. However, the technology is not sufficiently mature to support remote clinical practice in pathology. Several technical challenges have been contributing to the slow implementation of telepathology platforms. Most notably, the performance issues associated with the storage and distribution of huge volumes of data, the tremendous WSI resolution (gigapixel scale), and the interoperability with other systems associated with the medical practice, such as Picture Archive and Communications Systems (PACS) based on the DICOM standard.

This article proposes a novel architecture of a Web Pathology PACS that is fully compliant with DICOM standard communications and data formats. The solution includes a Cloud-ready repository that stores WSI studies in DICOM and offers a communication interface based on the most recent DICOM Web services. The second main component is a zero-footprint viewer that runs in any web browser. It features a tiling engine especially suited to manage the extreme requirements of WSI image pyramids. These components were designed with a special focus on efficiency and usability. The performance of the proposed system was assessed through a comparative analysis of the state-of-the-art solutions. The results demonstrate that it is possible to have a very competitive solution based on standard workflows. For instance, our solution managed to complete a visualization workflow on average 18x faster than its best counterpart.

1 — Department of Electronics, Telecommunications and Informatics & IEETA, University of Aveiro
2 — BMD Software, Portugal

FIGURE 1
Pathology PACS Architecture

FIGURE 2
Zero-footprint Web Viewer

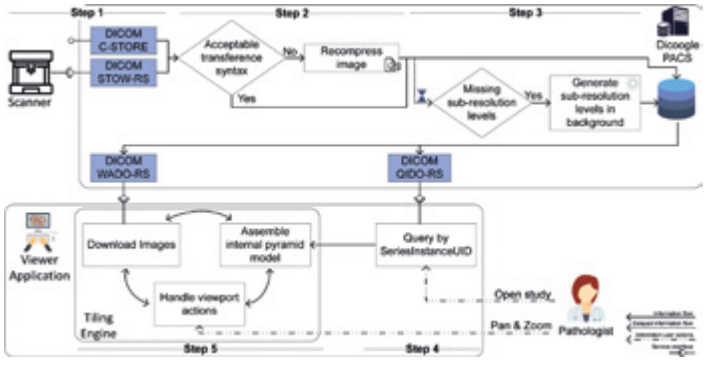


Figure 1

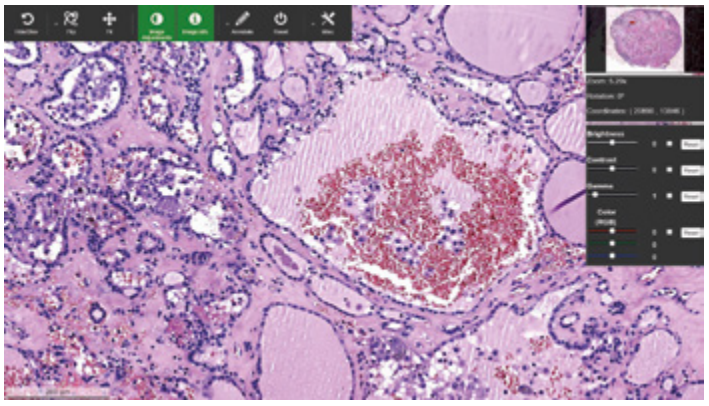


Figure 2

Binary autoregressive geometric modelling in a DNA context

Sónia Gouveia[1], Manuel G. Scotto[2], Christian H. Weiβ[3], Paulo Jorge S. G. Ferreira[4]

1 — IEETA & CIDMA, University of Aveiro
2 — Department of Mathematics & CEMAT, IST, University of Lisbon
3 — Helmut-Schmidt University, Hamburg, Germany
4 — Department of Electronics, Telecommunications and Informatics & IEETA, University of Aveiro

Symbolic sequences occur in many contexts and can be characterized by integer-valued intersymbol distances or binary-valued indicator sequences. The analysis of the numerical sequences often sheds light on the properties of the original symbolic sequences. This work introduces new statistical tools to explore autocorrelation structure in indicator sequences, with application to deoxyribonucleic acid (DNA) sequences.

DNA is a long A, C, G and T sequence from which 4 sequences of inter-nucleotide distances (IND) can be derived as the consecutive distances between equal nucleotides. It is known that IND probability distributions deviate significantly from those assuming independent random placement (i.e. geometric distributions) and the deviations can be used to discriminate between species and to build phylogenetic trees. To investigate the extent to which autocorrelation explains the deviations, each 0–1 indicator sequence is endowed with a binary autoregressive (AR) model of optimum order. The corresponding binary AR geometric distribution is derived analytically and compared with the observed IND distribution by goodness-of-fit X2-testing.

The figure shows observed/expected frequencies for the human mitochondrial DNA: the expected optimum BinAR frequencies (red) are better adjusted to the observed ones (grey) than those expected for the geometric distribution (black). Overall results from several species (GenBank, http://ncbi.nlm.nih.gov/genbank) indicate that the statistical hypothesis of equal observed/expected frequencies is seldom rejected with a binary AR model instead of independence (76/136 vs 125/136 rejections at 1% level). Furthermore, binary AR modelling leads to a relevant median observed/expected deviation reduction (30% for A, 80% C, 90% G, 60% T). Therefore, these models are suitable to describe the dependences within a given nucleotide and encourage the development of a model-based framework to compact IND information.

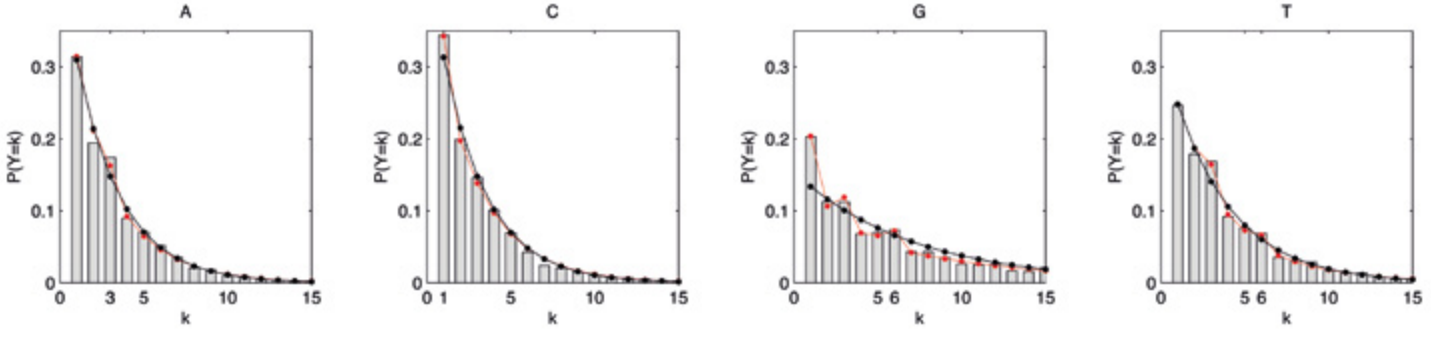


FIGURE 1
Probability mass functions of IND values (Y) for the Human species: observed frequencies (grey), expected geometric frequencies (black) and optimum order expected BinAR frequencies (red) with parameters estimated from the data. Chosen optimum order is (3,1,6,6) respectively for (A, C, G, T) nucleotides.

Learning Robot Tasks with Loops from Experiences to Enhance Robot Adaptability

Vahid Mokhtari[1], Luís S. Lopes[1], Armando J. Pinho[1]

This paper contributes towards the development of robot capabilities to acquire high-level task planning models, by conceptualizing past experiences, for solving any particular instances of the same tasks. The motivation for tackling this problem centers on the belief that it is impossible to preprogram all the necessary knowledge into a robot operating in a diverse, dynamic and unstructured environment. We propose and integrate the notion of Experience-Based Planning Domain (EBPD) – a framework that provides important concepts for long-term learning and planning) – into robotics. This framework includes three main components (see Figure 1): experience extraction, conceptualization and planning. Experience extraction provides a human-robot interaction for teaching tasks and an approach to recording experiences of past robot's observations and activities. Experiences are used to learn activity schemata, i.e., methods of guiding a searchbased planner for finding solutions to other related problems.

Conceptualization combines several techniques, including deductive generalization, different forms of abstraction, feature extraction and loop detection to generateactivity schemata from experiences. Planning is a hierarchical problem solver consisting of an abstract and a concrete planner which applies learned activity schemata for problem solving [1, 3, 2].

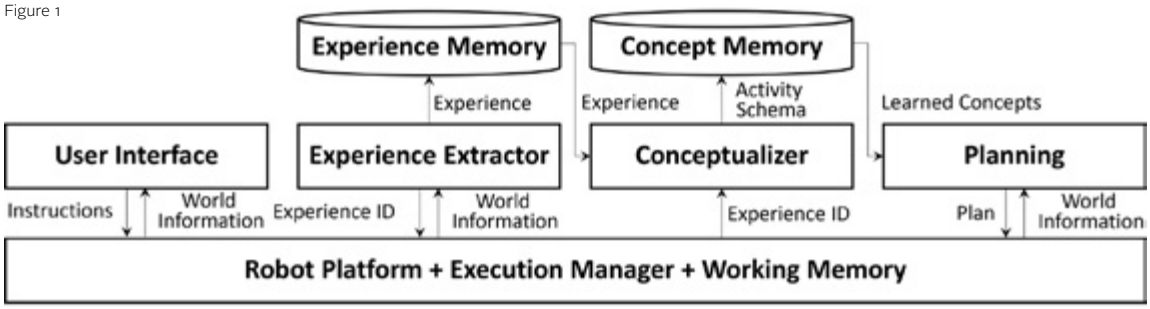
We demonstrated the utility of this system in different domains, and effectively tackled complex, real world tasks. Figure 2 shows the integration of this system into a real robotic arm JACO) – a lightweight assistive robotic device delivered by Kinova Robotics. In this demonstration, the JACO arm is taught to clear a table by removing objects from the table. By conceptualizing and learning this task, the robot is able to instantiate the learned concept and generate solutions to other instances of this problem with varying sets of objects without requiring an exhaustive search.

1 — Department of Electronics, Telecommunications and Informatics & IEETA, University of Aveiro

FIGURE 1
The learning and planning system in EBPDs.

FIGURE 2
From left to right, JACO arm moves to the cup, picks up the cup from the table, carries the cup, and place it on the tray.

