research@ua

2016

universidade de aveiro theoria poiesis praxis

title
research@ua

edition and property
Universidade de Aveiro
Campus Universitário de Santiago
3810-193 Aveiro
Portugal

phone [+ 351] 234 372 571
fax [+ 351] 234 370 004

june 2017
Published annually

edition
Research Support Office

design and output
Serviços de Comunicação, Imagem e Relações Públicas

Cover image
Susana Loureiro, CESAM

Image credits
CESAM, TEMA and SCIRP

printing / print run
Orgal
3 000 copies

issn
2182 - 9357

Depósito Legal
393132/15

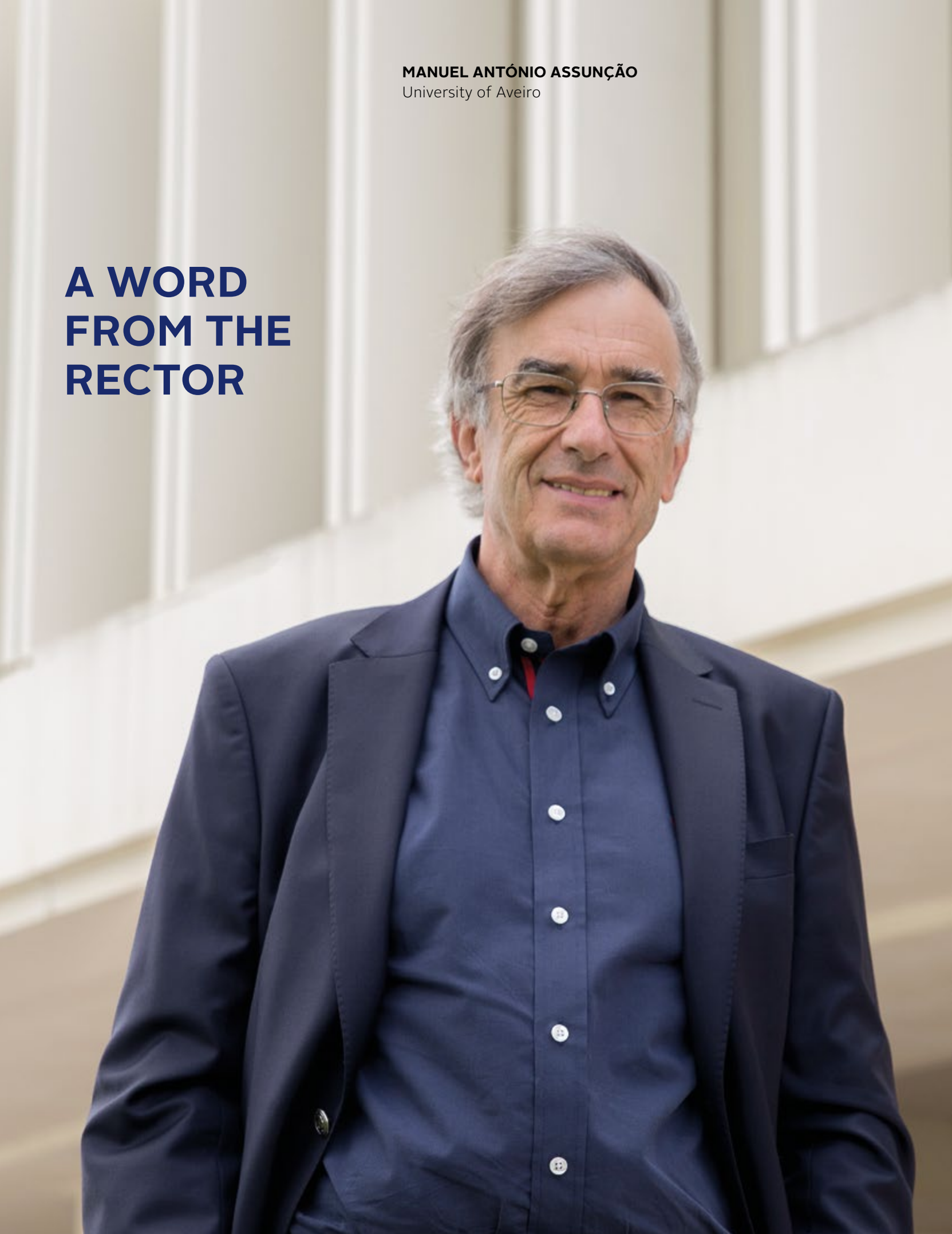
5

7

6

MANUEL ANTÓNIO ASSUNÇÃO
University of Aveiro

A WORD FROM THE RECTOR



" Sustainability is a keyword to address contemporary complex and threatening environmental, socio-economic and institutional issues essential for the well-being and future of humans and other species.

All societal actors must contribute to sustainable development widely, but universities must play here a major role. The opportunity to create a culture of sustainability for today's students and tomorrow's leaders should trigger the universities of the future, such as the University of Aveiro, to assume a moral and institutional responsibility in order to contribute to a better tomorrow."

JOSÉ FERNANDO MENDES
University of Aveiro

A WORD FROM THE VICE-RECTOR - 2016 IN REVIEW AND BEYOND

Throughout the years, UA has been able to anticipate and adapt to societal challenges, consistent with its mission and strategic vision. UA has sought to be innovative and pioneering, aspects that echoe in the high quality of the education it provides, the research it develops and its liaison with the society. Its matrix organizational structure and the strong emphasis it has given to the relationship with the region are also innovative. These factors have proved to be crucial in the growth and development of UA over the years and the 2016 achievements revealed it again.

2016 was a fruitful year in terms of big strategic projects for UA, namely those that reinforce the university's role and relationship with the Centro region. Six 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) were approved. These will start in mid-2017 and will have profound impact in terms of attraction and fixation of highly skilled researchers. International collaboration has been a fundamental aspect to advance and maintain UA visibility and success. The research support office (RSO) kept working on helping researchers in the preparation/submission of applications and on screening and scanning national and international calls of interest for UA researchers. Due to their outstanding role in recruiting doctoral students and researchers of international merit, Marie Curie actions also deserved special attention from the RSO. This is also related to the work of the Doctoral School (EDUA). Bearing in mind the need to constantly adapt to the challenges imposed by the new policies and dynamics of markets and society, its activity focused on stimulating policies for the promotion of doctoral courses better suited to today's societal challenges.

For its dimension and strategic importance, I must highlight the TEAMING – "The Discoveries Center for Regenerative and Precision Medicine", approved in 2016. Led by the University of Minho, it is a partnership between University College London, University of Porto, University of Aveiro, University of Lisbon and New University of Lisbon. The Aveiro campus will be an asset to UA and to the region, as it will allow networking in the areas of regenerative and precision medicine with institutions of reference at national and international level, namely with the University College London and with the hospitals in the region. Also, it will strength the competences already installed in the research units (RU) oriented to these scientific areas. A relevant role in the development of the teaching component in the area of medicine, which is one of the future challenges of UA, is also envisaged.

The next year will be challenging for our RU, with the upcoming evaluation period which will require a reflection on the partners to be involved, the scientific areas and the guidelines to follow, promoting, where appropriate, their reorganization, by reorienting research to new interdisciplinary areas, making them more competitive and aligned with regional, national, european and international funding policies. There is also the constant need to strengthen existing areas, interconnecting, whenever possible, research in the social and human sciences and arts with research in engineering, natural sciences and health sciences, taking advantage of the UA matrix structure. Furthermore, it is imperative to continue monitoring and guiding the restructuration plans which are under implementation, in order to overcome, in the next evaluation process, the less positive classifications.

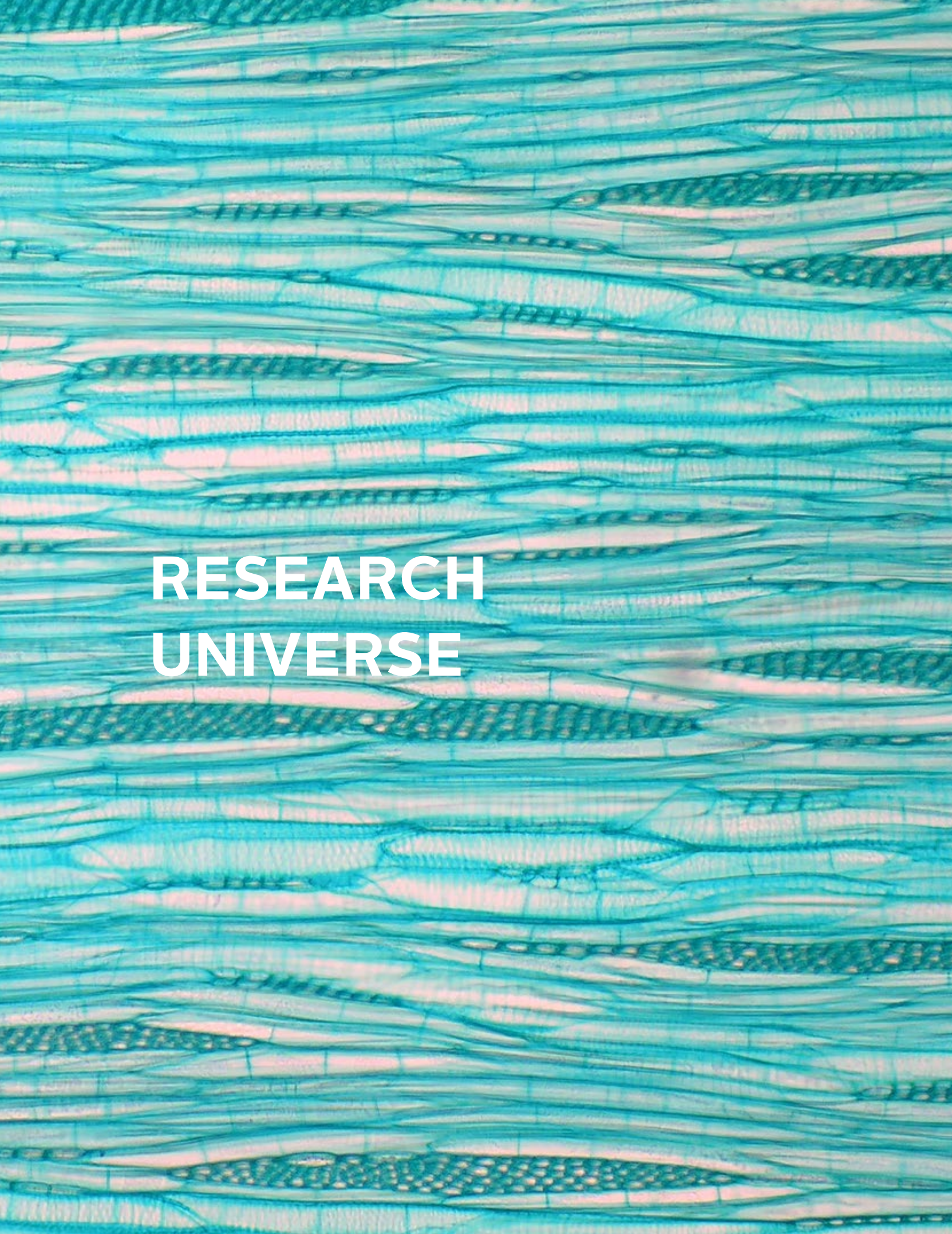
By reinforcing the capacity of the R&D of the RUs, namely in terms of equipment and staff, I must highlight the participation of UA in 9 research infrastructures identified by FCT. These will work in network, with different nodes along the country, maximizing resources and potentiating collaborations.

The consolidation of the path that UA has been pursuing is also reflected in the results obtained in the world rankings, namely Times Higher Education ranking (2016-2017) (456th position worldwide; 2nd best position at the national level). Equally revealing of the excellence of the research carried out in UA are the results of the 4th edition of the FCT Researcher call with 22 researchers funded (3rd national position).

People make the difference and these new researchers are the face of renewal. In line, UA is already setting up its internal recruitment program that foresees the opening of at least 10 researcher posts by the end of 2017. Also, the proposed national scientific employment strategy and the approval of DL.57 imply major changes both for UA and for the academic community and its implementation should be carefully monitored.

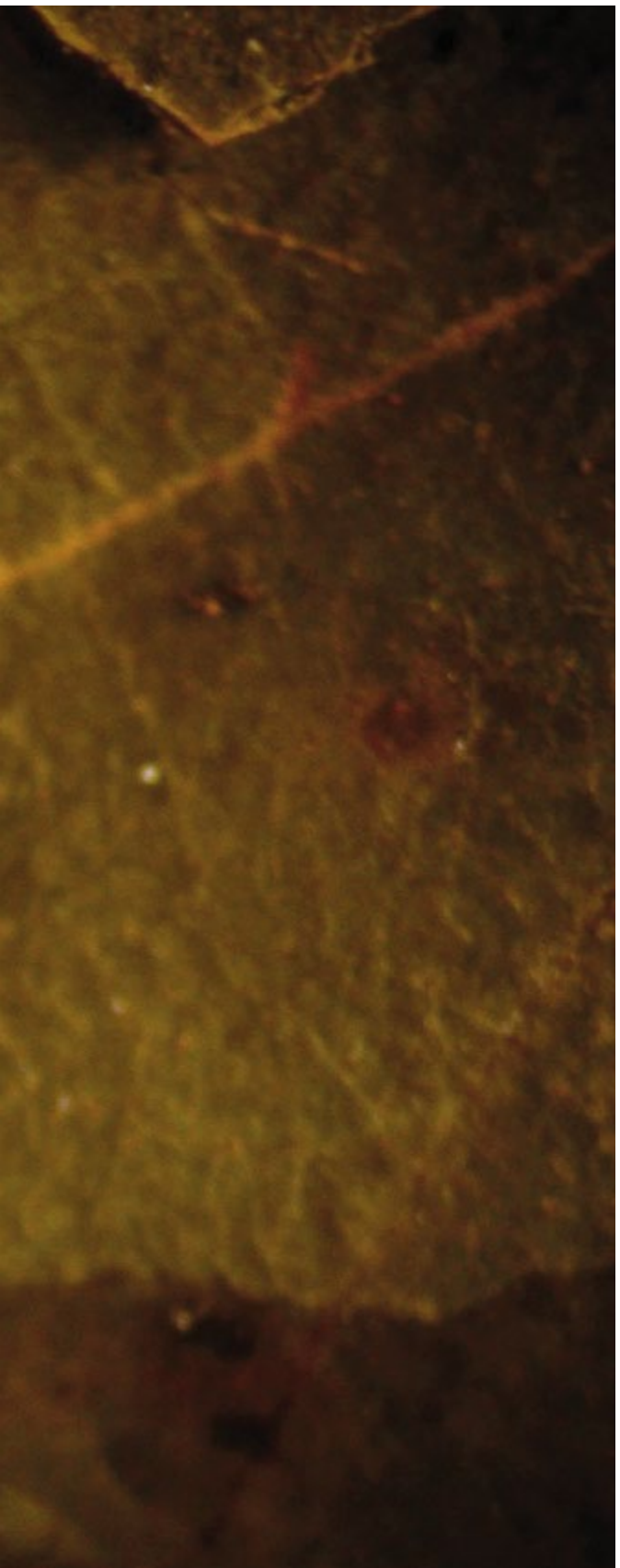
The contemporary challenges require a full response in terms of scientific innovation. It is hoped that scientific research, carried out in different areas and branches of knowledge, will have repercussions on the lives of individuals and on the social and cultural dynamics of communities, in a logic of strengthening ties and relations between Science, Innovation, Art and society. UA will keep working on that direction as we want to do more and better.