Figure 1



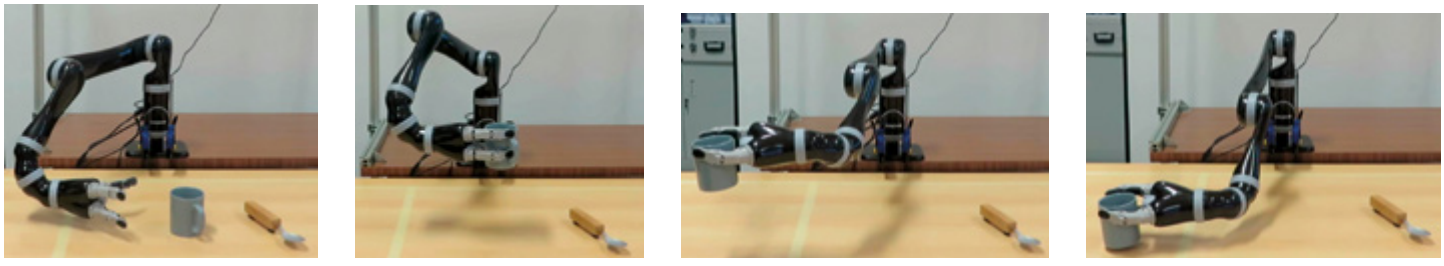


Figure 2

Impact of 5G MIMO Antenna Arrays Mutual Coupling on Amplifier Linearity and Efficiency

Filipe E. Barradas[1], Pedro M. Tomé[1], Telmo R. Cunha[1], Pedro M. Cabral[1], José C. Pedro[1]

1 — Department of Electronics, Telecommunications and Informatics, and Instituto de Telecomunicações, University of Aveiro

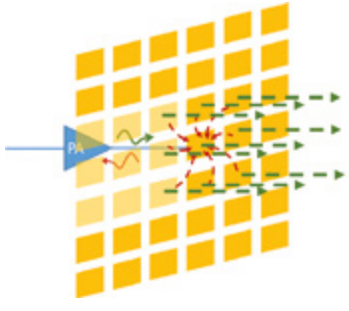
Modern and future 5th Generation transmitter architectures are driven toward multi-input multi-output (MIMO) transceivers in which several radio frequency (RF) power amplifiers (PAs) drive an antenna array. In 5G sub 6 GHz and, in particular, future millimeter-wave bands, the isolators often present between the antennas and the PAs must be removed, since they are based on bulky, and incompatible with integrated circuit technology, non-reciprocal ferrite-based devices.

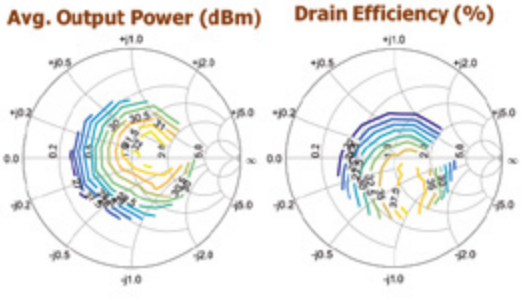
Because the antenna array elements are electromagnetically coupled, the waves feeding each of the antennas are also driving the output ports of all the other PAs. This effect creates an apparent variable load at the output of each PA, which can be caused by the different phases with which each antenna is excited – in a single-channel beam-steering scenario –, and so dynamically depends on the mobile position, or even simply induced by the interchanged information – in a multi-channel transmitting scenario.

In such a system, the behavior of each PA cannot be fully described as a function of, solely, its input, as it will change according to the coupled signal originated in all the other PAs. To predict and understand the behavior of these complex MIMO systems, simulation becomes a powerful, but also indispensable, engineering design tool.

In this work, the Wireless Circuits and Systems group of IT-Aveiro, not only demonstrated the unexpected impact of these load variations on the PAs' efficiency as, using their prize-winning double-input-double-output signal and dc PA behavioral model, were able to develop a simulator capable of predicting the MIMO transmitter FoMs of interest.

Because of the dramatic need to save energy in future 5G communication systems, the experimental demonstration and subsequent simulation of the impact of MIMO array antenna coupling onto the transmitters' power consumption efficiency was highlighted as a ground-breaking technology in the November, 2017, IEEE Microwave Newsletter.





Industrial and Office Networks Convergence

Paulo Pedreiras[1], Pedro Gonçalves[2], Luis Silva[1], Luis Almeida[3]

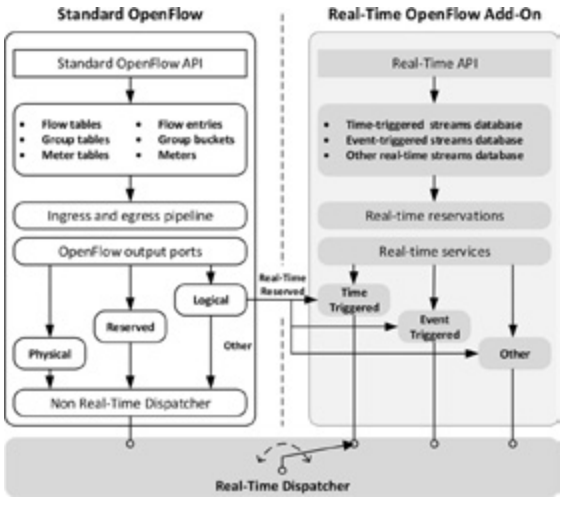
The concept of Industry 4.0 (I4.0) or, more generally, Smart Production (SP), is transforming radically the industrial chain of value. Building on Information and Communication Technologies, I4.0 boosts interoperability of machines and achieves seamless integration with the Internet and the manufacturing and production processes.

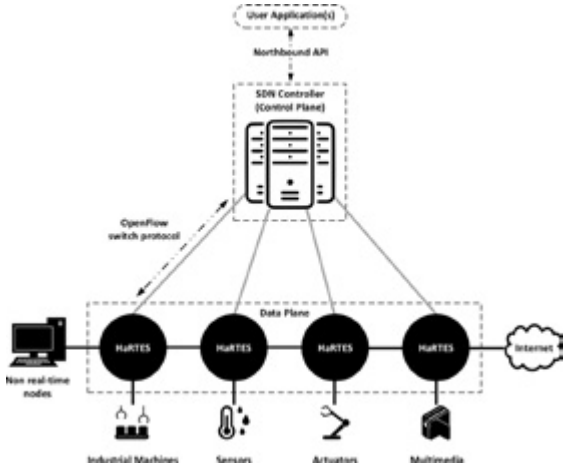
Networks are a core component of I4.0/SP systems, interconnecting all entities, both physical and virtual, such as products, manufacturing systems, management, logistics and business models. Designing networks for these scenarios is particularly challenging because they cross domains that often exhibit conflicting communication requirements, from cost and throughput typically valued at the management level to determinism and reliability that are often prime performance criteria in the shop floor.

Software-Defined Networking (SDN) is a disruptive network management paradigm that emerged on campus networks but was soon considered for use at industrial level. However, due to its roots, SDN protocols, e.g. OpenFlow (OF), do not support deterministic real-time services, thus hampering its adoption on I4.0/SP systems, at least for the lower layers. This problem is addressed by the METRICS project, proposing an OF extension to allow specifying and managing real-time communication services while keeping compatibility with the original standard.

The real-time services are accessed via a dedicated API that extends the standard one, being transparent to standard OF nodes. Supported real-time communication services include the transmission of synchronous and asynchronous real-time message streams. The extended API allows the dynamic creation, modification and elimination of real-time reservations. The framework also includes an admission control module to ensure that all accepted reservations are feasible.

METRICS also addresses the development of a bridge (data plane) capable of segregating standard OF and real-time traffic, providing dedicated scheduling and dispatching services for each of these traffic types.





1 — Department of Electronics, Telecommunications and Informatics, & Instituto de Telecomunicações, University of Aveiro
2 — Águeda School of Technology and Management & Instituto de Telecomunicações, University of Aveiro
3 — Department of Electrical and Computer Engineering & CISTER, Faculty of Engineering of the University of Porto

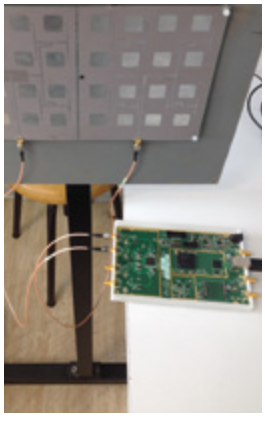
Bio-Radar – Measuring the Breath rate without physical contact

Carolina Gouveia[1], José Vieira[1], Pedro Pinho[2], Daniel Malafaia[3]

1 — Department of Eletronics, Telecommunication and Informatics, University of Aveiro
2 — Instituto Superior de Engenharia de Lisboa and Instituto de Telecomunicações, Instituto de Telecomunicações
3 — Instituto de Telecomunicações

The Bio-Radar is a system capable of monitoring vital parameters, such as respiratory and cardiac rhythms, without requiring any kind of contact with the human body, i.e. without the use of electrodes. This wireless monitoring system has several applications that aim to improve the quality of life in everyday situations, such as the continuous monitoring of bedridden patients, for example in hospital burn units where direct contact with patients is not recommended, sleeping monitoring for Obstructive Sleep Apnea Syndrome patients or even for rescuing people from collapsed buildings.

A Bio-Radar prototype was developed in the Telecommunications Institute and it can measure the respiration rate at more than 2 meters. This system uses the Doppler effect principle that relates the received signal properties with the distance change between the radar antennas and the person's chest-wall. It is composed by a continuous wave radar, that generates digitally a sinusoidal signal, modulates it in phase and quadrature with a carrier equal to 5,8 GHz and then transmits it towards the target, which is the patient's chest. The received signal will be a phased modulate version of the transmitted signal which occurs due to the chest-wall motion while the patient is breathing. This motion changes the travelled distance of the electromagnetic waves causing the phase modulation.



The prototype was developed with focus in real-time acquisition and processing of the respiratory signal. It is composed by a front-end based in Software Defined Radio and two antennas for transmission and reception, respectively. Then, the acquired signals are processed using the LabVIEW software from National Instruments, where an algorithm is implemented with the purpose to extract the vital signals accurately.

The overall system's performance was evaluated using as reference a certified measuring equipment, the BioPac MP100. The respiratory signal was measured using both acquisition systems, the Bio-Radar and the BioPac, simultaneously and the results were very accurate.

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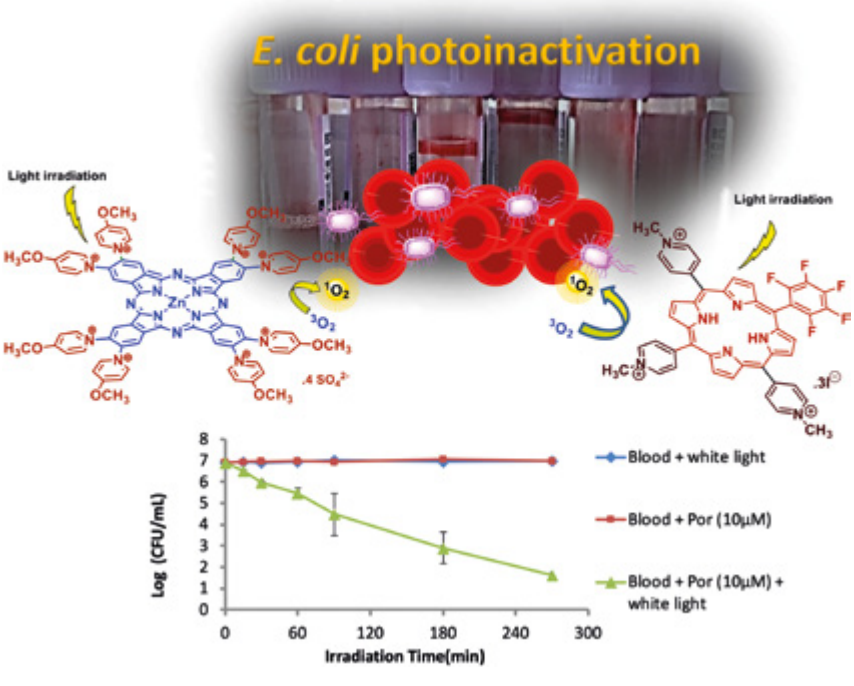
Tetrapyrrolic photosensitizers in the development of protocols for safe blood disinfection

Leandro MO Lourenço[1], João PC Tomé[1], Maria GPMS Neves[1], Maria AF Faustino[1], Lúcia Marciel[2], Luís Teles[2], Beatriz Moreira[2], Mário Pacheco[2], Adelaide Almeida[2]

1 — Department of Chemistry & QOPNA, University of Aveiro
2 — Department of Biology & CESAM, University of Aveiro

Blood transfusion is a life-saver medical procedure used worldwide. Although several advances were made towards an improvement in transfusion security, microbial infections transmitted through blood products transfusion still occur, causing disease in the recipient. Conventional blood disinfection techniques, considered safe for plasma, are usually associated with collateral damages on concentrated platelets and erythrocytes. Alternative methods are required and antimicrobial PhotoDynamic Therapy (aPDT) has been suggested as an alternative technique to blood disinfection. aPDT is based on the interaction of a photosensitizer (PS) agent, light and molecular oxygen which results in the production of reactive oxygen species (ROS) that cause biomolecular damage leading to microbial death. Methylene blue, psoralen and riboflavin are already approved PS in some countries to disinfect plasma. However, there is no aPDT-approved application for concentrated platelets and erythrocytes.

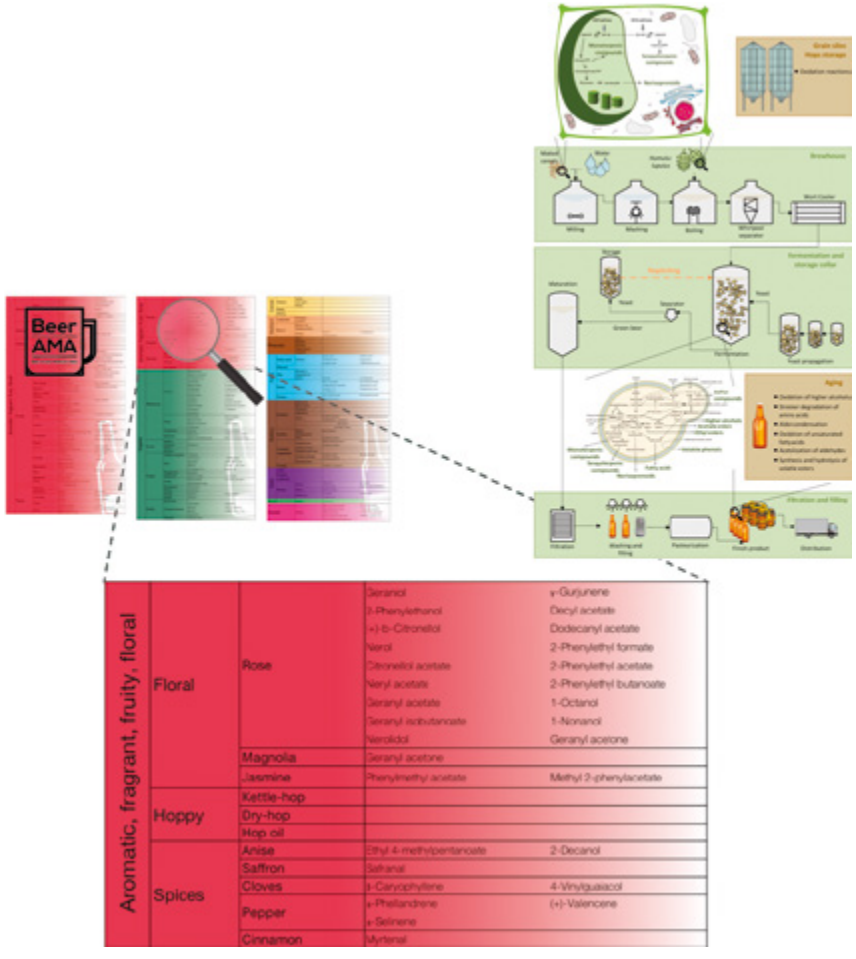
In the last years, others PS are being considered for blood disinfection namely tetrapyrrolic macrocycles such as porphyrins (Por) and the analogues phthalocyanines (Pc). Pc and Por derivatives show interesting features especially strong visible light interaction, good ROS production and effectiveness in the photoinactivation of viruses, mainly enveloped ones such as HIV, and bacteria, even those resistant to antibiotics. Focused to find efficient PS agents to blood disinfection the octa-substituted methoxypyridinium phthalocyanine $Zn(MeOPy^{+})_8Pc$ (bearing eight positive charges) and the tri-substituted pyridinium porphyrin Tri-Py^{+}-Me-PF (bearing three positive charges), developed in our group, were used to evaluate their suitability to photoinactivate bacteria present in contaminated blood products (plasma and whole blood). Effective reduction of Gram-positive and Gram-negative bacteria in contaminated blood samples were attained using porphyrin Tri-Py^{+}-Me-PF with no significant osmotic stress. These results show that aPDT with the tri-cationic porphyrin can be a promising alternative method to disinfect blood.



BeerAMA: new advanced tool for beer aroma in-depth comprehension

Cátia Martinsa[1], Tiago Brandão[3], Adelaide Almeida[2], Sílvia M. Rocha[1]

1 — Departament of Chemistry & QOPNA, University of Aveiro
2 — Departament of Biology & CESAM, University of Aveiro
3 — Super Bock Group



Beer represents a widespread alcoholic beverage, being the first most consumed beverage per capita in Europe. Beer volatile composition has been studied based on gas chromatographic analysis, and seldom complemented by sensorial assays. Specific tools have been used for sensorial analysis, such as Beer Flavour Wheel, and more recently Beer Flavour Map, and despite their utility, scarce information about the related molecules is included. Thus, this work intended to in-depth comprehend beer aroma by mapping its volatile molecules. For this purpose, an advanced multidimensional chromatographic methodology based on headspace solid-phase microextraction (HS-SPME) combined with comprehensive two-dimensional gas chromatography with time-of-flight mass spectrometry (GC×GC-ToFMS) was developed and applied to a set of lager beers, the main produced and consumed type. This methodology allowed the detection of hundreds of compounds, from which was selected 8 chemical families: acids, alcohols, esters, monoterpenic compounds, norisoprenoids, sesquiterpenic compounds, sulfur compounds, and volatile phenols, mainly associated to raw materials' (i.e. cereals and hops) and yeasts' metabolism (Fig. 1).

Using the Beer Flavor Wheel (including 3 information levels, with exiguous chemical information) as a starting point, information about beer volatile molecules, respective aroma descriptors and origins were combined to create BeerAMA – Beer Aroma Molecular Atlas (Fig. 1). The 4th level of information, containing only data about volatile molecules, represents the most in-depth study about beer volatile composition.

BeerAMA, an easy and user-friendly tool, can be further used in industrial context, namely by brewers as a complement of sensorial analysis, to control the brewing process and product, and to evaluate the impact of the raw materials, including the new ones to produce distinctive beer styles, a recent market trend.

The best of thermally processed foods through non-enzymatic transglycosylation reactions

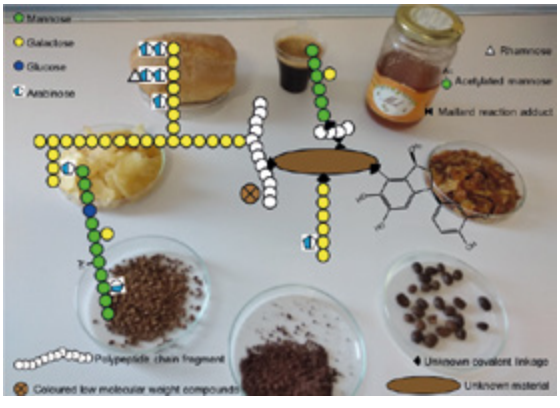
Manuel A. Coimbra[1], Ana S.P. Moreira[1], Cláudia P. Passos[1]; Sílvia Petronilho[1,2], Guido R. Lopes[1], Andreia Ferreira[1], Sónia S. Ferreira[1], Soraia P. Silva[1], Idalina Gonçalves[1,3], Joana Lopes[1,3], Ana Barra[1,3], Gonçalo Oliveira[1,3], Elisabete Coelho[1], Cláudia Nunes[1,3], Paula Ferreira[4], Sílvia M. Rocha[1], Fernando M. Nunes[2], M. Rosário M. Domingues[1]

1 — Department of Chemistry & QOPNA, University of Aveiro
2 — Department of Chemistry & CQ-VR, University of Trás-os-Montes and Alto Douro
3 — Department of Chemistry & CICECO, University of Aveiro
4 — Department of Materials and Ceramic Engineering & CICECO, University of Aveiro

The availability of nutrients and mitigation of harmful compounds are provided when foods are thermally treated, a process known as cooking, rendering their safety. This was a human civilization advance achieved 1.9 million years ago. Roasting is a thermal process that, under a low water environment, foods develop novel sensory properties, still highly appreciated nowadays. Coffee, baked, and fried foods are examples of daily-consumed thermally processed food products. Melanoidins are high molecular weight nitrogen containing compounds with the peculiar brown colour of roasted, baked, and fried foods. These have beneficial health properties and can mitigate and prevent the bioavailability of harmful pyrolysis products formed during these processes. The biological activities attributed to coffee brew melanoidins include antimicrobial, anticariogenic, anticarcinogenic, anti-inflammatory, immunostimulatory and antiglycative properties.