3



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, 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 interdisciplinary research-oriented strategy. High-level researchers, postdoc 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. The existence of 19 research centres, from which 7 are poles, sharing infrastructures and know-how at the campus fortifies this reality of a multidisciplinary and collaborative research environment.

Research centres at the campus

CESAM – Centre for Environmental and Marine Studies
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
Unit coordinator: Ana Lillebo
http://www.cesam.ua.pt/

CIC.DIGITAL – Center for Research in Communication, Information and Digital Culture
Research areas: Media and Technology, Society, Culture and Arts, Information and Communication
Pole coordinator: Fernando Ramos
http://www.cicdigital.org/

CICECO – Aveiro Institute of Materials
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
Unit coordinator: João Rocha
http://www.ciceco.ua.pt/

CIDMA – Center for Research and Development in Mathematics and Applications
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
Unit coordinator: Luís Castro
http://cidma.mat.ua.pt/ma/home.php

CIDTFF – Research Centre for Didatics and Technology in Teacher Education
Research areas: Education, Didatics, Supervision, Evaluation, Society and Training
Unit coordinator: Helena Araújo e Sá
https://www.ua.pt/cidtff/

CLLC - Centre for Languages, Literatures and Cultures
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)
Unit coordinator: Teresa Cortez
https://www.ua.pt/cllc/

CINTESIS – Center for Health Technology and Services Research
Research areas: Clinical & Health Services Research, Ageing & Neurosciences Research, Diagnosis, Disease & Therapeutics Research and Data & Methods Research
Pole coordinator: Carlos Silva
http://www.cintesis.eu/

CIPES - Center for Research in Higher Education Policies
Research areas: Higher Education, System Level Policies, Institutional and Organisational Analysis and Resources, Performance and Human Capital
Pole coordinator: Teresa Carvalho
http://www.ua.pt/cipes/

GEOBIOTEC – GeoBioSciences, GeoTechnologies and GeoEngineering
Research areas: Lithospheric Evolution, Complex Environmental Systems, Georessources, Geotechnics and Geomaterials
Unit coordinator: Fernando Rocha
http://www.ua.pt/geo/PageText.aspx?id=17534

GOVCOPP – Governance, Competitiveness and Public Policies
Research areas: Public Policies, Competitiveness, Local and Regional Innovation Systems, Territory, Development and Tourism
Unit coordinator: Eduardo Castro
http://www.ua.pt/govcopp/

IBIMED – Institute of Biomedicine
Research areas: Human Ageing, Protein Aggregation, Epigenome, Ageing Related Diseases, Systems Biomedicine, Clinical Studies
Unit coordinator: Manuel Santos
http://www.ua.pt/ibimed/

Research Institute for Design, Media and Culture [ID+]
Research areas: Design, Art, Media and Culture
Unit coordinator: Vasco Branco
http://www.idmais.org/pt-pt/

IEETA – Institute of Electronics and Informatics Engineering of Aveiro
Research area: Information Processing, Information Systems, Biomedical Informatics, Biomedical Tecnologies, Intelligent Robotics, Intelligent Systems
Unit coordinator: Armando Pinho
www.ieeta.pt/

INET-Md – Institute of Ethnomusicology - Research Centre on Music and Dance
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
Pole coordinator: Susana Sardo
http://www.fcsh.unl.pt/inet/

I3N – FSCOSD – Institute for Nanostructures, Nanomodelling and Nanofabrication – Physics of Semicondutors, Optoelectronics and Disordered Systems
Research areas: Modelling of Materials Behaviour, Nanofabrication and Micro-technologies, Nano and Microstructured Polymer-based Systems and Physical Characterization of Self-Assembled Nanostructures
Pole coordinator: Armando Neves
http://www.i3n.org/

IT – Telecommunications Institute
Research areas: Wireless Communications, Optical Communications, Networks and Multimedia and Basic Sciences and Enabling Technologies
Pole coordinator: José Neves
http://www.it.pt/

QOPNA – Organic Chemistry, Natural Products and Agro-food Stuffs
Research areas: Organic Chemistry, Natural Products, Food Science /Biochemistry and Mass Spectometry
Unit coordinator: José Cavaleiro
https://www.ua.pt/qopna/

RISCO – Aveiro Research Centre of Risks and Sustainability in Construction
Research areas: Risks in the Built Environment, Construction Sustainability, Built Heritage Conservation and Restoration
Unit coordinator: Paulo Cachim
http://www.ua.pt/risco/

TEMA – Centre for Mechanical Technology and Automation
Research areas: Advanced Mechanical Engineering and Fracture Mechanics, Applied Energy, Biomechanics, Nanoengineering, Transportation Technology and Simulation Software Research and Development
Unit coordinator: António Bastos
https://www.ua.pt/tema/

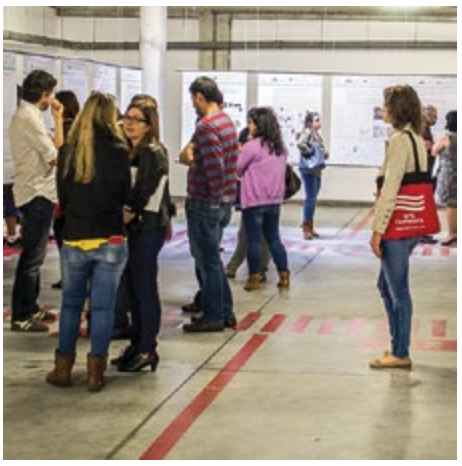

4

SPOTLIGHT ON RESEARCH DISSEMINATION

Research Day 2016

The Research Day@UA was first launched in 2011 and is a one-day event celebrating the University of Aveiro's research achievements, as well as an opportunity to foster the interdisciplinary sharing of good practice in research and a vehicle for promoting effective collaboration among researchers, departments and research units.
Last year's edition was held on June 15th and was dedicated to Human-oriented Research. Attended by more than 700 people (post-graduation students, researchers, professors and industry representatives), the edition counted with the presentation of around 200 posters and 5 short talks from research areas as diverse as regenerative medicine (João Mano), demography and economy (Jan Wolf), mathematics and cryptography (Diego Napp), energy (António Cunha) and music (Paulo Rodrigues). These were representative of the high quality research that is performed at our campus. Rita Bicho, Reddithota Vidyasagar, Marcos Santos, Marta Graça, Isabel Gomes dos Santos where distinguished with the Best Poster Award in Sciences, Engineering and Arts and Humanities, respectively.

Abdallah Harati (Head of Incubation & Start Up Sales, Strategy & Sales Operations of Nokia), Garrick Louis (Associate Professor at the Department of Systems and Information Engineering, University of Virginia), Júlio Pedrosa (Senior Researcher of the Centre for Research in Ceramics and composite Materials of the University of Aveiro), Nuno Sousa (Full Professor at the School of Health Science, University of Minho and Director of the Medical Degree at the same University), Richard Walker (Senior Researcher in the BBP Brain Simulation team) and Susana Sargento (Associate Professor at the University of Aveiro and the Institute of Telecommunications) have given their personal contribute in areas as diverse as research & society, education, science management and funding providing Research Day attendees with unique and distinctive insights and moments.



Researchers of the Month 2016

SUSANA SARGENTO
Department of Electronics,
Telecommunications and Informatics & IT
susana@ua.pt

1. What are your personal perspectives as a researcher?

A researcher is a person that has the flexibility to work in new, unexplored and interesting areas, but that also has the responsibility to take the most out of its research towards the public, in new services, products, knowledge areas, etc. The research can take a huge impact both in industry, education and the end-user, as it is the basis of innovation in the world. Working and researching in future communication networks, being able to think about the future of the networks, how to connect everyone, every-time and everywhere, working on the services that can be provided through this ubiquitous communication, is very challenging but also very rewarding professionally and personally.

2. In your opinion, what are the biggest challenges in your area of research?

I usually say that I am very lucky to be researching communication networks in an era of revolution of this area. I started my research path when the mobile phones were starting to take place, and after that a great electronic revolution has taken place. At this stage we hear the concept of smart cities and smart places everywhere. To have this concept come true we need to have information about everything and everyone, from the people to the vehicles and sensors around a place, being able to coordinate all the services in a dynamic and autonomous way. The communication networks are very important to provide the knowledge of all the information of the people and things around, being mostly mobile. The research of a communication network that is able to connect people, cars, boats, drones, bicycles, sensors, homes, office, is the main challenge I have been researching in the last years. The services that can be provided through such a network, all the data available and how to use it, is also a big challenge nowadays.

3. Where are the strengths of the UA in your opinion?

UA is very strong in telecommunications since the beginning. The experience we have in UA in this area since the beginning makes us in the forefront of these technologies. From the knowledge and human resources to the lab and real-world experimentation conditions, we have all that we need to be in the cutting edge of the telecommunications research.

4. Could you give one idea to improve research in the UA?

The main aspect that needs to be improved is to provide attractive conditions to maintain our researchers in our departments and research institutes, through good contracts and a clear research evolvement path.

JOSÉ CARLOS PEDRO
Department of Electronics,
Telecommunications and Informatics & IT
jcpedro@ua.pt

1. What are your personal perspectives as a researcher?

I feel I have already passed the time in which I was competing for another project, a new idea or source of funding. Therefore, nowadays, I tend to focus my personal objectives in two major directions. The first one is to find practical application for the knowledge I conceive, which means having contracts with major companies in which the research is oriented towards true engineering problems. The second one is to use my knowledge to serve the scientific community, either as a professor or by aiding the younger researchers that work in my team or even by helping the peer review process for major journals and conferences as this is what grants the quality of the scientific knowledge that every day is made available.

2. In your opinion, what are the biggest challenges in your area of research?

The biggest challenge of research in Electrical Engineering is to attract young people. Research consists in studying advanced topics to then propose solutions to unsolved problems. So, it is mostly dependent on brain power, which implies that, without new brains, there can't be any good research. As an example of the lack of new researchers we face, nowadays, I notice that, in my research topic and related fields, there are more offers of research grants than good recently graduated people to absorb them.

3. Where are the strengths of the UA in your opinion?

Using its partnership with the Instituto de Telecomunicações, UA has access to a well--equipped research laboratory on RF electronics. In addition, it already has a group of well-prepared people that offers the necessary critical mass to perform high-level research work on RF electronics. Together, these are the two most import assets of UA in my research field.

4. Could you give one idea to improve research in the UA?

There would be many things I could list to improve research in the UA. But, focusing my attention in only a very practical one, I suggest UA library enters an agreement with IEEE to obtain unlimited access to IEEE Xplore. Having access to papers that were published only after 2005 sounds like electrical engineering has only 10 years of existence or that MSc education provides the whole knowledge developed during the previous 85 years.

MARGARIDA COELHO
Department of Mechanical Engineering
& TEMA
margarida.coelho@ua.pt

1. What are your personal perspectives as a researcher?

To conduct and disseminate high level research on the impacts of road transportation systems in order to improve the sector (better mobility, less traffic congestion, lower emission levels, less road accidents). Mobility is a need of our daily activities and because it is so close of everyday life, it is an inspiring field. In my research group, I am supervising research on Impacts of transportation systems (Modelling&Analysis); Intelligent Transportation Systems; LCA of alternative materials/ energy vectors for transportation; and Active modes (cycling and walking), with a dynamic group of researchers. In particular, the training / supervision of a new generation of people, is rewarding. Another perspective is the continuous need to foster national synergies and international partnerships in this field; the international experience that I have in institutions outside Portugal (namely in USA), has opened my mind, because I had the opportunity to view the work and organization different groups, experience different methodologies and outlooks that are the basis and requirement for working in an interdisciplinary research field such as transportation.

2. In your opinion, what are the biggest challenges in your area of research?

There are several challenges, I will outline 4:
1) the trade-off among the negative impacts of transportation. For instance, we can implement a technology (on the road or in the vehicles themselves) with the main objective to reduce traffic accidents, but maybe this implementation will negatively affect pollutant emissions (if this change increases accelerations in driving patterns), or will increase traffic congestion;
2) I must emphasize the dichotomy between alternative vehicles / new technologies and human behavior. For example, there are electric vehicles or hydrogen vehicles, but what should be the focus of energy and transportation policies in order to influence consumer behavior. This balance is also present in the "hot-topic" of automated vehicles: where is the line that splits technology and human responsibilities in case of an accident involving these vehicles;
3) big data and transportation. In an era where our personal mobility data can be collected, what can (and should) researchers and decision makers do with this huge amount of data;
4) the challenge brought by the interest on active modes (e.g cycling): the interaction between the different users of the road has still to be explored, namely to decrease the number of accidents involving vulnerable road users.

3. Where are the strengths of the UA in your opinion?

I am fortunate to be associated to UA. UA is very dynamic and has made a great evolution towards becoming a top research and education university.
Involving different areas is essential for a multidisciplinary field as Transportation. In practical terms, since UA is divided in Departments I feel it is easier to reach the people I want to contact. There are many young faculty and researchers motivated and I feel that the bonds between different Departments / Research Units have been increasing in these last few years. In terms of work environment, once I graduated from a "pure" Engineering school (IST of Lisbon), I also felt "fresh air" to be in a University that has several areas of expertise.

4. Could you give one idea to improve research in the UA?

In Portugal there was a relevant reduction in the funding for science in the last years, which caused the end of some consolidated research activities and stopped the career of many young researchers. I think there should be a compromise in Portugal to implement a long-term research policy. So, in order to proceed with the high level performance of the research in Portugal and in the UA, there is the need to protect research, namely with funding to recruit people. Equipment and facilities are important, but nothing is made without human support, so we need more researchers, more PhD students and technicians and administrative personnel (e.g. to give assistance to the development of international proposals).

MÓNICA AMORIM
Department of Biology & CESAM
mjamorim@ua.pt

1. What are your personal perspectives as a researcher?

To be able to sustain a long term research plan integrated within a dynamic research group/department is one of the most important aspects in my personal view. Well-established structures/laboratories with implemented transfer of knowledge, this within communication and collaboration with a targeted but vast network, are some of the keys towards excellence in research. This is what we tried to do in the stress biology group in CESAM (Dep. Biology). The ecotoxicogenomics lab, for which I am responsible, has currently a well-equipped lab and a team of core 9 researchers (3 post-doc, 6 PhD), all started from scratch in 2006. This is possible in a context of continuous search for funding and active research involving a network of researchers from various complimentary areas (genomics, bioinformatics, ecotoxicology, chemistry, etc.). Presently, the FP7-SUN and FCT NM-OREO contains resources for both a 4 year PhD and 6 year Post-Doc grants, contributing also to the UA human resources flow. The networking will be further developed and support future projects and students exchange, all contributing to the future consolidation and leadership in this particular area of knowledge – ecotoxicogenomics. Last, the consolidation of this area at University of Aveiro is an aim, less than 10 labs exist in the world. A systems biology approach is considered one of the top achievements and covers a wide range of applications, and e.g. clearly envisaged by the EU 2020 horizon.

2. In your opinion, what are the biggest challenges in your area of research?

One of the biggest challenges is to be able to communicate efficiently with the various areas of knowledge. Ecotoxicogenomics is highly interdisciplinary and the languages of each area offer a specificity that is often not easy to process, e.g. bioinformatics with genetics with ecotoxicology. Within nanotoxicology, which is also covered in the group, the involved disciplines include physics, materials science, chemists, toxicologists, image analysis experts, and besides this, various industry and regulators stakeholders. Here one of the challenges lays in providing the right scientific knowledge to industry, promoting safe(r)-by--design technologies and materials, helping a sustainable use of resources while ensuring known environmental risks, bringing the science onto regulation.

3. Where are the strengths of the UA in your opinion?

Here the strengths are in line with the challenges because the UA holds a strong interdisciplinary suite of research areas. For instance the collaboration between various departments of e.g. CESAM and CICECO has been very important in this field of research. Obviously it is also a strength of UA to hold one of few ecotoxicogenomic research groups in the world. UA is also in an appealing geographical location, both in terms of life quality and research growth. Moreover, the possibility I have had to make independent research shows the maturity level achieved and has been not only attractive but also promoting responsible progress.

4. Could you give one idea to improve research in the UA?

Despite the referred strengths I believe that further collaboration should be facilitated and promoted. There is still room for improvement in terms of work conditions (facilities, office rooms, laboratories) which would better attract and keep good resources. Last but maybe ultimately important, the implementation of the announced researcher career in full will be a keystone to improve, maintain and avoid loss of good research in UA. Hence, an implementation of the research career will give the structure and the required support for a successful line.

FRANK G.A VERHEIJEN
Department of Environment and Planning & CESAM
verheijen@ua.pt

1. What are your personal perspectives as a researcher?

Our society depends on how we manage our soils, more than many people realise. Many civilisations in the past have fallen due to mismanagement of soils. Soil (aka the pedosphere) is central in physical geography and has been the 'red thread' in my research. My primary research interest is the interaction between vegetation – soil organic matter – and soil hydrology dynamics. My motivations for doing research are i) scientific curiosity, and ii) usefulness to society. My previous positions tended to focus on either one or the other. I was lucky to have had both motivations during my PhD work, which results were immediately used by the Ministry of Agriculture. Also my various current research activities have both the element of satisfying my scientific curiosity, and the link to society. I have moved around a bit, both physically and regarding research, and I have enjoyed the experiences. Now I'm looking to consolidate and develop my research over a longer time period in Aveiro. Of course, this will depend on the available career opportunities here.

2. In your opinion, what are the biggest challenges in your area of research?

Looking broadly, it is still a challenge to study soils holistically. This is in part because soils form the most complex ecosystems on Earth, but also because relevant time scales are often too long to experimentally observe. Soil scientists come from separate backgrounds, either geography/geology or chemistry or biology or engineering. A degree where all relevant disciplines are integrated does not exist in most countries, including Portugal as far as I know. We study soils by putting experts from different disciplines together in projects, multi-disciplinarily, which is useful, but for true inter-disciplinarily we need more broadly trained scientists as well. The UA is one of the places where this could be realised.

Looking specifically at biochar, the holistic challenge applies here too. In addition, the challenge of relevant scales of space and time is pressing. Biochar's long residence time in soil is of interest for climate change mitigation and adaptation, but it poses real challenges studying the long term effects of a biochar on a soil, and where in the environment biochar moves to and accumulates. This understanding will be essential to develop a sustainable biochar application system.

3. Where are the strengths of the UA in your opinion?

Besides the excellent location of the campus, a real selling point, I think the strengths of the UA are in its open culture that enables collaborations. I have not experienced the 'empire building' of research groups here as much as is often the case in older universities. This is really positive as these 'empires' can really obstruct inter-group collaborations and scientific progress. Another strength is simply the people at the UA. Having dedicated, competent, and friendly professionals in research support positions, makes all the difference.

4. Could you give one idea to improve research in the UA?

I think that the one improvement that would have the biggest impact is to create a more stable career path, beyond temporary contracts and fellowships, for researchers at the UA. A happy researcher with career stability is a more productive researcher, and one that is more likely to publish higher quality works. Uncertainty about career prospects also hinders researchers from investing in building new research lines 'from the bottom up', thereby decreasing the capacity of the UA to respond quickly to new developments in tackling societal and environmental challenges.

CARLOS COSTA
Department of Economics, Management, Industrial Engineering and Tourism & GOVCOPP
ccosta@ua.pt

1. What are your personal perspectives as a researcher?

Research is clearly among the top motivations of academics. Research is about analyzing and understanding the world, finding optimal and nice solutions for problems and to contribute to a better world and better societies. For an academic, research is yet the leitmotiv for the other activities.

Based on this assumption I welcome policies that emerge from research, that create new forms of teaching based on the results arising from research, and also that find new developments and innovations with the industry through findings and achievement coming from research.

2. In your opinion, what are the biggest challenges in your area of research?

My main research is centered on Management and in particular on Tourism. Tourism has evolved from a 'mere' social phenomenon and from a minor activity to one of the most prominent research areas. Since the 1960s tourism expanded so rapidly that nowadays it has become the world's largest economic sector, well ahead of the two traditional economic giants: oil production and car industry. Not surprisingly, the academy has directed attention to this emerging area. Over the last 3 decades, and in addition to this economic growth, publications and research projects in the area have mushroomed all around the world. Tourism has clearly become fashionable and growing number of academics from all scientific areas are directing their projects to this field.

3. Where are the strengths of the UA in your opinion?

The UA is clearly amongst the most attractive campus in Portugal and, despite being relatively small, it is one of the best places to conduct research in the world. Notably the architecture, the design, the location and the nearby city are amongst the most important features of our campus. Academics are human beings, whenever they decide where to live, they give particular attention to the living conditions and the individual and family comfort. Therefore, the quality of the infrastructure and its location play a critical role to decide where to live.

Also, and in addition to its physical plant, the campus is well advanced from a technological point of view. Nowadays, the concept of geographical centrality is losing ground to the idea of knowledge centrality... and it is undeniable that the UA has gained ground from a technological and scientific point of view.

The close networking developed with the business and organizations outside the campus is also amongst the most distinctive features of the UA. This pushes academics into some of the most critical challenges they are faced at present: they have to innovate in close cooperation with the 'outside' world, and also they have to re-orient their research to activities that support their research and teaching activities but also that are also responsible for raising new sources of funding.

4. Could you give one idea to improve research in the UA?

One of the main advantages of the UA is its integrated campus. Right from the beginning the UA has expanded its plant and based its teaching and research under the umbrella of a very simple governance: departments that interact horizontally with each other. And there is no doubt that this organization is one of the cornerstones of the UA success.

However, the university of the 1970s and 1980s, with less than 5 thousand students, has given stage to a city of knowledge with more than 15 thousand students, and with worldwide connections.

While it seems undeniable that its horizontal structure should be maintained in the future, and new tiers of government and bureaucratic structures should be avoided, the UA has to strengthen its internal connections and take advantage of the physical and scientific 'proximities' and accelerate forms of internal networking to densify and optimize all its potential. The evolution of research and the emergence of new ways of teaching will clearly depend on the capacity of the UA to innovate and to rediscover itself.

PAULA MARIA VILARINHO
Department of Materials and Ceramic Engineering & CICECO
paula.vilarinho@ua.pt

1. What are your personal perspectives as a researcher?

I´m committed to be and to do excellent research in the field of Materials Science.

I see myself, now and in the future, as contributing to the field by creating and disseminating new knowledge.

I´m committed to contribute to the transformation of some industrial areas within Materials and transfer some of the knowledge generated at the laboratory to the industry.

I would like to see myself as a contributor to break the established and seeding the transformation and inspiring some youngest to be committed to excel themselves in the field of Materials.

2. In your opinion, what are the biggest challenges in your area of research?

My research field lies within Materials Science and I´m engaged in applied research on functional materials for electronics, microelectronics and related applications (memories, sensors and actuators, thermoelectric devices, tunable dielectrics) and more recently for biomedical microelectromechanical systems BioMEMs and BioSensors for diagnosis and tissue engineering. While developing and understanding materials properties is central in many of my R&D activities, transferring knowledge to the industry is becoming increasingly important in my research activities.

In my opinion, a major challenge in this area is related with "size", as size impacts critical mass, funding, excellence and technology transfer, but also with its "intrinsic multidisciplinarity" nature, in the sense that Materials Science though "practiced" by many is not always credit as Materials Science.

This becomes even a major one in Portugal, when "functional materials for electronics, microelectronics and related applications" do not have a significant industrial expression in Portugal.

I also feel that the absence of a long-term research funding and research policy, (that includes priorities and funding opportunities) challenges markedly research in this field and research in general. In some way excellence is attained defining strategy and guarantying continuity.

Last but not the least, being part of a system that lacks incentives and rewards for excellent performers has always been a key challenge.

3. Where are the strengths of the UA in your opinion?

Dimension or size. In this case I see dimension as an important strength. In principle, being a relative small university makes it easier to change and to adapt. Thinking about the University of the Future, in which, interdisciplinarity, adaptability, problem solving approaches, internationalization, will be the "distinctive and survival skills", I feel that we should maximize this unique advantage of UA. Of course this requires strategic thinking, nurturing excellence and the creation of a culture of excellence.

The other strength of UA is the proximity to the industrial tissue and in particular to the one related with materials. Within some of the activities we have undergoing at the Portuguese Society of Materials (SPM) our studies on the impact of materials on the social and economic Portuguese tissue, clearly demonstrate the importance of the Central Region of Portugal in this field. To me UA is ideally positioned.

4. Could you give one idea to improve research in the UA?

One just one... selecting just one is pretty difficult because visible improvements require concerted actions.

However and somehow related to what I´ve said above, and thinking in what I feel will be the University of the Future, leveraging the internationalization of the research at UA will definitely have a strong impact on our R&D activities. I´m referring in particular to foster international partnerships.

ROB PULLAR
Department of Materials and Ceramic Engineering & CICECO
rpullar@ua.pt

1. What are your personal perspectives as a researcher?

Essentially, research is all about curiosity. Someone can have a great mind for learning or understanding, but if you don't have that basic curiosity to know why, and maybe then make it better, then research is not for you. I am very glad that I have a job where I actually enjoy what I do, and I generally find it extremely rewarding intellectually, creatively and emotionally (definitely not financially!). Problem solving is also an important part of research. I also hope that in some way my research may eventually make the world a slightly better place, and I like addressing issues that I care about politically and personally in my research.

2. In your opinion, what are the biggest challenges in your area of research?

I feel that sustainability and recycling / re-use of materials is a key element, of both our society and our technology. Regarding recycling and re-use, we must really begin obtaining more raw materials from used products and wastes, instead of having a ridiculous system where we are damaging our environment and incurring ever increasing costs extracting raw materials from nature, while we are just throwing away those same raw materials, burying them or burning them.Sustainability means minimising pollution and harmful side effects of our technology on human health and the environment, such as using less toxic reactions and solvents to produce materials, or developing new processes and technologies with less harmful emissions. But this also means minimising waste, encouraging energy and materials efficiency and exploiting sustainable natural products and resources, which can be easily replaced or recovered. Nanotechnology is one area in particular where these issues are currently ignored, and for nanotech to become viable for everyday use in simple applications, it must become affordable, easy and where possible based on aqueous processes. For this reason, I focus on Sustainable Chemistry (SusChem) and Green Nanosynthesis methods.
Also, one major challenge is the ever increasing competition for funding. When I tell someone in industry how much time we spend chasing relatively small amounts of money, they are amazed at how unproductive the whole system is, and say that for a big company the cost of the time spent doing this would make it instantly uneconomic and unfeasible.

3. Where are the strengths of the UA in your opinion?

UA is a top university, especially in my area (Materials Science). It is also one of the best Universities under 50 years old in the world. It has really good analysis facilities and personally I have had a great deal of support from the Department, CICECO and the Research Support Office. We also have really capable, efficient and charming secretarial/admin staff and scientific technicians, which makes a massive difference, and contrasts greatly with some of my former institutions.
It may not be a good thing for the country overall, but the fact that Portugal is a relatively poor EU country makes us more competitive financially and able to supply better value for money for the same level of funding compared to many richer countries.