At the University of Aveiro, gas chromatography and mass spectrometry tools using models and real matrices of coffee roasted beans allow to disclose the chimeric melanoidins structural features and new carbohydrate-based compounds formed. These compounds have also been identified and characterized in bread crust and toasts, as well as in potato chips. The beneficial compounds produced through non-enzymatic transglycosylation reactions are at the origin of newly-formed dietary fibres and oligosaccharides with potential prebiotic effect. Honey, although not submitted to the high temperatures of roasted foods, have an acidic and low water activity medium, which for long periods favours the transglycosylation reactions that promote the formation of bioactive oligosaccharides.

Consequently, daily-consumed thermally processed food industries produce huge amounts of disposable by-products as putative sources of melanoidins prone to be used to design new food ingredients with functional properties, as well as on the development of new biodegradable polysaccharide-based packaging materials by integration of different food industry by-products, including spent coffee grounds, coffee silver skin, potato peels, and starch.



Research on Coastal Erosion Mitigation

C. Coelho[1], A. Guimarães[1], B. Marinho[1], M. Lima[1], P. Narra[1]

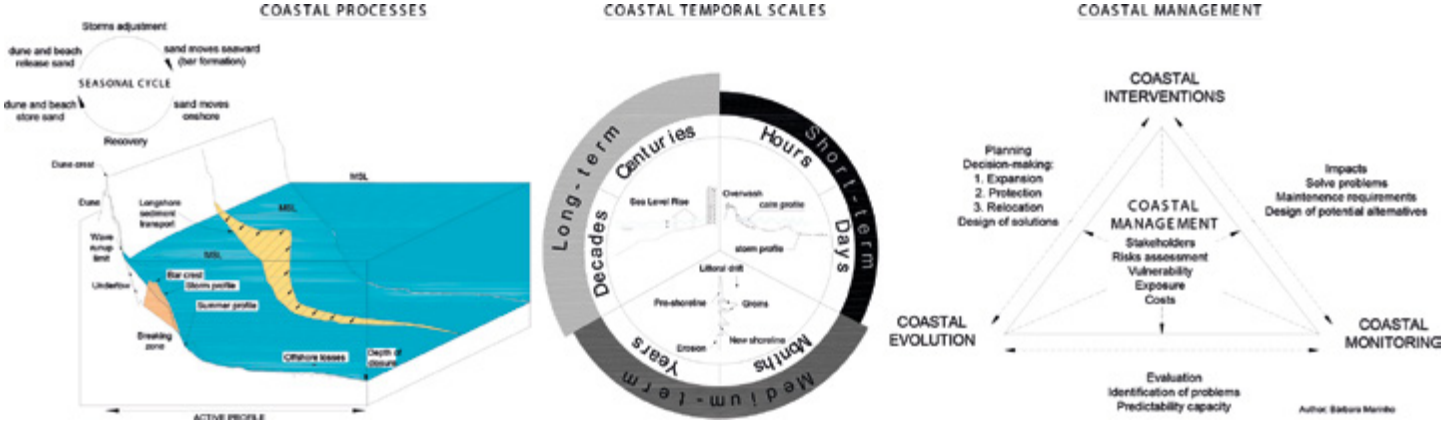
1 — Department of Civil Engineering & RISCO, University of Aveiro

Coastal zones are subjected to several maritime hazards, capable of causing coastal erosion. These zones are under high anthropogenic pressures, requiring a thoughtful management in order to protect society, economy and natural environment. Thus, research is being developed to contribute for the process of coastal management, considering the generalized coastal erosion and shoreline retreat. Therefore, several works were published in 2017 that contribute for this subject.

A GIS-based tool that aims to provide a quick assessment of coastal erosion risk was developed. The simple processes and small amount of data required by the tool provides an alternative to other methods, which are often more complex and difficult to apply. The tool provides a hierarchy of the erosion risk locations. Then, numerical modelling of the shoreline evolution in these risk areas is important to understand the complexity of the coastal processes and to support coastal zone planning and management.

Research related with different types of interventions is improving the modelling capacity. Short- and long-term coastal morphologic changes in response to artificial beach nourishment operations were investigated, contributing to the ongoing discussion about the effectiveness of nearshore nourishments, especially in context of an energetic environment. Improving the simulation capacity of the cross-shore nourishments evolution towards equilibrium was also investigated, by applying a numerical cross-shore profile evolution model.

Finally, artificial nourishment impacts based on laboratory works were also performed, at Oporto University laboratories. Two physical models were developed, with and without artificial nourishments, being compared the performance considering the longitudinal sediment transport rates. Longitudinal rocky revetments and submerged detached breakwaters performance was also discussed based on numerical tests, considering the cross-shore behavior and the impacts on the shoreline.



A mathematical model of tissue-engineered cartilage development under cyclic compressive loading

Cátia Bandeiras[1,2,3], António Completo[4]

The major challenge associated with tissue engineered cartilage is the difficulty to approximate the mechanical properties of the new tissues to the native ones. When implanted, these inferior tissues are detrimental due to cell damage and degradation of extracellular matrix. In order to increase the production of extracellular matrix and mechanical properties of the cultured tissues, mechanical stimulation in bioreactors has provided good results. Computational modelling techniques are useful to establish protocols for mechanical stimulation of tissue engineered cartilage, as well as to provide further insights on outputs not easily measurable experimentally. In this work a coupled model of solute transport and uptake, cell proliferation, extracellular matrix (ECM) synthesis and remodeling of mechanical properties accounting for the impact of mechanical loading in is presented as an advancement of a previous coupled model validated for free swelling tissue engineered cartilage cultures. Tissue engineering constructs were modeled as biphasic with a linear elastic solid and relevant intrinsic mechanical stimuli in the constructs were determined by numerical simulation for use as inputs of the coupled model. The mechanical dependent formulations were derived from a calibration and parametrization dataset and validated by comparison of normalized ratios of cell counts (Fig 1), total glycosaminoglycans (Fig 2) and collagen after 24h continuous cyclic unconfined compression from another dataset. The model successfully fit the calibration dataset and predicted the results from the validation dataset with good agreement, with average relative errors up to 3.1 and 4.3% respectively. Temporal and spatial patterns determined for other model outputs were consistent with reported studies. The results suggest that the model describes the interaction between the simultaneous factors involved in in vitro tissue engineered cartilage culture under dynamic loading. This approach could also be attractive for optimization of culture protocols, namely through the application to longer culture times and other types of mechanical stimuli.

1 — TEMA, University of Aveiro
2 — University of Lisbon
3 — Harvard Medical School, USA
4 — Department of Mechanical Engineering & TEMA, University of Aveiro

FIGURE 1
Comparison between numerical predictions and experimental averages of cell densities. Open circles – numerical averages. Open squares – experimental averages with +/- standard deviation bars. A – 5% amplitude. B – 10% amplitude.

FIGURE 2
Estimated ratio of released GAGs vs total GAGs. Blue circles – 5% amplitude. Red circles – 10% amplitude. Green circles – 15% amplitude.

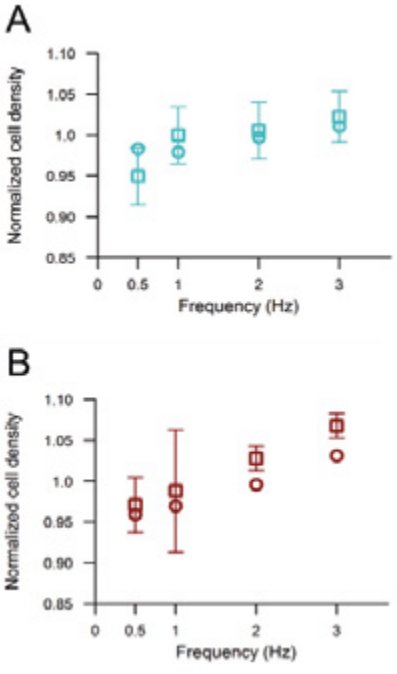


Figure 1

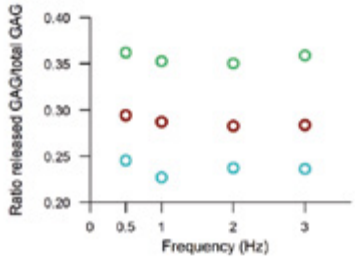


Figure 2

Incorporation of fiber Bragg sensors for shape memory polyurethanes characterization

Nélia Alberto[1,2], Maria Alexandra Fonseca[1], Victor Neto[1], Rogério Nogueira[2], Mónica Oliveira[1], Rui Moreira[1]

1 — Department of Mechanical Engineering & TEMA, University of Aveiro
2 — Instituto de Telecomunicações, Aveiro

Shape memory polymers (SMPs) are a class of smart materials which, in recent years, have been receiving special attention, due to their tremendous technological potential as actuators for biomedical applications, as well as in morphing structures, to be used in aerospace, aeronautic, and marine structural fields. SMPs can be shaped reconfigured and maintained in a transitory shape until receiving a special stimulus, for instance temperature.

The experimental characterization of the shape memory effect is usually performed using methods which are not sufficiently accurate. The development of improved measurement techniques, towards enhanced levels of accuracy and repeatability is crucial for an efficient and reliable material characterization. Due to their unique characteristics, including immunity to electromagnetic interference, compact size, high sensitivity, integration ability into other materials, multiplexing capability and real-time measurement, fiber Bragg grating (FBG)-based systems became one of the most attractive technologies for sensing applications.

FBGs sensors were embedded into shape memory polyurethanes (SMPUs), during the SMP injection process, aiming to characterize its shape memory effect. Therefore, a dedicated mold with v-shaped grooves to accommodate the optical fibers was specially designed to allow the simultaneous injection of the SMPU and embedding of the FBG sensors into the samples. With this methodology it was expected to obtain instrumented samples with an improved strain transfer between the material and the sensor, and, consequently, incrementing the measurement accuracy. The experimental setup also allowed the in situ monitoring of the injection process.