4. Could you give one idea to improve research in the UA?

I feel that the lack of any clear career progression for researchers in UA is a problem, as in the rest of Portugal. There are almost no new professor posts that open, so that avenue seems non-existent, and yet there are also very few equivalent Researcher positions with any degree of long term prospects beyond a five year contract. It seems that the national bureaucracy and antiquated regulations make it impossible to create teaching or senior researcher positions, and there is very little flexibility on the part of individual institutions. I fear that the recent decisions to change post-doc contracts, along with the end of the excellent Investigador programme, will only make this worse, especially because at the moment nobody seems to know exactly what will happen. A clear, realistic and accessible career structure is required.

Academia de Verão

"ACADEMIA DE VERÃO" IN AN OPEN CAMPUS LIKE A REAL STUDENT

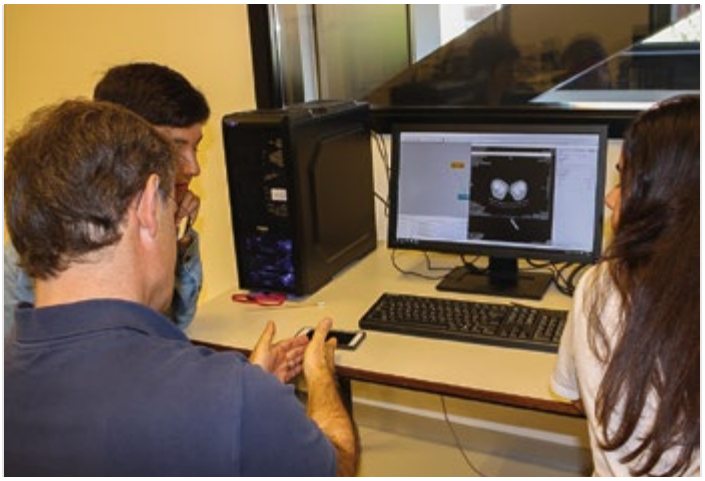
The Summer Academy (Academia de Verão) is the most intense outreach activity for young people promoted by the University of Aveiro. In 2016, 494 young students from all over the country (aged between 10 and 19 years old) participated in this programme. During two weeks of July, the departments and schools organized 29 thematic programmes in different scientific areas, to fulfill the interests and expectations of the young participants.

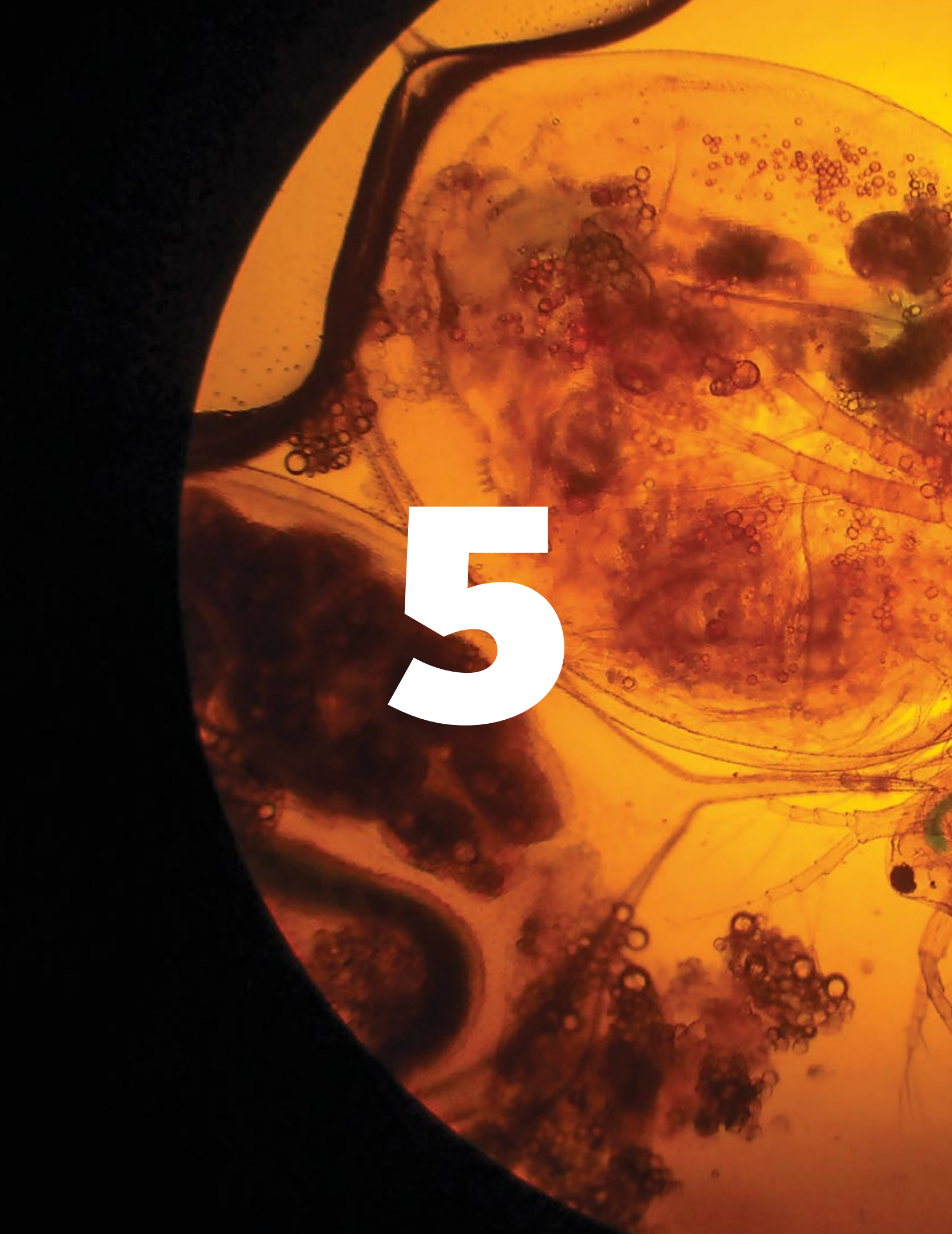
Either during one or two weeks, the university provided these young participants the opportunity to explore interesting scientific projects, integrate a handful of projects totally organized by the departments that accepted this annual challenge. Some municipalities and companies have sponsored the participation of the best students in the Academy, with a total of 114 scholarships.

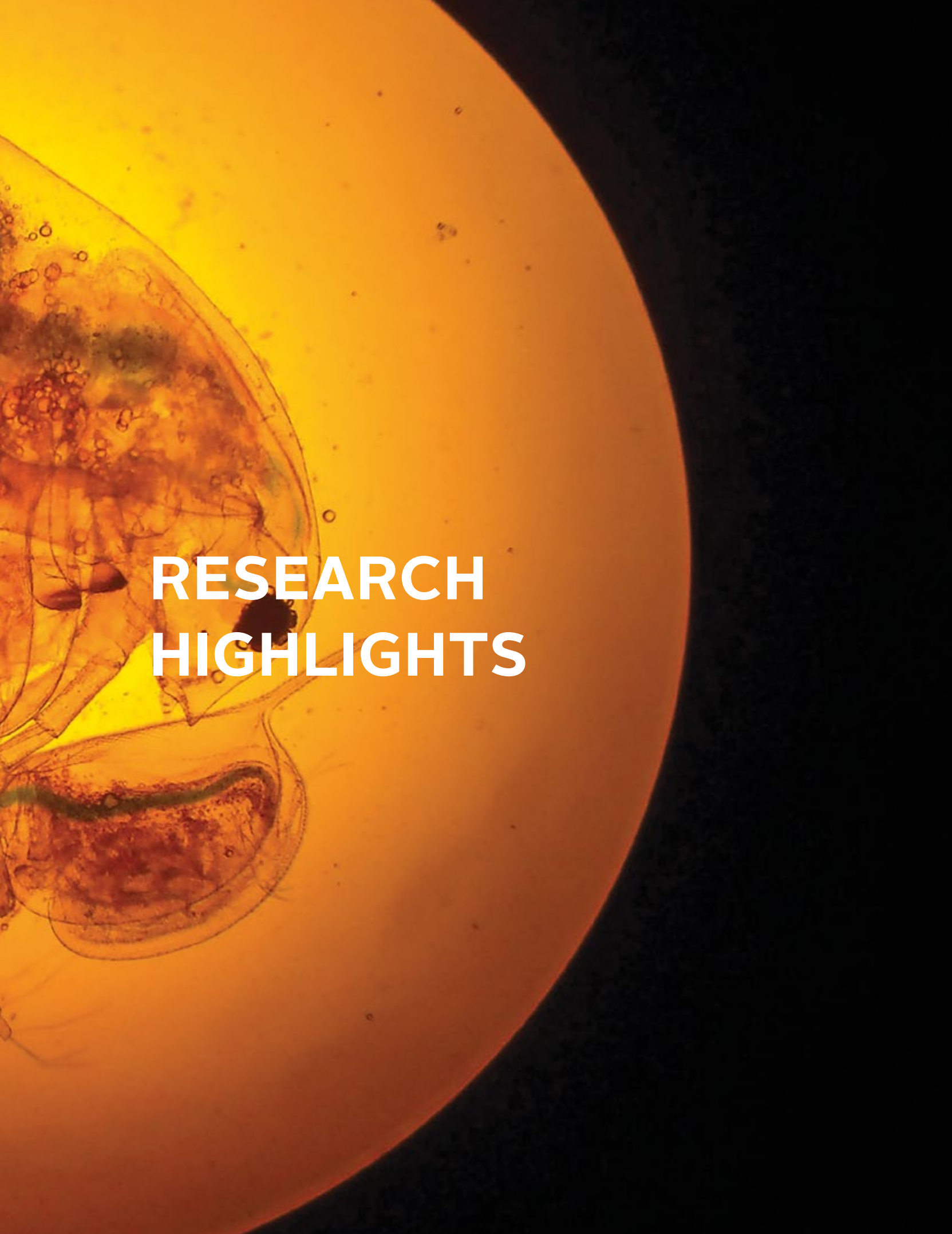
Besides the laboratory experiments, the exciting field work and the pleasant field visits outside the Campus, students also had the privilege of being in contact with the real university lifestyle - they were accommodated in the students' residences, had their meals in the campus canteens and performed sports activities in the gymnasium and on the university lanes in the afternoon. Of extreme importance was the close relationship with the university students and researchers that monitored their stay on Campus and coordinated the cultural, sports and lab activities.

Children and young people are welcome to visit the campus and join the scientific and cultural activities, promoted especially for them, throughout the year. In 2016, more than 5870 visitors were in the university campus. In the Science and Technology Open Week, which takes place in November, over 5200 students joined the university students and researchers in 304 activities specially designed for them.

As its motto states, the University of Aveiro is a true "campus with ideas".




5



RESEARCH HIGHLIGHTS

The amazing diversity of migratory and incubation strategies of shorebirds

José Artur Alves[1]

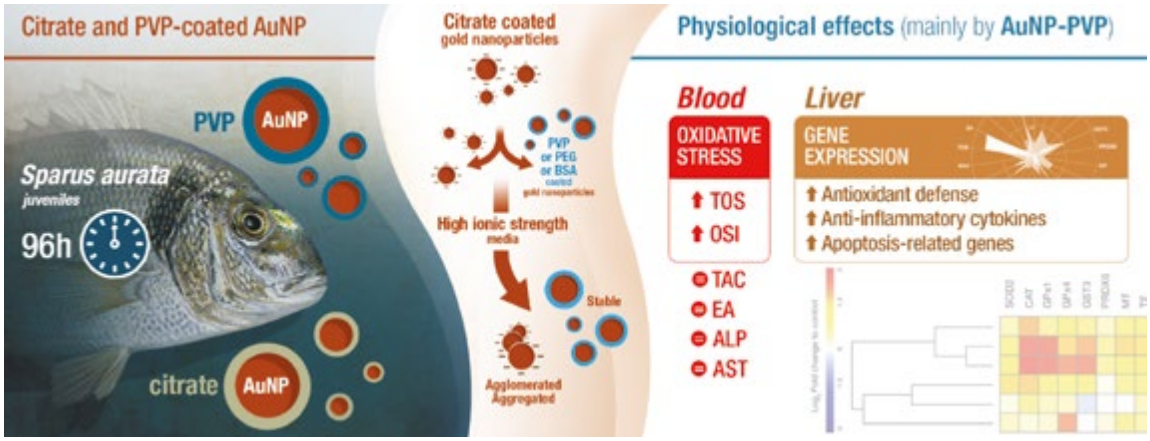
1 — Department of Biology & CESAM, University of Aveiro

Shorebirds mostly use coastal wetlands along continental land masses during winter while in summer, the vast majority of these species profits from the arctic bonanza to breed and raise young. However, in order to reach such high latitudes, shorebirds must undertake long distance flights typically traveling thousands of kilometres in their migrations. Given the distances involved, it is no surprise that the migratory routes of these species tends to follow the shoreline, so that they can find shelter in suitable habitats to rest and refuel, particularly when encountering adverse weather conditions such as strong headwinds. Our most recent tracking of these migrations revealed that the whimbrel (*Numenius phaeopus*), a shorebird that breeds in Iceland and winters in West Africa, completes direct flights in excess of 5500 km between these locations, flying non-stop over the ocean (an unsuitable habitat for the species), when an alternative mainly overland route is available and is used by other bird species along the same flyway. Contrary to previously tracked shorebirds breeding in Iceland, the whimbrel flies continuously during five days and five nights achieving maximum speeds of ca. 86 km/h to reach their wintering areas. This study revealed a new migratory strategy which involves undertaking direct flights over oceanic waters when alternative costal routes are available, and was published in the open access journal of Nature group, *Scientific Reports* (Alves et al. 2016). The individual trade-offs and demographic consequences of such extreme migratory strategy are currently being studied by PhD student Camilo Carneiro (DBio & CESAM), who has already unravelled direct flights of even longer distances.

Still in Iceland, we collaborated in a large study involving 76 researchers from 69 institutions that described for the first time the wide diversity of incubation patters found on shorebird species, by analysing 729 nests from 91 populations breeding across the globe. Most shorebirds are ground nesting species, with some using the short arctic and sub-arctic vegetation as well as their feather patters to camouflage their nests. Generally both parents incubate the eggs which require their body heat in order for the embryo to develop. Such parental care implies high synchronization between couple members, so that one adult is continuously warming and protecting the eggs while the other can go forage. Given the very low temperatures in these habitats the most likely driver of incubation rhythms was believed to be energetic depletion of incubating adults, that is, the need to feed in order to maintain body temperature. However, some species are able to incubate for long periods, commonly of 19 consecutive hours with the most extreme case being over 50 straight hours. Contrary to previous knowledge, we found that it is in fact predator pressure that determines incubation rhythms. Species that rely on crypsis (by concealing theirs nests) have long incubation shifts in order to minimize partner exchange and thus reduce the likelihood of nest detection by predators; conversely, species that have open nests make short incubation stints and readily leave the nest when the vigilant partner warns about predator presence. This key study in the area of chronobiology was published in *Nature* (Bulla et al. 2016).

Gold nanoparticles: Their behaviour and effects on marine fish

Mariana Teles[1], Angela Barreto[2], Tito Trindade[3], Amadeu M.V.M. Soares[2], L. Tort[1], Marcelino Oliveira[2]

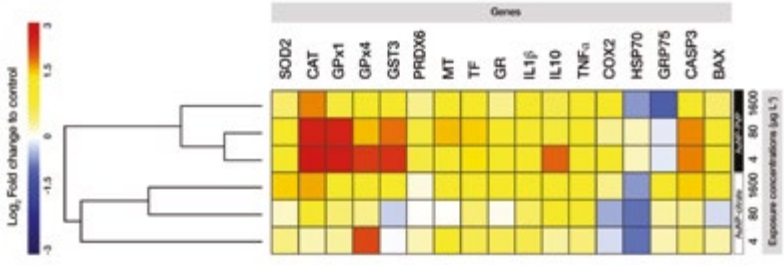


1 — Universitat Autònoma de Barcelona, Spain
2 — Department of Biology & CESAM, University of Aveiro
3 — Department of Chemistry & CICECO, University of Aveiro

FIGURE 1/2
Overall *S. aurata* hepatic mRNA response profile to AuNP represented as a heatmap. *sod2* (superoxide dismutase [Mn]), *cat* (catalase), *gpx1, gpx4* (glutathione peroxidase 1 and 4), *gst3* (glutathione-S-transferase 3), *prdx6* (peroxiredoxin 6), *mt* (metallothionein), *tf* (transferrin), *gr* (glutathione reductase), *il1β* (interleukin 1 β), il10 (interleukin 10), *tnfα* (tumour necrosis factor-α), *cox2* (cyclooxygenase 2), *hsp70* (heat-shock protein 70), *grp75* (glucose-regulated protein, 75 kDa), *casp3* (caspase 3), *bax* (Bcl-2 associated X protein).

Information on the potential hazardous effects of the increasingly used engineered nanoparticles is urgently required to ensure human and environmental safety and promote safe use of novel nanotechnologies. Among the most used nanoparticles, gold nanoparticles (AuNP) have been employed in high technology applications that include drug delivery and recently water remediation and aquaculture practices. For these applications, AuNP are coated with different agents that alter their stability and biological interactions. One of the prerequisites for its use is their non-toxic and biocompatible nature but little is known in terms of effects on estuarine/marine organisms. An ongoing collaboration between Aveiro University and Universitat Autònoma de Barcelona is studying the behaviour of AuNP with different surface coatings, under marine conditions, and its effects to economically relevant fish species, such as Sparus aurata (gilthead sea bream). This species, widespread in Atlantic and Mediterranean coastal waters, is one of the most commercially important (fishery and aquaculture) and consumed fish in south Europe.

Overall, data revealed that although citrate coated nanoparticles tend to aggregate in high ionic strength media, some molecules (e.g. polyvinylpyrrolidone, polyethylene glycol, bovine serum albumin) may provide them with stability that allow them to remain in suspension, in the nm size range. AuNP, even with biocompatible coatings and at low concentrations, can alter the expression of antioxidant, immune and apoptosis related genes (Fig. 1), thus presenting a potential impact to marine fish at the molecular level. AuNP may activate the fish hypothalamus-pituitary-interrenal (HPI) axis, reflected by an increased plasma cortisol levels, and thus represent a potential endocrine disrupting threat to fish due to its interference with endocrine function. Further studies are being performed under different conditions to evaluate AuNP impact in the environment and aquaculture facilities to provide information for the safe use of nanoparticles.



A Primer on -Omics Strategy for Untargeted Profiling of Organic Aerosols: Lessons Learned and Future Challenges

Regina Duarte[1], João Matos[1], Armando Duarte[1]

1 — Department of Chemistry & CESAM, University of Aveiro

Organic aerosols (OA) is an important component of air particles and one of the key drivers that impacts the Earth's radiative budget, ecosystems, and health. Understanding the processes involving OA in the atmosphere depends on how well the chemical composition of this component is decoded. Yet, obtaining this information for atmospheric OA faces a number of challenges, such as their collection, extraction, and chemical complexity. To overcome these challenges, we pioneered a multidimensional non-targeted analytical strategy (see Figure 1) that allows for detailed structural characterization and source attribution of OA from contrasting environments. This integrated approach includes state-of-the-art analytical techniques and data processing tools for assemble useful and usable information for the identification of chemical patterns of primary (anthropogenic and biogenic) and secondary OA.

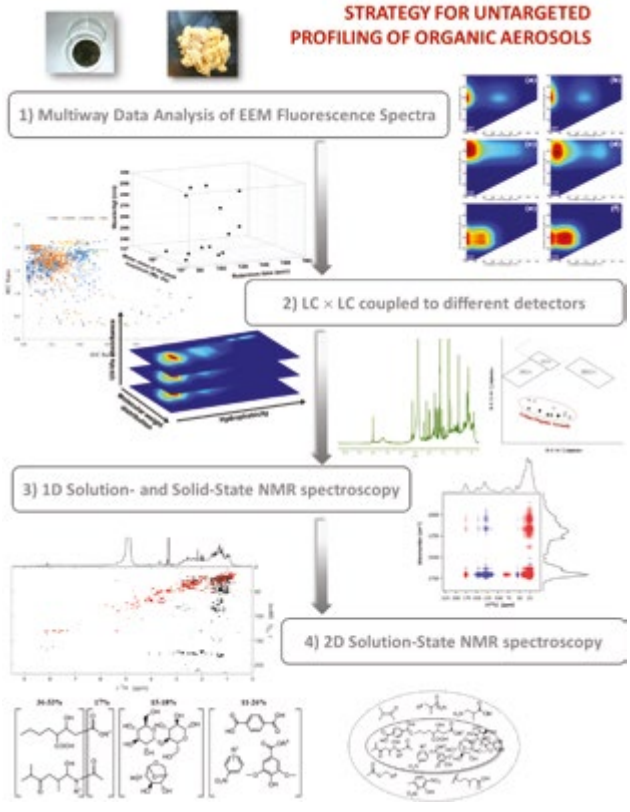


FIGURE 1
Multidimensional non-targeted analytical strategy for decoding OA chemical properties.

Excitation-emission matrix (EEM) fluorescence data, comprehensive 2D liquid chromatography (LCxLC) coupled to different detectors, and nuclear magnetic resonance (NMR) spectroscopy constitute the core of avant-garde analytical tools that have allowed us to perceive and resolve the chemical and size continuum of atmospheric OA. We have shown the existence of an "annual background" profile of the structural composition of OA, featuring a core with heteroatom-rich branched aliphatics from both primary and secondary origin, aromatic secondary organics originated from anthropogenic aromatic precursors, and biogenic primary saccharides and amino sugar derivatives. Lignin-derived structures, nitroaromatics, disaccharides, and anhydrosaccharides were also identified in smoke impacted OA, reflecting the impact of biomass-burning sources. These data were further used to develop a universal database of atmospherically relevant compounds, which is an invaluable asset for assessing and modelling the chemical properties and sources of OA.

This novel integrated strategy has paved the way into a future where we can, indeed, learn to read the wealth of molecular information within the OA pool in order to achieve a much clearer picture of their impact in a changing climate scenario. The complete characterization of OA could be achieved with the further development of high resolution hyphenated analytical techniques, which is an objective currently in progress in our research group. The multidimensional analytical platform can be applied to a diverse set of complex organic mixtures from different environmental matrices, allowing an in-depth and unified understanding of the molecular diversity and environmental functioning of such complex matrices.

GPS – Global Portuguese Scientists

Carlos Santos [1], David Marçal[2], Carlos Fiolhais[3], Pedro Magalhães[3]

The GPS network – http://gps.pt – is a social media platform that aims to map Portuguese scientists working around the world, to promote the visibility of their research activities and to facilitate the communication between scientists and the Portuguese society.
This network is a partnership between Fundação Francisco Manuel dos Santos, Agência Nacional para a Cultura Científica e Tecnológica – Ciência Viva, Universidade de Aveiro e Altice Labs.

The platform was launched in November 2016 and already has more than 3000 registered users that include Portuguese scientists working abroad, scientists working in Portugal, and other professionals such as journalists.
The network is open to any Portuguese scientist. The user's profile is built upon a set of information regarding a summary, map locations related with research activities (institution, position and dates) and relevant links. The social network component allows the members to exchange information and discuss any topic around a "general" community that is also organized in groups created by GPS scientists.

The GPS scientists map allows to look for locations where Portuguese scientists have been working in a specific time interval. Results can also be filtered by scientist name, country, scientific domain and location.

This network is also supported by Portuguese scientists' associations around the globe that explore the platform's community features to disseminate their work and to look for partnerships. These associations have their own community built inside the GPS network.
The network was built by reusing the core technology from SAPO Campus, a social network platform for education that has been developed since 2009 at CIC.Digital/DigiMedia and AlticeLabs@UA (former SAPOLabs@ua).

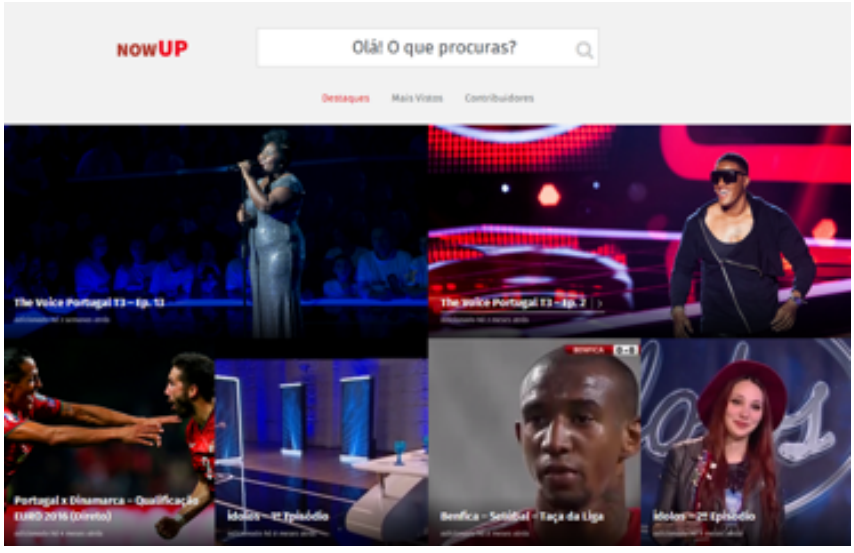
1 — Department of Communication and Arts & CIC.Digital, University of Aveiro
2 — Agência Nacional para a Cultura Científica e Tecnológica – Ciência Viva
3 — Fundação Francisco Manuel dos Santos

nowUP – a totally automated system for the creation of TV summaries based on Twitter activity

Pedro Almeida[1], Jorge Ferraz de Abreu[1], Rita Oliveira[1]

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

The main premise that motivated the development of this system relies on the fact that viewers post a lot of TV program-related information on social networks, while they are watching TV, especially during its key moments. Therefore, this social buzz has the potential to be used as an automatic editorial criterion. Having this in consideration, the nowUP main goal was to automatically create TV summaries of popular television programs (like football matches, talent or reality shows) based on the Twitter activity and integrating a part of that activity in the summary. For this, a totally automated system incorporating different modules was developed.



A data-mining engine, developed under the support of a research group of the Telecommunications Institute, headed by Prof. Diogo Gomes, processes continuously the activity of Twitter looking for tweets associated with TV shows. Based on the program metadata it indexes the twitter activity; correlates tweets; and creates clusters of peaks, being the relevant clusters associated with the TV highlights. With this, a video engine automatically creates a full video summary (an edited sequence of TV highlights) and publishes it in an online platform, making it also available to be used in a Catch-up TV service. The TV summaries are enriched with visual separators and with a textual overlay of the most relevant tweet of each highlight serving as a commentary to that segment.

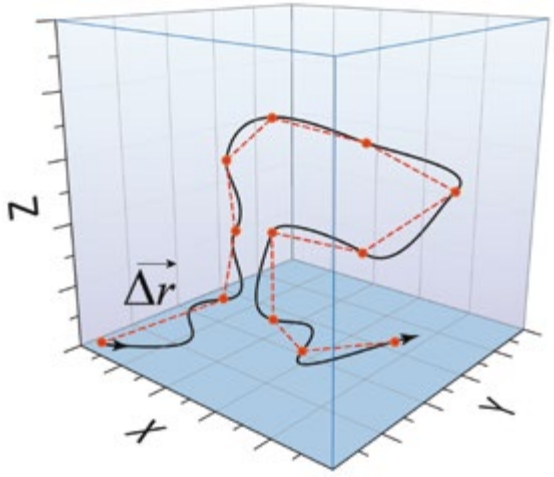
The research team carried a study to compare the outputs of nowUP with official editorial/professional video summaries. The results show that the solution was very successful in achieving the project main goal and users want to have access to this type of social buzz-based video summaries. The nowUP solution also promises potential gains in the value chain of TV producers and broadcasters.