This work has shown the ability to incorporate FBGs in polymers during the injection process, which can be used not only to characterize smart materials, but also to access further details on other engineering polymers.

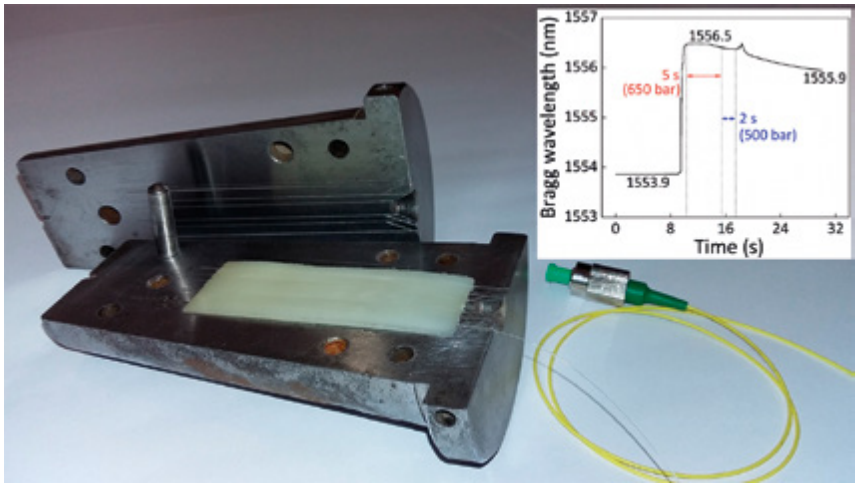


FIGURE 1
Mold cavity containing the SMPU with the embedded FBG and evolution of the Bragg wavelength along with the injection time.

Mechanical testing of micromolded plastic parts by nanoindentation

Tatiana Zhiltsova[1], Bernardo Daga[2], Patricia Frontini[2], Victor Neto[1], Mónica Oliveira[1]

Weld lines have always been an unavoidable drawback of the injection molding process. With quantities and locations inherently linked to the polymer flow pattern in the impression, weld lines, when located at the areas subjected to load in service, besides the cosmetic defects, may threaten the molded part structural integrity. This is especially true for micro molded parts, where weld line position and its severity can be seen as an indicator of the polymer fluidity as the flow front progresses away from the gate part of the micro impression. Several techniques, both, qualitative and quantitative but destructive, have been employed for assessment of the weld line tensile strength.

As an alternative, nanoindentation offers the possibility for quick quasi-non-destructive in-situ testing, allowing for monitoring the changes that occur in the surface layer of a plastic micro part. In this study, a methodology for the assessment of the superficial properties such as hardness H and reduced Young's modulus Er of micro-molded parts was established. The micro parts, molded from Polyoxymethylene with two different sets of processing conditions were tested throughout the entire length and in the vicinity of the welding line.

The observed hardness H and reduced Young's modulus Er suggest that there is a steady increase in both values along the weld line from the adjoining flow front point at the inner side of the micro part towards the outer edge. In addition, H and Er were found out to vary consistently with the alterations induced on the processing conditions. To complement this approach, the weld line severity (width) assessed by optical microscopy, indicated that the narrowest weld line width was obtained by molding with high levels of the injection velocity, mold and melt temperatures, which contribute positively for intermixing of the polymer fronts and consequently, lessen the probability of micro parts failure when subjected to mechanical solicitations.

1 — Department of Mechanical Engineering & TEMA, University of Aveiro
2 — Universidad Nacional de Mar del Plata, Argentina

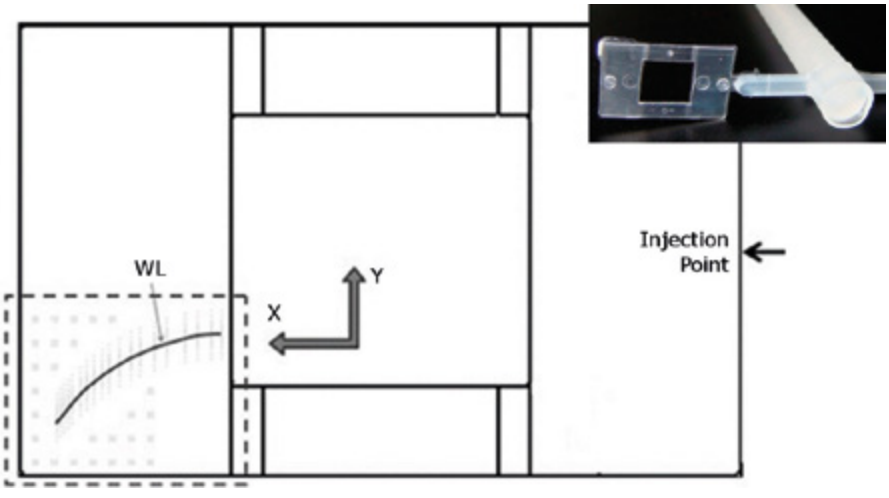


FIGURE 1
Illustration of a micromolded plastic part analyzed by nanoindentation for weld line location.


6

QUICK FACTS AND STATS

People

FACULTY BY DEPARTMENT

	FACULTY (FTE)			
	TOTAL	TOTAL	PERCENTAGE OF WOMEN	PERCENTAGE OF FOREIGNERS
UNIVERSITY	**2016**	**2017**		
Department of Biology	32,8	33,8	43%	
Department of Chemistry	45,3	44,3	53%	
Department of Civil Engineering	15,15	15,35	21%	
Department of Communication and Art	73,5	74,4	31%	4%
Department of Economics, Management and Industrial Engineering and Tourism	54	52,2	57%	4%
Department of Education and Psychology	38,4	37,8	72%	3%
Department of Electronics, Telecommunications and Informatics	78	76	8%	
Department of Environment and Planning	17	17	59%	
Department of Geosciences	13,3	13,3	38%	
Department of Languages and Cultures	43,3	42,6	51%	21%
Department of Materials Engineering and Ceramics	16	15	47%	
Department of Mathematics	56,6	56,6	45%	9%
Department of Mechanical Engineering	24,9	26,3	11%	
Department of Medical Sciences	19,8	19,8	66%	12%
Department of Physics	44,3	44,3	18%	7%
Department of Social Sciences, Policy and Planning	23,3	21,3	31%	
POLYTECHNIC SCHOOLS				
Águeda School of Technology and Management	54,7	55	44%	1%
School of Accounting and Administration of Aveiro	68,4	64,7	51%	
School of Design, Management and Production Technologies of Aveiro North	20,95	25,9	29%	2%
School of Health of the University of Aveiro	39,6	43,1	65%	
TOTAL	**779,3**	**778,75**	**41%**	**3%**

RESEARCHERS BY DEPARTMENT

	RESEARCHERS (FTE)			
DEPARTMENT	TOTAL	TOTAL	PERCENTAGE OF WOMEN	PERCENTAGE OF FOREIGNERS
UNIVERSITY	**2016**	**2017**		
Department of Biology	82	90	68%	18%
Department of Chemistry	117	130,5	64%	22%
Department of Civil Engineering	3	3	67%	
Department of Communication and Art	6	8	50%	25%
Department of Economics, Management and Industrial Engineering and Tourism	3	3	67%	
Department of Education and Psychology	16	19	95%	
Department of Electronics, Telecommunications and Informatics	17	24	33%	25%
Department of Environment and Planning	22,6	33	58%	27%
Department of Geosciences	11	9	67%	11%
Department of Languages and Cultures	1			
Department of Medical Sciences	7	11	73%	
Department of Materials Engineering and Ceramics	36,3	37,3	32%	33%
Department of Mathematics	9	7	43%	43%
Department of Mechanical Engineering	25,4	32,4	46%	66%
Department of Physics	55	75	27%	45%
Department of Social Sciences, Policy and Planning	7	19	63%	26%
School of Design, Management and Production Technologies of Aveiro North	1	2	50%	50%
School of Health of The University of Aveiro	1			
TOTAL	**420,3**	**503,2**	**54%**	**28%**

STAFF BY CATEGORY

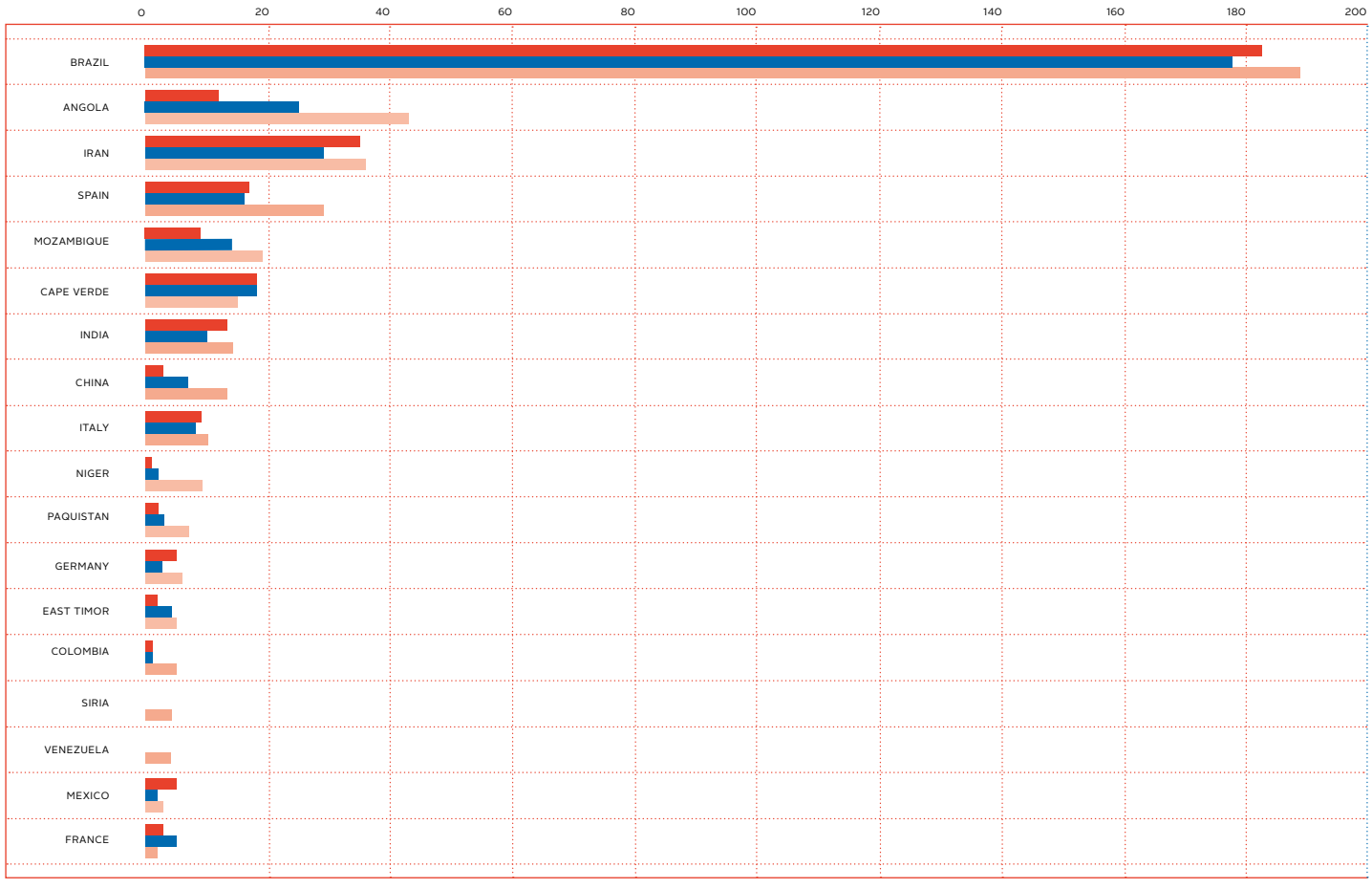
	FACULTY (FTE)			
CATEGORY	**2016**	**2017**		
UNIVERSITY	**TOTAL**	**TOTAL**	**PERCENTAGE OF WOMEN**	**PERCENTAGE OF FOREIGNERS**
Full professors	56,9	54,5	12%	4%
Associated professors	122,3	121	39%	2%
Assistant professors	377,2	378,4	44%	4%
Lecturers	22,95	19,55	56%	
Other teaching staff	16,3	16,6	76%	42%
Researchers	92,3	120,2	38%	31%
Post-doctoral fellows	328	383	60%	27%
POLYTECHNIC SCHOOLS				
Coordinator professors	13,9	12,9	31%	
Adjunt professors	117,6	125,4	51%	1%
Lecturers	52,15	50,4	51%	
TOTAL	**1199,6**	**1281,95**	**47%**	**13%**

PhD STUDENTS BY DEPARTMENT

		PhD STUDENTS			
UNIVERSITY	**TOTAL**	**TOTAL**	**PERCENTAGE OF WOMEN**	**PERCENTAGE OF FOREIGNERS**	**PERCENTAGE OF NEW STUDENTS**
DEPARTMENT	**2015/2016**	**2016/2017**			
Department of Biology	166	173	67%	27%	20%
Department of Chemistry	114	122	73%	17%	21%
Department of Civil Engineering	51	50	18%	42%	20%
Department of Communication and Art	214	242	49%	47%	33%
Department of Economics, Management and Industrial Engineering and Tourism	173	178	47%	38%	26%
Department of Education and Psychology	219	244	73%	34%	30%
Department of Electronics, Telecommunications and Informatics	111	100	18%	36%	27%
Department of Environment and Planning	74	83	47%	43%	34%
Department of Geosciences	11	8	75%	50%	0%
Department of Languages and Cultures	46	50	72%	38%	26%
Department of Materials Engineering and Ceramics	74	75	39%	39%	27%
Department of Mathematics	26	22	68%	14%	14%
Department of Mechanical Engineering	78	65	46%	25%	14%
Department of Medical Sciences	28	48	73%	4%	21%
Department of Physics	83	91	34%	19%	36%
Department of Social Sciences, Policy and Planning	41	62	44%	39%	50%
TOTAL*	**1316**	**1377**	**54%**	**33%**	**28%**

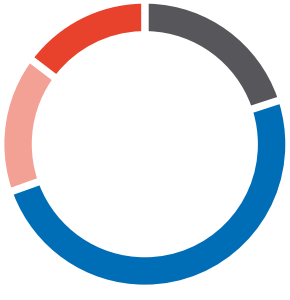
* The students of joint doctoral studies are considered in each participating department. Therefore, the sum of the students by department is superior to the total.

FOREIGN PhD STUDENTS BY NATIONALITY



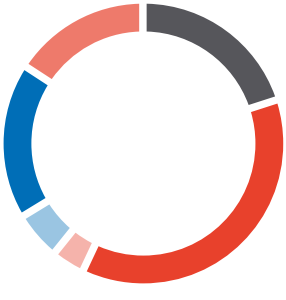
MSc and PhD theses

FOREIGN PhD STUDENTS BY CONTINENT



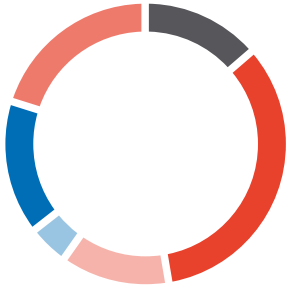
- Europe (14%)
- Africa (22%)
- Asia (19%)
- America (45%)

MSc THESES IN 2017 PER AREA



- Arts and Humanities (20%)
- Social Sciences (16%)
- Exact Sciences (3%)
- Health Sciences (6%)
- Life Sciences (18%)
- Engineering and Technology (37%)

PhD THESES IN 2017 PER AREA



- Arts and Humanities (14%)
- Social Sciences (20%)
- Exact Sciences (12%)
- Health Sciences (5%)
- Life Sciences (15%)
- Engineering and Technology (34%)

Sci Papers

TOP 10 SUBJECT AREAS FOR PAPERS PUBLISHED IN 2017	RECORD COUNT	% OF 2117
ENVIRONMENTAL SCIENCES	199	9.40%
MATERIALS SCIENCE MULTIDISCIPLINARY	172	8.12%
ENGINEERING ELECTRICAL ELECTRONIC	151	7.13%
CHEMISTRY PHYSICAL	122	5.76%
CHEMISTRY MULTIDISCIPLINARY	108	5.10%
PHYSICS APPLIED	108	5.10%
TELECOMMUNICATIONS	93	4.39%
MATHEMATICS APPLIED	73	3.45%
OPTICS	72	3.40%
EDUCATION EDUCATIONAL RESEARCH	64	3.02%

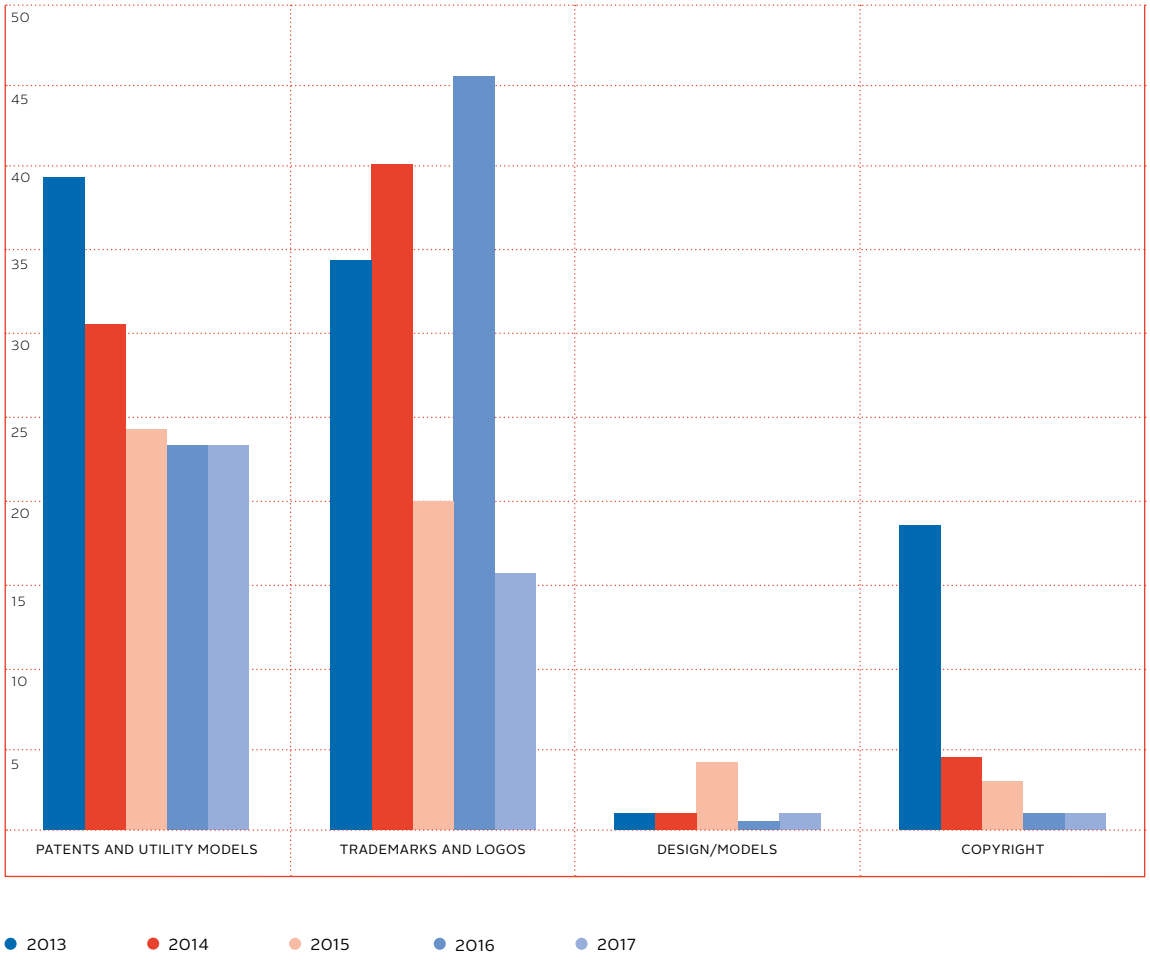
Data retrieved from ISI Web of Knowledge SM (Thomson Reuters) in 8 November 2018