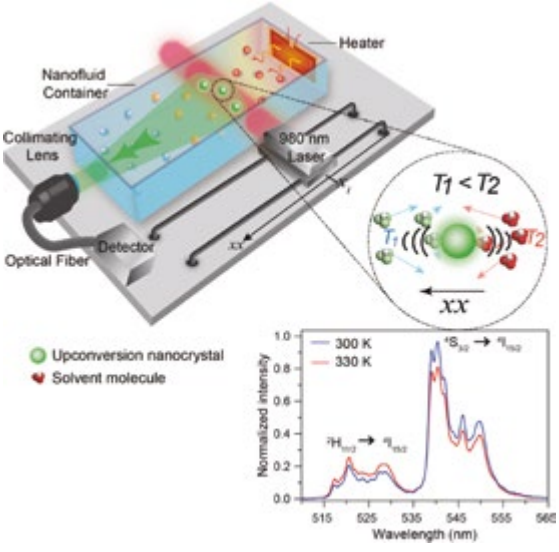
Instantaneous ballistic velocity of suspended Brownian nanocrystals measured by upconversion nanothermometry

Carlos D. S. Brites[1], Xiaoji Xie[2], Mengistie L. Debasu[1],Xian Qin[3], Xian Qin[2,4], João Rocha[5], Xiaogang Liu[3,6], Luís D. Carlos[1]

Understanding Brownian motion, the random movement of microscopic particles in liquids and gases (Figure 1), provides an intimate insight into a microscopic world and enables answering questions on how substances interact with each other at different time ranges. The conceptual implications of Brownian motion impact almost every field of science and even economics, from dissipative processes in thermodynamic systems, gene therapy in biomedical research, artificial motors and galaxy formation to the behavior of stock prices. Using conventional techniques, it has been challenging to measure Brownian motion due to the rapid and random movements of the particles at the very short time scale of 10-10 s (namely, ballistic regime). Since Brownian motion is extremely sensitive to the variation of temperature, nanothermometry (capable of monitoring thermal fluctuation at the nanoscale) is a tool that may be used for studying such motion of nanoparticles.

We demonstrated the use of upconversion nanothermometry for measuring the instantaneous ballistic velocity of nanoparticles with different sizes and shapes (Figure 2). Measuring the instantaneous Brownian velocity of these tiny particles, however, has proved to be a daunting task, as evidenced by the seminal work of Einstein in 1905. Our work has verified Einstein's prediction made in 1907 that the instantaneous Brownian velocity is independent of the particle size and shape under infinite dilution conditions. Better understanding of Brownian motion of suspended particles in non-equilibrium systems would have an invaluable impact in a wide range of scientific fields. For example, it allows improved understanding of thermal conductivity, convective heat and mass transfer in various types of nanofluids.
Upconversion nanocrystals may be dispersed in various solvents, providing a versatile platform for investigating the ballistic Brownian motion in non-equilibrium systems and related phenomena, without the stringent constraints associated with optical tweezers. The newly developed technique may be used to achieve a better understanding of fluid properties. It may also be extended into biological systems to understand the transport of molecules and cells.





1 — Department of Physics & CICECO, University of Aveiro
2 — Nanjing Tech University, Nanjing, China
3 — Institute of Materials Research and Engineering, Singapore
4 — Nanjing University of Posts and Telecommunications, Nanjing, China
5 — Departament of Chemistry & CICECO, University of Aveiro
6 — Department of Chemistry, National University of Singapore, Singapore

FIGURE 1
3D trajectory of a single Brownian nanoparticle, indicating the effect of the temporal resolution on the measurement of the instantaneous velocity in the ballistic regime.

FIGURE 2
Schematic of the experimental set-up for upconversion measurements of the nanofluids. A collimating lens collects the upconversion emission generated at different positions by moving a 980-nm laser along the x direction and the signals are guided to the detector by an optical fiber. The inset shows the solvent-mixing effect arising from the Brownian motion of the nanoparticle located at the interface between the cold (T1) and hot (T2) regions of the nanofluid. The emission spectra of the water-based nanofluid under 980 nm excitation is also presented for 300 and 330 K.

A molecular-level view of the synthesis of the MCM-41 mesoporous material

Germán Pérez-Sánchez[1], José Richard B. Gomes[1], Natália D.S. Cordeiro[2], Szu-Chia Chien[3], Scott M. Auerbach[3], Peter A. Monson[3], Miguel Jorge[4]

1 — Department of Chemistry & CICECO, University of Aveiro
2 — University of Porto
3 — University of Massachusetts, USA
4 — University of Strathclyde, UK

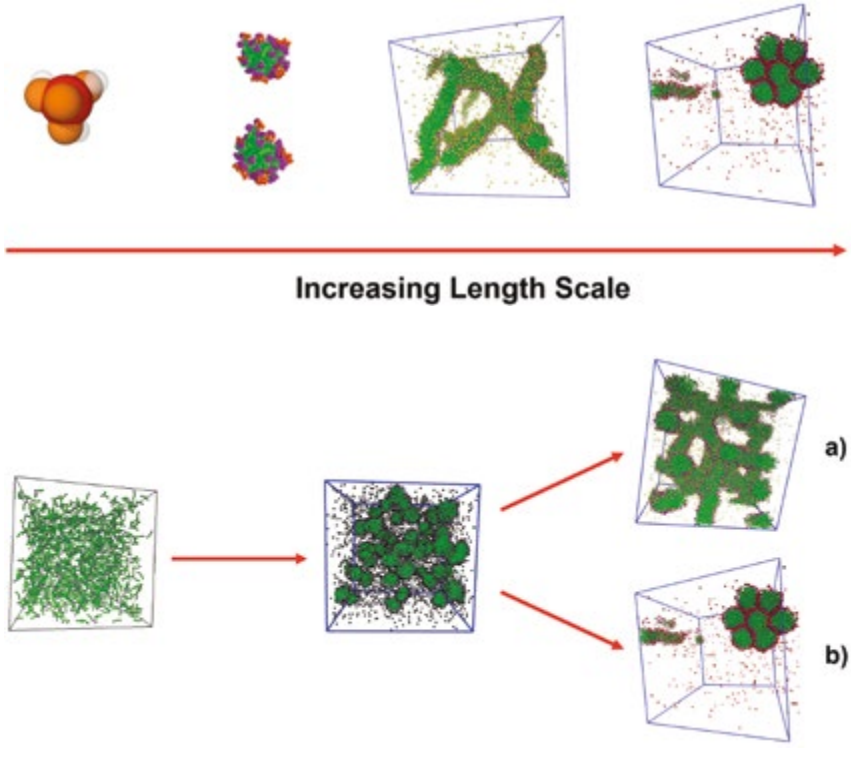
Periodic mesoporous silica (PMS) materials are tailor made ordered nanomaterials. Their synthesis follows a surfactant template approach, involving multiple silica reactions in aqueous surfactant solutions and a delicate interplay between hydrophobic forces, electrostatic interactions and phase equilibrium, which makes the study of PMS synthesis a difficult task. Indeed, intense research was performed for the most representative archetypal example of a PMS material, the hexagonal-ordered MCM-41, but the mechanism leading to its formation yielded seemingly conflicting information.

Our group adopted a multiscale computational approach, starting with quantum mechanical calculations to parameterize a classical all-atom model to finally calibrate a mesoscale coarse-grained model for silica/surfactant water solutions [1]. This approach allowed to access progressively larger time and length scales without compromising accuracy, while maintaining a level of realism that enables direct comparison with experimental data (Fig. 1). This is a major advance over previous modeling studies, which were either restricted to short simulation times or to less realistic structural models.

From long classical molecular dynamics simulations with large molecular systems, it was found that the addition of silica monomers to a surfactant solution induces the fusion of small spherical micelles to form elongated rod-like aggregates, Fig. 2a. However, the presence of monomers alone is not sufficient to promote the formation of the hexagonal phase. Instead, the formation of this phase requires some degree of silica oligomerization, Fig. 2b. The silica oligomers act as multidentate binding sites, bridging the surfactant headgroups in different micelles, which promotes the formation of larger surfactant aggregates. The model was able to attain the relevant time and length scales to study PMS synthesis in detail, capturing the effects of pH, temperature and concentration, opening the door for realistic computer material design.

FIGURE 1
Multiscale strategy from quantum mechanics atomistic (left) to classical coarse-grained (right) simulations

FIGURE 2
Effect of silica monomers (a) and oligomers (b) in the formation of larger aggregates



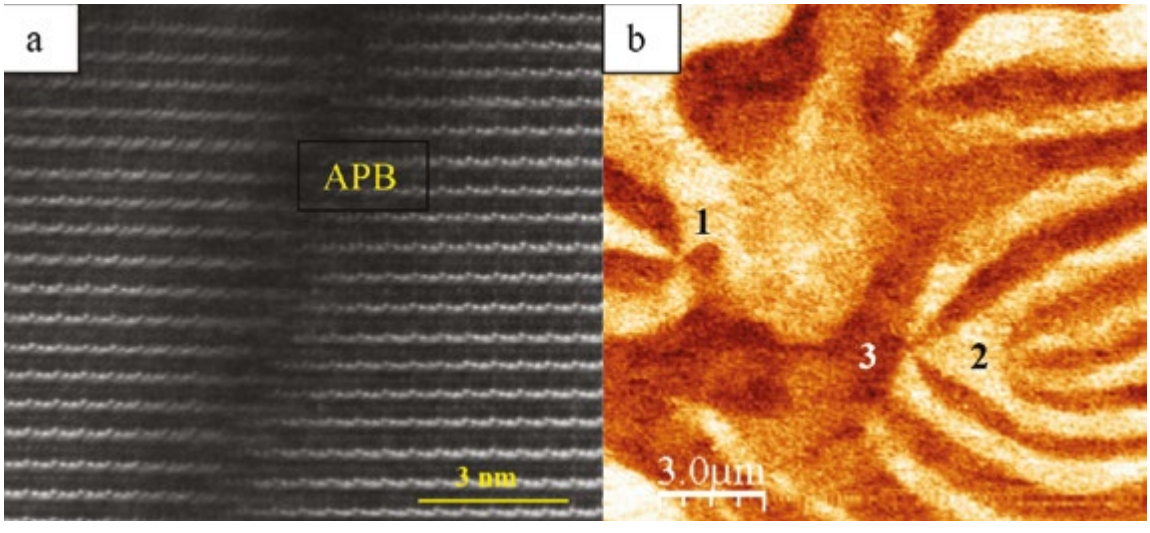
Nanodomains Coupled to Ferroelectric Domains Induced by Lattice Distortion in Self-doped LuMnxO3±δ Hexagonal Ceramics

A. Baghizade[1], Joaquim M. Vieira[1], João N. Gonçalves[2], Marc-Georg Willinger[3], Marta C. Ferro[3], Vitor S. Amaral[2]

Rare-earth multiferroic manganites of the hexagonal lattice offer promising properties owe to coupling of magnetic, ferroelectric and structural distortions, providing manipulation of one property via other properties. Linking the Z2xZ3 topology of ferroelectric (FE) domain walls in h-$RMnO_3$ crystalline lattices to phase transition phenomena with spontaneous symmetry breaking as described by the Kibble-Zurek mechanism created the opportunity here as in other domains of solid state physics to combine concepts of cosmological theories of the Universe with information on near-critical beha-viour taken in the materials laboratory. The current group publication focuses the interlocking of FE walls to structural distortions in the lattice with profound effects on the FE domain formation [1]. Also, the symmetry change on FE/APB anti-phase boundary structural walls may in turn invoke spin disordering in the antiferromagnetic state of the material, resulting in presence of the weak ferromagnetic component at low temperatures.

Our approach uses TEM/STEM transmission electron microscopy at nano-scale to identify occurrence of nano-FE domains in the lattice of vacancy doped h-$LuMn_xO_{3\pm\delta}$ ceramics, FIG. 1a). Switching of electrical polarization in the lattice is linked to the structural distortions like stacking faults, structural antiphase boundaries and other classes of planar defects, FIG. 1b). The weak ferromagnetic component measurable slightly below Neel transition temperature is coupled to FE and structural walls observed in TEM is revealing the profound impact of internal interfaces on physical properties. Using local probe electron beam with the EELS technique, switching of electrical polarization driven by inhomogeneities in the lattice was investigated. First-principles calculations were used to interpret our measured EELS spectra.

Exploring the underlying mechanisms on the effects of nano-scale features on ferroelectric and magnetic properties of multiferroics as seen in h-$RMnO_3$ manganites can be directly extended not just to sister families of materials like hexagonal rare-earth ferrites but also to the orthoferrites which can be stabilized as epitaxial layers on low-cost substrates.



1 — Department of Materials and Ceramic Engineering & CICECO, University of Aveiro
2 — Department of Physics & CICECO, University of Aveiro
3 — Department of Inorganic Chemistry, Fritz Haber Institute of the Max Planck Society, Germany

FIGURE 1
a) Cs corrected HAADF/STEM image of interference of the anti-phase boundary (APB) with the ferroelectric polarization (FE) in the lattice of polycrystalline $LuMn_{1.04}O_{3\pm\delta}$ solid solution, the sign of FE polarization each side of the APB is unchanged but the phase order parameter shifts by $\Delta\phi=2\pi/3$, as sintered 1300 °C, 5 days in air (FEI Titan 200 kV ChemiStem TEM/HAADF-STEM, collaborative research with INL, PT). b) PFM image, development of 2 topological 6-fold vortices (1,2) of FE domains inside the volume of polycrystalline grains and truncation of a topological vortex (3) by interaction with pore free surface, same composition sintered for 10 days, post-annealed above Curie temperature at 1450 °C 3 h with controlled cooling rate 40 $Kmin^{-1}$, NT-MDT NTEGRA PRIMA AFM/PFM, CICECO/UA infrastructure.

Approximation in Morrey spaces

Alexandre Almeida[1], Stefan Samko[2]

1 — Department of Mathematics & CIDMA, University of Aveiro
2 — University of Algarve

Morrey spaces are widely used in applications to regularity properties of solutions to partial differential equations (PDE), including the study of Navier–Stokes equations. They are usually attributed to C.B. Morrey due to the celebrated paper On the solutions of quasi-linear elliptic partial differential equations, Trans. Amer. Math. Soc. 43 (1938), 126–166.

Although Morrey spaces are not separable in general, they allow to describe local properties of functions better than Lebesgue spaces. This feature is particularly important in applications. Nowadays there are many papers in the literature dealing with this kind of spaces and their generalizations.