TOP 10 CITED PAPERS	TOTAL Nº CITATIONS (2013 – 2017)
Klionsky, DJ; Abdelmohsen, K; Abe, A; Abedin, MJ; Abeliovich, H; Arozena, AA; et al (2016). Guidelines for the use and interpretation of assays for monitoring autophagy (3rd edition). Autophagy, 12: 1-222	848
Gomes, AP; Price, NL; Ling, AJY; Moslehi, JJ; Montgomery, MK; Rajman, L; et al (2013). Declining NAD(+) Induces a Pseudohypoxic State Disrupting Nuclear-Mitochondrial Communication during Aging. Cell, 155: 1624-1638	330
Antognini, A; Nez, F; Schuhmann, K; Amaro, FD; Biraben, F; Cardoso, JMR; et al (2013). Proton Structure from the Measurement of 2S-2P Transition Frequencies of Muonic Hydrogen. Science, 339: 417-420	299
Hubbard, BP; Gomes, AP; Dai, H; Li, J; Case, AW; Considine, T; et al (2013). Evidence for a Common Mechanism of SIRT1 Regulation by Allosteric Activators. Science, 339: 1216-1219	304
Berti, E; Barausse, E; Cardoso, V; Gualtieri, L; Pani, P; Sperhake, U; et al (2015). Testing general relativity with present and future astrophysical observations. Classical and Quantum Gravity, 32, Article Number: 243001	206
Oh, MH; Yu, T; Yu, SH; Lim, B; Ko, KT; Willinger, MG; et al (2013). Galvanic Replacement Reactions in Metal Oxide Nanocrystals. Science, 340: 964-968	229
Herdeiro, CAR; Radu, E (2013). Kerr Black Holes with Scalar Hair. Physical Review Letters, 112, Article Number: 221101	213
Phillips, AJL; Alves, A; Abdollahzadeh, J; Slippers, B; Wingfield, MJ; Groenewald, JZ; et al (2013). The Botryosphaeriaceae: genera and species known from culture. Studies in Mycology, 76: 51-167	199
Silva, P; Vilela, SMF; Tome, JPC; Paz, FAA (2015). Multifunctional metal-organic frameworks: from academia to industrial applications. Chemical Society Reviews, 44: 6774-6803	158
Vilela, C; Sousa, AF; Fonseca, AC; Serra, AC; Coelho, JFJ; Freire, CSR; et al (2014). The quest for sustainable polyesters – insights into the future. Polymer Chemistry, 5: 3119-3141	147

Intellectual Property

INTELLECTUAL PROPERTY RIGHTS REGISTRATION

	2013	2014	2015	2016	2017
Patents and Utility Models	39	32	24	23	23
Trademarks and Logos	34	40	20	46	17
Design/Models	1	1	4	1	2
Copyright	18	4	3	2	2



International Projects

EU-FUNDED PROJECTS STARTED IN 2017

HORIZON 2020 – PROJECTS COORDINATED BY UA	ACRONYM	PROJECT COORDINATOR
Fundamental fields and compact objects: theory and astrophysical phenomenology	FunFiCO	Carlos Herdeiro

HORIZON 2020 – MONOBENEFICIARY PROJECTS	ACRONYM	LOCAL COORDINATOR
Toxicity of anthropogenic multi-stressed soils under a global warming perspective	GLOBALTOX	Susana Loureiro
Thermometry and Photoacoustic – Imaging Outstanding Nanoprobes	TEMPTATION	Luís Carlos

HORIZON 2020	ACRONYM	PROJECT COORDINATOR
GENetic diversity exploitation for Innovative macro-ALGal biorefinery	GENIALG	Rosário Domingues
Implementation of the Discoveries Centre for Regenerative and Precision Medicine, a new Centre of Excellence in Portugal	DISCOVERIES	Odete Cruz e Silva
New Market Niches for the Pulp and Paper Industry Waste based on Circular Economy Approaches	PAPERCHAIN	Victor Ferreira
Urban Nature Labs	UNALAB	Peter Roebeling
Development of New Methodologies for Industrial CO2 – Free Stell Production by Eletrowinning	SIDERWIN	Jorge Frade
BIOmaterial RIsk MAnagement	BIORIMA	Mónica Amorim
Transition metal oxides with metastable phases: a way towards superior ferroic properties	TRANSFERR	Andrei Kholkine

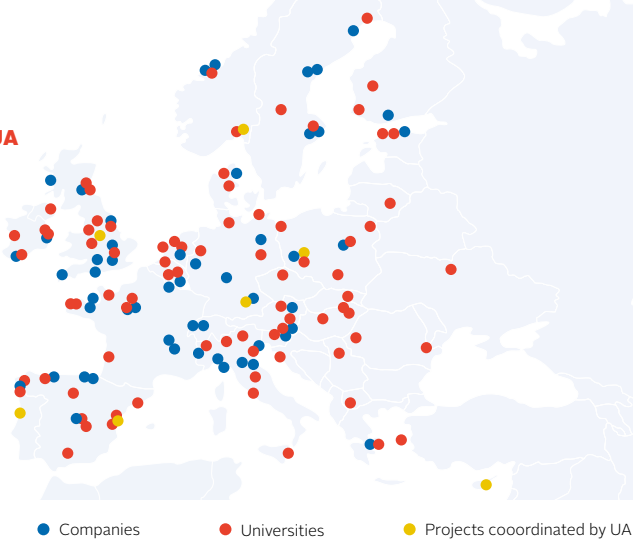
EUROPEAN MARITIME AND FISHERIES FUND	ACRONYM	LOCAL COORDINATOR
Supporting Implementation of Maritime Spatial Planning in the Northern European Atlantic	SIMNORAT	Fátima Alves

RESEARCH FUND FOR COAL AND STEEL	ACRONYM	LOCAL COORDINATOR
Temperature assessment of a vertical steel member subjected to localised fire – Valorisation	LOCAFIplus	Paulo Vila Real

ERASMUS +	ACRONYM	LOCAL COORDINATOR
Knowledge Alliance on Product -Service Development Towards Circular Economy and Sustainability in Higher Education.	KATCH	Teresa Franqueira
Future-proof your classroom: teaching skills 2030		Elisabeth Kastenholz
Academic Business Coach – Meles 2.0	ABC – Meles 2.0	Tatiana Cordeiro
Managing Cultural Heritage in Tourism	E-Cul-Tours	Elisabeth Kastenholz
Autonomous ENglish language learning aimed at people with different ABILITIES	EN-ABILITIES	Jaime Ribeiro
Technical Innovation in Blended Learning	TIBL	Maria João Loureiro
Refining Higher Apprenticeships with enterprises in Europe	ApprEnt	Lucília Santos
Sustainable Quality Enhancement in Higher Education Learning and Teaching. Integrative Core Dataset and Performance Data Analytics.	SQELT	M João Pires da Rosa
Promoting inclusion and a STEM curriculum in schools through the use of tangible programming concepts and activities.	TANGIN	Isabel Cabrita
Lire en Europe Aujourd'hui	LEA	Maria Herminia Laurel

INTERREG ATLANTIC AREA	ACRONYM	LOCAL COORDINATOR
Co-Operation for Restoring CocKle SheLlfisheries & its Ecosystem-Services in the Atlantic Area (AA)	COCKLES	Rosa Freitas
Octopus, Squid, Cuttlefish, Sustainable Fisheries and Chefs	CephsandChefs	Cristina Pita

NETWORK OF EUROPEAN UNIVERSITIES AND COMPANIES WORKING WITH UA IN EU PROJECTS STARTED IN 2017



● Companies ● Universities ● Projects cooordinated by UA

AUSTRIA (KATCH, FUTURE, TIBL, APPRENT, SQELT, BIORIMA)
BELGIUM (E-CUL-TOURS, APPRENT, SQELT, LOCAFLPLUS, UNALAB, SIDERWIN, BIORIMA)
BULGARIA (TANGIN)
CHECK REPUBLIC (LOCAFLPLUS, UNALAB)
CROATIA (FUTURE)
CYPRUS (BIOFOODPACK)
DENMARK (KATCH, BIORIMA)
ESTONIA (LOCAFLPLUS, APPRENT)
FINLAND (APPRENT, LOCAFLPLUS, UNALAB)
FRANCE (APPRENT, PERCEBES, SIMNORAT, LOCAFLPLUS, GENIALG, UNALAB, PAPERCHAIN, SIDERWIN, BIORIMA,COCKLES, CEPHS AND CHEFS)
GERMANY (ABC-MELES 2.0, E-CUL-TOURS, SQUELT, LOCAFLPLUS, TEMPTATION, UNALAB, BIORIMA)
GREECE (ABC-MELES 2.0, SIDERWIN, BIORIMA)
HUNGRY (FUTURE, LOCAFLPLUS, LEA)
IRLAND (ABILITIES, GENIALG, BIORIMA, COCKLES, CEPHS AND CHEFS)
ITALY (FUTURE, E-CUL-TOURS, TIBL, APPRENT, LOCAFLPLUS, UNALAB, BIORIMA)
LATVIA (TANGIN)
LITHUANIA (TRANSFERR)
LUXEMBOURG (LOCAFLPLUS)
MACEDONIA (FUTURE)
NETHERLANDS(SQELT, LOCAFLPLUS, GENIALG, UNALAB, BIORIMA)
NORWAY (SQELT, BLUETEETH, MOCO3, GENIALG, UNALAB, SIDERWIN)
POLAND (ABC-MELES 2.0, SQELT, MOCO3, BIOFOODPACK, LOCAFLPLUS, TRANSFERR)
PORTUGAL (COORDINATED BY UA – BIOFOODPACK, BLUETEETH, FUNFICO)
ROMANIA (ABILITIES, LOCAFLPLUS)
SERBIA (ABILITIES)
SLOVAKIA (LOCAFLPLUS)
SLOVENIA (FUTURE, LOCAFLPLUS, PAPERCHAIN)
SPAIN (KATCH, FUTURE, ABILITIES, TIBL, APPRENT, TANGIN, PERCEBES, SIMNORAT, LOCAFLPLUS, PAPERCHAIN, UNALAB, SIDERWIN, BIORIMA,FUNFICO, COCKLES, CEPHS AND CHEFS)
SWEDEN (E-CUL-TOURS, TIBL, LOCAFLPLUS, PAPERCHAIN)
SWITZERLAND (SIDERWIN, BIORIMA)
TURKEY (UNALAB)
UKRAINE (TRANSFERR)
UNITED KINGDOM (SQELT, LOCAFLPLUS, GENIALG, THE DISCOVERIES CTR, BIORIMA, FUNFICO, CEPHS AND CHEFS)