Our work gives a contribution to the problem of the approximation by smooth functions with compact support in Morrey setting. Considering a number of known and new vanishing properties for Morrey functions, we have introduced a new subspace of Morrey spaces whose elements can be approximated by infinitely differentiable compactly supported functions. As a consequence, we have obtained an explicit description of the closure of the set of such functions in Morrey norm.
This research was motivated from the lack of density of smooth functions in Morrey spaces. We believe that our contribution will be of strong interest either for the theory of function spaces itself or from the applications point of view. On the other hand, our results are expected to be very useful in Harmonic Analysis (including Calderón-Zygmund theory) in Morrey spaces. Moreover, we are convinced this will be highlighted in new papers stimulated by this research.

A global Riemann-Hilbert problem for two-dimensional inverse scattering at xed energy

Evgeny L. Lakshtanov[1], Roman G. Novikov[2], Boris R. Vainber[3]

Imagine that one instructs a monkey to write formal mathematical expressions and we ask it to propose an equation for us to solve. The truth of life is that mathematicians, almost for sure, will not know how to solve this equation explicitly, i.e. creating a formula as we solve quadratic equations in high school. So one can consider Mathematics as an art of tricks to solve a vanishing percentage of possible problems a monkey can propose. Another side of this truth is the following: if a problem is important enough, several generations of mathematicians are able to find a sequence of tricks which lead to a solution. Very rarely the miracle happens that a new trick allows to solve a pack of problems given by a monkey named Nature.

It happened exactly 50 years ago in 1967 when a group of mathematicians discovered that the KdV equation (1D water equation, simplest among nonlinear equations) can be reduced to a couple of linear equations [1]. In the following years it was discovered that the same procedure is applicable for many other important 1D and 2D equations. For example, equations that mode nonlinear propagation of light in an optic fiber, propagation of water waves, Heisenberg ferromagnetic model. The early stage of this progress is connected with names of Lax, Faddeev, Zakharov and Shabat. Although, in general the idea of this method has been clearly absorbed by scientific community, the proposed technique is not a set of computer applicable methods, but contains a piece of art: How can the problem be reduced to a Riemann-Hilbert factorization problem?

During 1980s attempts to solve some 2D equation (Novikov-Veselov, Davey-Stewartson II, Kadomtsev–Petviashvili II and Ishimori) met a common problem: the possible appearance of "curves" of special points, exactly those points which in 1D correspond to travelling waves: solitons. In the 1D case such solitons form a set of isolated points and do not represent a serious technical problem, but in 2D they can appear as a curve and analogues of its successful treatment did not exist.

In 1991 the monograph by Ablowitz and Clarkson [2] on nonlinear evolution equations joined these problems together and stated the overcoming of this common difficulty as an open problem. The art of solving nonlinear equations equations has been enriched in 2016 with appearance of the article [3] where authors proposed a method of reducing to the Riemann-Hilbert problem in the possible presence of "soliton curves". Let us give a brief technical insight into the developed method. In 1D scattering problem the solution allows an analytic continuation into the complex plane of non-physical energies. The quotient of the limiting values equals to the scattering amplitude and therefore the Riemann-Hilbert problem is a natural tool to reconstruct the scattering solution via the known scattering amplitude. In 2D scattering problem there does not exist an appropriate analytic continuation into the plane of non-physical energies, instead of that the quotient of the scattering solution and its partial derivative (dbar) equals to the scattering amplitude. In this case the inverse procedure is given by a superposition of the dbar-problem in the whole complex plane and the non-local Riemann-Hilbert problem at the real line. This beautiful idealistic situation holds only in the case of absence of “soliton” energies. Authors of [3] developed an alternative: if one chose a finite domain D such that all possible “soliton” points or curves are inside D, then the inverse procedure can be reduced to a superposition of the dbar-problem outside D and the non-local Riemann-Hilbert problem at the boundary of D.

1 — Department of Mathematics & CIDMA, University of Aveiro
2 — Ecole Polytechnique, France
3 — University of North Carolina, USA

Warm Little Inflaton

Mar Bastero-Gil[1], Arjun Berera[2], Rudnei O. Ramos[3], João G. Rosa[4]

1 — Department of Theoretical and Cosmological Physics, University of Granada, Spain
2 — School of Physics and Astronomy, University of Edinburgh, United Kingdom
3 — Department of Theoretical Physics, Rio de Janeiro State University, Brazil
4 — Department of Physics & CIDMA, University of Aveiro

Inflation is one of the pillars of modern cosmology, postulating the existence of a new scalar field, a coherent collection of spin-0 particles, which was responsible for the exponential expansion of the Universe in its first tiny fractions of a second. Inflation explains not only the observed flatness and homogeneity of the Universe but also the small temperature anisotropies in the Cosmic Microwave Background (CMB), seeded by quantum fluctuations in the "inflaton" field.

The inflationary Universe is conventionally thought to have been extremely cold, due to the exponentially fast expansion, and to only later have reheated as a result of the inflaton's decay into ordinary matter and radiation. This decay could not, however, have left any observational imprint in the CMB, making it very hard to experimentally assess how the inflaton interacts with the known elementary particles.

In an alternative scenario, known as warm inflation, the inflaton field could have decayed during (rather than after) inflation, and slowly converted its energy into warm radiation. This could have prevented the Universe from supercooling during inflation and left a distinctive imprint in the CMB.

Despite its several attractive features, this idea has been regarded for nearly two decades as nearly impossible, since the inflaton's decay could have prevented inflation from occurring. In this Letter, we have confounded these expectations and constructed the first simple and compelling particle physics model of warm inflation, finding an excellent agreement with the latest observations of the CMB by ESA's Planck satellite. Our construction employed simple symmetry requirements, analogous to "Little Higgs" models of the recently discovered Higgs boson, to show that the early Universe may have always been in a warm state, thus opening up new avenues for research in early Universe cosmology.

International cooperation in the impact evaluation of restructuring general secondary education in East Timor – achievements and challenges

Isabel Cabrita[1], Margarida Lucas[1]

The TIMOR project Evaluating the impact of restructuring secondary education in East Timor: a study in the context of international cooperation (http://projetotimor.web.ua.pt) was framed by Evidence Based Policy, Theory of Change and Monitoring and Evaluation (ME). Timorese policy makers, intermediate government structures, school directors, teachers' educators, teachers, pupils and Portuguese teacher educators were involved in the ME phases of the mixed study. Data was collected using questionnaires, interviews, focus groups, documental analysis and observation in schools, training sessions and classrooms.

Data analysis enabled to conclude that the i) curriculum materials (co)developed with Timorese entities – curricular plan, 14 syllabus, 42 student's books and 42 teacher's guides for the general secondary (GS) education – are valued due to their quality, the standardization of the GS curriculum they enable, their coherence/adaptation to the Timorese context and ii) educational activities concerning their use resulted in short/medium-term advantages to the educational process regarding linguistic/scientific/curricular/didactic levels. Medium/long-term contributions for the country's development are likely to be achieved, should favorable conditions for the restructuring be maintained.

Recommendations to overcome challenges identified have been proposed, namely regarding the conditions of GS schools in terms of infrastructure, organization, functioning and respective legislation and regulatory mechanisms for education and school management; the initial, postgraduate and in-service teacher education (duly monitored and certified) and its adaptation to the current curriculum with a view to change the existing teaching practices, teachers' and students' conceptions regarding the educational process, and to improve the quality of teaching and learning.

These justify the continuity of the ongoing cooperation and ME of the GS restructuring, which brings considerable benefits beyond the parties involved.

1 — Department of Education and Psychology & CIDTFF, University of Aveiro

Team members: Isabel Cabrita, Adriana Ferreira, Ana Capelo, Ana Torres, Carlos Santos, Margarida Lucas, Margarida Morgado, Maria Costa, Mariana Martinho, Patrícia Almeida, Patrícia Sá and Zélia Breda
Consultants: Isabel P. Martins, Ana Margarida Ramos and Luís Marques

Female preferences' for masculinity cues in body odour

Mariana L. Carrito [1, 2, 3], Isabel. M. Santos [1], Laura Alho [1, 2, 4], J. Ferreira [1, 2], Sandra C. Soares [1, 5, 6], Pedro Bem-Haja [1, 2], Carlos F. Silva [1], David I. Perrett[3]

1 — Department of Education and Psychology & CINTESIS, University of Aveiro
2 — Faculty of Medicine & IBILI, University of Coimbra
3 — School of Psychology and Neuroscience, University of St Andrews, United Kingdom
4 — Lusófona University of Humanities and Technology
5 — Department of Clinical Neuroscience, Division for Psychology, Karolinska Institutet, Sweden
6 — ISPA-Instituto Universitário, William James Center for Research

Previous studies indicated that attractiveness perceptions in humans are influenced by cues of sexual dimorphism (masculinity/ femininity). From an evolutionary view, extremes of phenotypic sexual dimorphism (more feminine for women, more masculine for men) are attractive because they advertise the quality of an individual in terms of heritable benefits ('good genes') and/or superiority in intrasexual (within same-sex members) competitiveness. Namely, more masculine men are believed to provide gains to the partner, such as higher chances of survival, reduced risk of infection, increased resources and offspring disease resistance. One of the variables that seem to be sexually dimorphic is skin colour. Men tend to have a darker, redder and yellower hue comparing to women. In previous research from our lab, women were found to prefer faces of men with a more masculine skin tone.

The present study aimed to understand whether men with more masculine skin colour also have a more attractive body odour. Body odours are believed to communicate important social information and may be used to advertise mate quality. Therefore, we hypothesised that women discriminate opposite-sex body odours based on its level of masculinity. To address this question, we used spectrophotometry to measure CieLAB facial skin colour values from 18 male participants, and a skin masculinity score was attributed to each participant. Male participants also donated a sample of their body odour. Such samples were later smelled and rated by 48 female non-pill users. Ratings included measures of attractiveness, pleasantness and sexiness. As expected, results showed that women attributed higher ratings on such measures to body odours belonging to men with more masculine skin tone. Such findings may imply that women do prefer the odours of men with more masculine skin colour and that sex hormones, responsible for sexual maturation and sexual dimorphic features, may influence chemical compounds in body odours.

Radiogenic isotope geochemistry applied to the characterization of the provenance of sediments transported by icebergs during the last glacial period: A study in the Galicia Interior Basin

Maider Plaza-Morlote[1], José F. Santos[2], Sara Ribeiro[2], Daniel Rey[2], Vírginia Martins[2, 3]

In the scope of a collaboration with the University of Vigo, the Geobiotec research unit has contributed with studies on the Sr and Nd isotopic fingerprints of the sediments deposited in the Galicia Interior Basin in the last six Heinrich Stadials (HS; climatic oscillations that culminated by massive discharge of icebergs to the North Atlantic during the last glacial period). Strongly negative ε_{Nd} values during HS1 (~15-16 ka), HS2 (~23.5-25 ka), HS4 (~37.5-40 ka) and HS5(~43.8-45.5 ka) are consistent with a Canadian source for the sediments dropped by icebergs. In contrast, higher ε_{Nd} and relatively low $^{87}Sr/^{86}Sr$ values were recorded during HS3, HS5a, HS6, but also in the initial stages of HS1 (~16-17.5 ka), HS2 (~25-26.3 ka) and HS4 (~40-42 ka), pointing to an European provenance of those sediments. The whole set of data suggests that large European meltwater discharges in the beginning of HS1, HS2 and HS4 could have contributed to the weakening of the Atlantic Meridional Overturning Circulation and, consequently, to the collapse of the ice sheets covering NW Europe and NE America[1].

1 — University of Vigo, Spain
2 — Department of Geosciences & Geobiotec, University of Aveiro
3 — University of Estado do Rio de Janeiro, Brazil

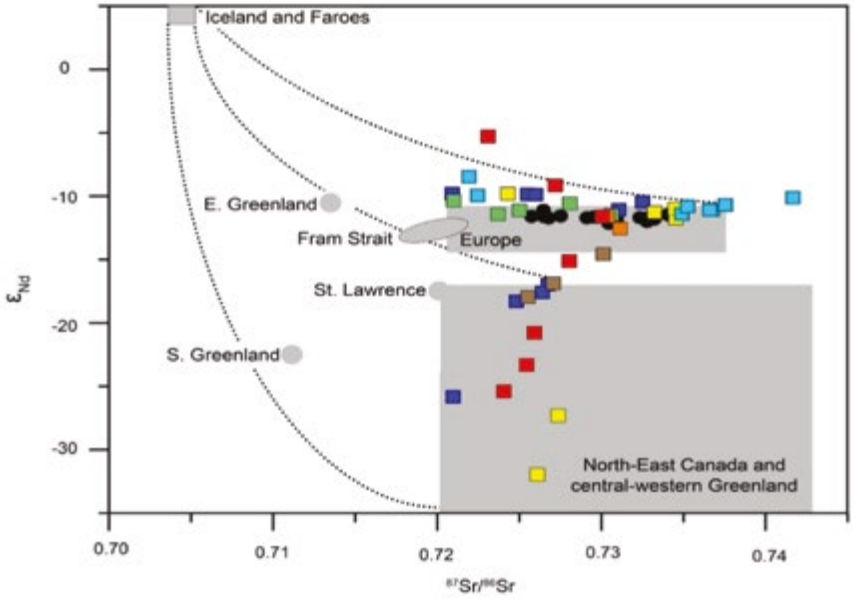


FIGURE 1

ε_{Nd} vs $^{87}Sr/^{86}Sr$. Black circles - layers without HS sediments. Solid squares - HS1 (dark-blue), HS2 (red), HS3 (green), HS4 (yellow), HS5 (brown), HS5a (orange) and HS6 (light-blue). Grey fields - possible source areas adapted from several compilations in the literature. Dotted lines represent potential mixing hyperboles between sources.