Budget

TOTAL BUDGET OF THE PROJECTS STARTED IN 2017 BY RESEARCH CENTRES AND FUNDING AGENCY*

RESEARCH CENTRE	CCDRC	EUROPEAN UNION	FCT	ANI	AICEP	OTHER NATIONAL	2016	2017
CESAM	1.198.543	1.916.778	1.103.241			3.365.174	4.807.028	7.583.737
CIC.DIGITAL				367.401			340.506	367.401
CICECO	2.398.401	1.004.738	2.826.982	194.875			8.601.399	6.424.995
CIDMA		111.310	516.915				211.550	628.225
CIDTFF		119.802					569.322	119.802
CIPES		41.308						41.308
CLLC		20.465						20.465
GEOBIOTEC			72.201				111.640	72.201
GOVCOPP	1.192.920	77.742					1.553.916	1.270.662
I3N			46.068				1.510.234	46.068
IBIMED	1.598.206	1.001.138	2.005.396				1.672.005	4.604.740
ID+		74.861					0	74.861
IEETA	1.197.274		498.823	407.045			954.163	2.103.142
INET-MD							389.964	0
IT		1.454.675	4.053.815	1.032.558			2.835.439	6.541.048
NOT INTEGRATED*	573.291		288.338		8.568.781	2.860.420	3.552.077	12.290.830
QOPNA		597.816	798.231	838.074		278.078	1.023.420	2.512.198
RISCO		39.691					616.525	39.691
TEMA			1.659.611	202.911			1.017.271	1.862.521
TOTAL	**8.158.636**	**6.460.323**	**13.869.620**	**3.042.863**	**8.568.781**	**6.503.673**	**29.766.458**	**46.603.897**

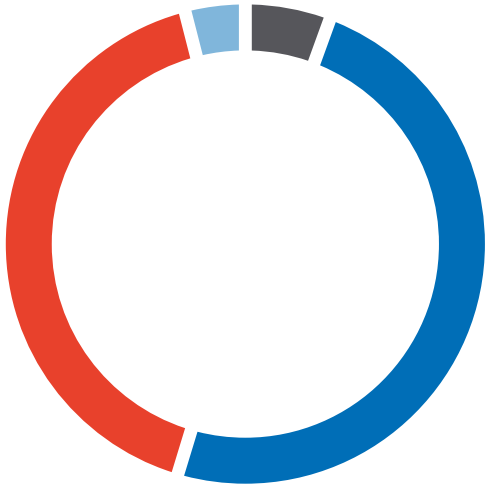
*Contracts with industry and multiannual budget of research centres not included *Projects not integrated in research centres *in Euros

APPROVED BUDGET UNDER EU-FUNDED PROJECTS*

EUROPEAN PROGRAMMES	2016	2017
H2020 – ERC ADG	2.438.987	
H2020 – TEAMING		1.001.138
H2020 – TWINNING	203.718	
H2020 -FETOPEN	244.250	
H2020 – ITN-ETN	476.713	1.133.425
H2020 – RISE	58.500	207.000
H2020 – IF		356.395
H2020 – NMP	691.150	
H2020 – NMBP		188.876
H2020 – EEB	289.250	
H2020 – ICT	237.563	321.250
H2020 – ECSEL	583.750	
H2020 – SC5	566.586	
H2020 – SCC		484.900
H2020 – SPIRE		246.655
H2020 – BG		597.816
H2020 – CIRC		419.823
ERASMUS +	451.130	368.987
LIFE+	1.138.876	
INTERREG EUROPE	383.555	
INTERREG SUDOE	634.626	
INTERREG ATLANTIC AREA		826.759
EDA	102.250	
EMFF		267.607
RFSC		39.691
TOTAL	**8.500.904**	**6.460.323**

*in Euros

DISTRIBUTION OF RECEIVED FUNDS, BY FUNDING AGENCY*



* Contracts with industry and multiannual budget of research centres not included

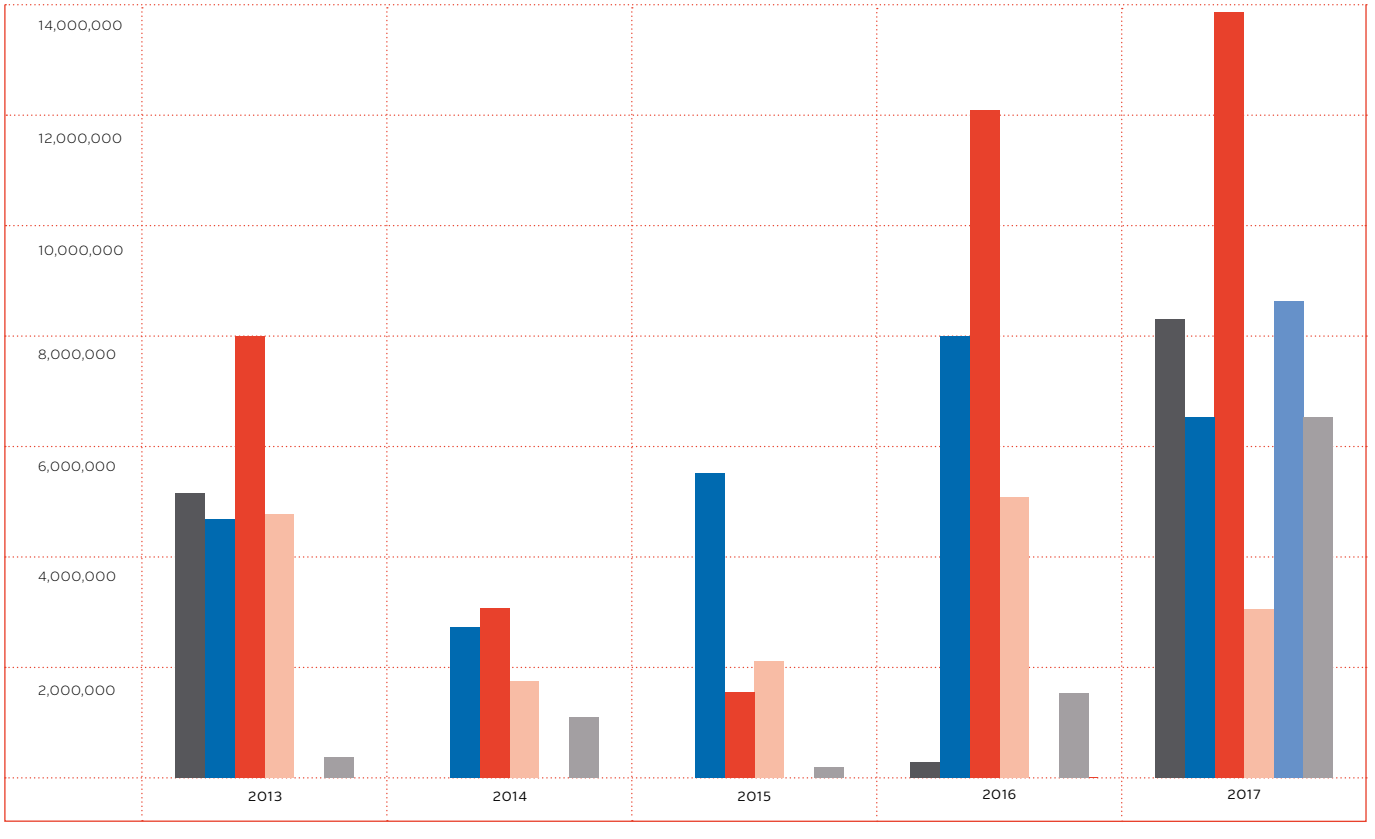
APPROVED BUDGET UNDER FCT PROJECTS*

RESEARCH CENTRE	ARTS, HUMANITIES AND SOCIAL SCIENCES	ENGINEERING	SCIENCES	2016	2017
CESAM			1.103.241	3.293.916	1.103.241
CIC.DIGITAL				110.712	
CICECO			2.826.982	3.152.486	2.826.982
CIDMA			516.915	74.960	516.915
CIDTFF				262.601	
GEOBIOTEC			72.201	11.640	72.201
GOVCOPP				923.228	
I3N			46.068	258.941	46.068
IBIMED			2.005.396	1.672.005	2.005.396
IEETA		498.823		743.514	498.823
INET-MD				334.039	
IT		4.053.815		1.327.186	4.053.815
NOT INTEGRATED*	122.837	165.501			288.338
QOPNA			798.231	614.965	798.231
RISCO				132.189	
TEMA		1.659.611		466.990	1.659.611
TOTAL	**122.837**	**6.377.749**	**7.369.034**	**13.379.372**	**13.869.620**

*in Euros

*Projects not integrated in research centres

TOTAL BUDGET OF THE PROJECTS STARTED PER YEAR AND FUNDING AGENCY*



* Contracts with industry and multiannual budget of research centres not included


7

RESEARCH SUPPORT

Support for researchers

The University of Aveiro is continuously working to become one of the foremost research organizations in Europe and a major player in the construction of the European Research Area. Therefore, it strongly encourages its researchers to create ties with their colleagues in Portugal and in other countries, by responding jointly to calls for proposals for national and international funding programs, having in place a dedicated office to support those activities.

The Research Support Office (RSO) is constituted by a team of 3 officers, Luísa Sal, Tatiana Costa and Vera Fernandes, led by Artur Silva, Vice-rector for Research, Innovation and 3rd Cycle.

It provides support to research activity across all disciplines at the University, assisting UA research community in its efforts to secure external funding (regional, national, international, awards and prizes) by providing high quality administrative, technical, contracting and financial services (Pre-Award phase, budget evaluation and validation) to ensure proper management of those funds and to minimize the risk to university resources.

RSO work splits across a number of core activities:
1) research development – working with faculty and researchers to identify funding opportunities and bring together interdisciplinary groups of researchers with common interests; dissemination of funding information and partnership opportunities, as well as training in applying for grants;
2) strategy support and implementation – including support and coordination strategic activities/projects and technical and interface support to the Coordination of Research Units and Associated Laboratories of the UA;
3) research grants and contracts – provision of advice on costing and submission of grant applications and University authorization for submission, responsibility for negotiating contract terms with funders and collaboration agreements with other HEIs and public sector collaborators.

RSO works closely with colleagues in Financial Management and Human Resources (sGFRH), Technology Transfer Office (UATEC) and Juridical Support team.

Research Support Office
www.ua.pt/research
research@ua.pt

universidade de aveiro theoria poiesis praxis

www.ua.pt/research

Universidade de Aveiro
Campus Universitário de Santiago
3810 - 193 Aveiro
Portugal

tel (+351) 234 370 200
fax (+351) 234 370 985
email research@ua.pt