Aqueous Acid Orange 7 dye removal by clay and red mud mixes

Walid Hajjaji[1], Robert C. Pullar[2], João A. Labrincha[2], Fernando Rocha[1]

1 —Department of Geosciences & Geobiotec, University of Aveiro
2 —Department of Materials and Ceramic Engineering & CICECO, University of Aveiro

Portuguese clay, Fe-impregnated clay, red mud and clay/red mud mixtures were used in the removal of Acid Orange 7 by Fenton and photo-Fenton (under UV light) oxidation processes. Used red mud was supplied by ALCOA San Ciprián (Lugo, Spain), being a mixture containing about 40% of solids, collected immediately after alumina recovery from the digestion process (Bayer process). In comparison with pure adsorption, the catalytic activity of Fe-loaded clay showed an optimum removal rate (98%). This photo-assisted Fenton degradation of Acid Orange 7 azo-dye molecules was exploiting HO center dot radicals from generated H2O2 and clay supported iron species, following the pseudo-first order kinetic mechanism. Using red mud pre-calcined at 4000 C, 10% improvement in overall discolouration was observed in comparison to the untreated clay. This improvement is attributed to the partial reduction of Fe3+ to Fe2+ species on the surface of the catalyst, and to the reaction with H2O2 to generate highly oxidative hydroxyl radicals. The synergistic effect of photocatalysis due to the presence of TiO2 in the red mud also contributed in this photo Fenton process. Furthermore, the use of red mud/clay catalyst mixes assured 38% dye discolouration at pH 7, but a lowering of solution pH to 3 resulted in a much higher discolouration rate (over 80% after 1 h). The good fitting with a pseudo-second-order kinetic model (R-2 equals to 0.99) shows that adsorption.

FIGURE 1
Catalytic Activity (RM - Red Mud; RM400- Calcined; RM400+H2O2 –with H_2O_2 Addition).

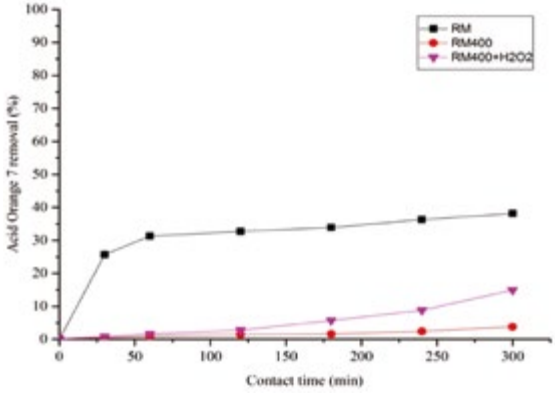
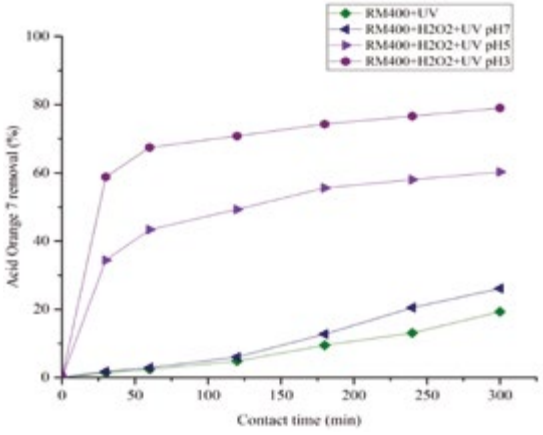


FIGURE 2
Catalytic Activity under UV, at different pH conditions



Integrated Decision Support System

João Lourenço Marques[1], Paulo Batista[1], Monique Borges[1], Eduardo Castro[1]

The socioeconomic importance of housing and its medium- and long-term investment returns requires a significant effort to predict future dynamics to ensure that the different real estate market agents make the best decisions. Furthermore, the territory structure and the lack of information and transparency of the housing market mechanisms also influence its understanding.

The call for data analysis techniques, either to understand the theoretical background of the mechanisms that determine the functioning of the market and define its dynamics, either to provide the basis for the development of decision support tools and policy formulation and assessment, lies on the complexity explained by:

· the lack of high-quality information and adequate tools to support decision making;

· the housing market not being transparent: objective supply information about housing stock, and its technical and financial constraints, isn't clearly available;

·the pricing mechanisms and buyers preferences and expectations not being directly provided.

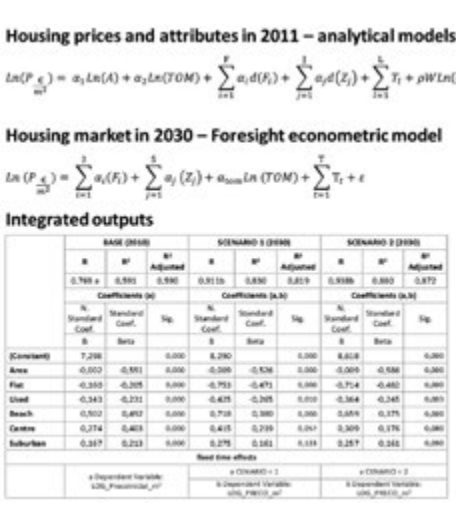
There is a variety of literature on spatial economics that gives theoretical basis for predict housing prices and attributes valuation. However, these analytical models are subject to criticisms because of their inability to integrate the variability of exogenous.

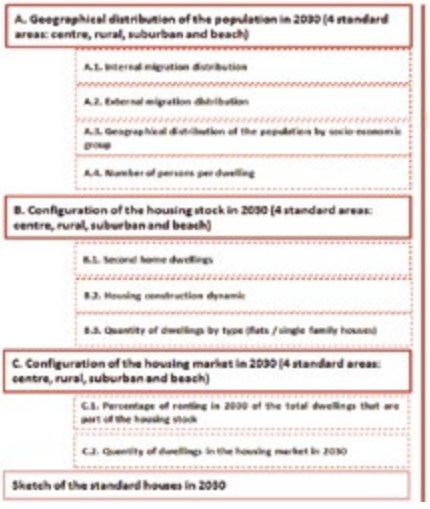
Thus, foresight analysis is a complementary tool to these analytical models, and is one of the central concerns of DONUT-Prospect: an Integrated Decision Support System that deals with the challenges in describing the housing market, both in its spatial heterogeneity and temporal evolution. The conceptual basis and the general framework are based on the combination of two main foresight techniques (scenario analysis and Delphi surveys) with a traditional hedonic housing price model, based on the assumption that it is possible to discuss strategies in the context of great uncertainty and to identify trends and assess future evolution. The empirical application outcomes support the estimation of housing characteristics and its hedonic prices in 2030, based on the evolution of social and economic phenomena and the heterogeneity supply demand (housing prices and features; and type of consumers).

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

FIGURE 1
Housing price model: 2010 e 2030 (foresight model).

FIGURE 2
Link between the expert panel and Delphi exercises.



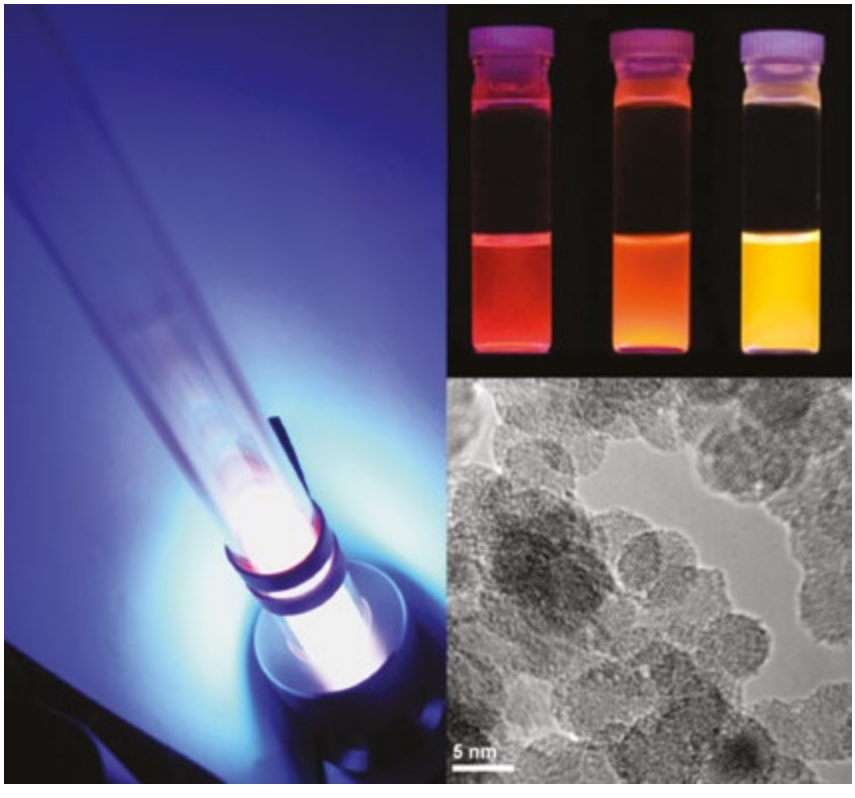


Nonthermal Plasma Synthesis of Nanocrystals: Fundamental Principles, Materials, and Applications

Rui N. Pereira[1], Uwe R. Kortshagen[2], Steven L. Girshick[2], Jeslin J. Wu[2], Eray S. Aydil[2], R. Mohan Sankaran[3]

1 — Department of Physics & I3N, University of Aveiro
2 — University of Minnesota, USA
3 — Case Western Reserve University, USA

Ever since the discovery of size-dependent electronic properties in nanometer-sized crystals of semiconductors, their synthesis, characterization, and applications have intrigued the scientific community. Nanocrystals have led to advances in the fields of solar cells, light emitting devices, and bioimaging, to name just a few. The majority of nanocrystal research is based on materials that are synthesized in the liquid phase, most prominently, group II–VI and IV–VI semiconductors. The temperatures of liquid phase synthesis approaches, however, are limited by the boiling points of available solvents. Thus, the liquid phase synthesis of some materials is inherently difficult as they usually require higher temperatures to produce in crystalline form. This is where gas phase approaches excel, as they do not require organic solvents and are thus inherently capable of high process temperatures. Gas-phase processes can operate under conditions that are close to thermal equilibrium or very far from it. Approaches in the former category include flame synthesis, thermal pyrolysis in furnaces, laser pyrolysis, and thermal plasmas.



Nonthermal plasmas are at the opposite end of the spectrum of gas-phase synthesis approaches as they feature very different temperatures of their constituents: the heavy gas species are at temperatures close to room temperature, while free plasma electrons can achieve temperatures above ~10 000. Collisions between these hot electrons and molecules very effectively dissociate and ionize gaseous nanoparticle precursors, producing highly reactive radicals and ions. These radicals and ions react exothermically on the nanoparticle surfaces, heating the nanoparticles to hundreds of Kelvin above the neutral gas temperature, which is essential for forming nanocrystals. The plasma electrons also charge nanoparticles in the plasma negatively, reducing or eliminating agglomeration, in contrast to other gas-phase processes where agglomeration is difficult to avoid. In an article published in Chemical Reviews, we reviewed the state of the art in nonthermal plasma synthesis of nanocrystals. We discuss the fundamentals of nanocrystal formation in plasmas, review practical implementations of plasma reactors, survey the materials that have been produced with nonthermal plasmas and surface chemistries that have been developed, and provide an overview of applications of plasma-synthesized nanocrystals.

Niobium oxides and niobates for high tech applications

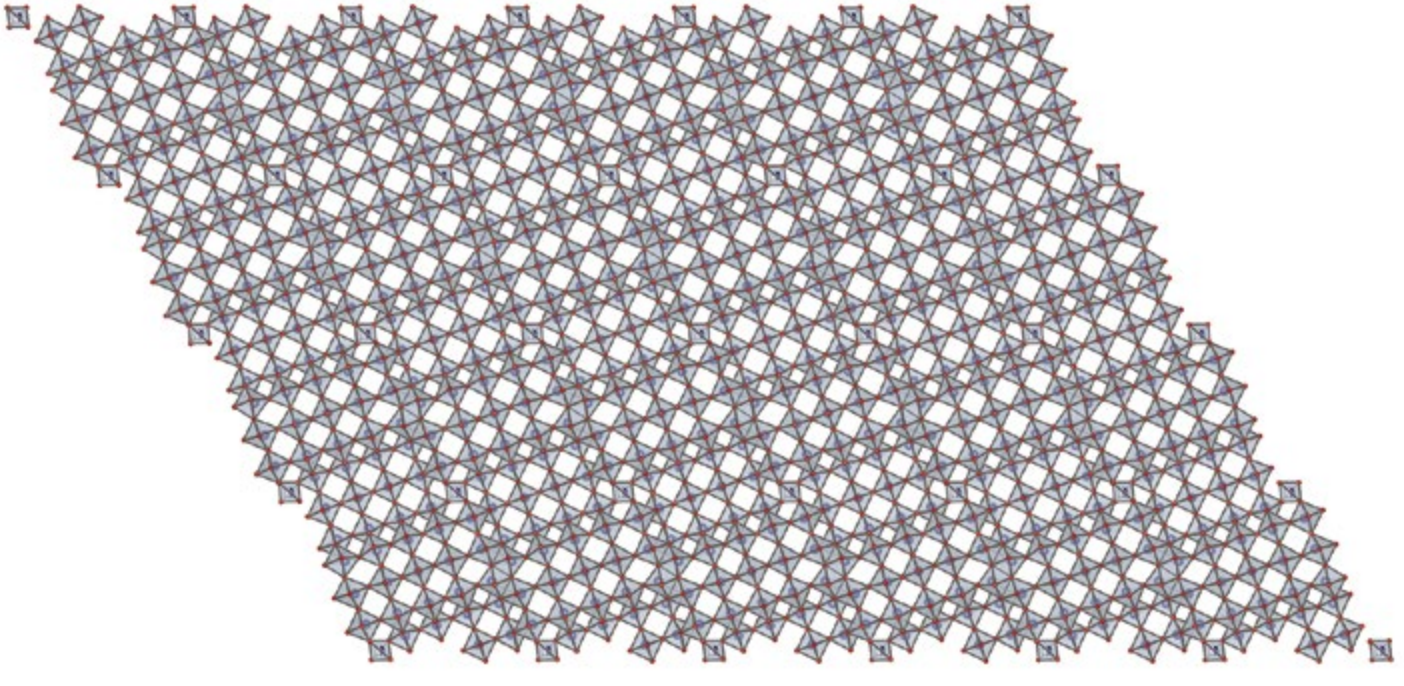
Cláudio Nico[1], Teresa Monteiro[1], Manuel P. F. Graça[1]

It is common knowledge that most technological breakthroughs are tightly related to the ability to manipulate and to engineer the properties of different materials. This ability is often sustained and catalysed by a deep understanding of the physical mechanisms that describe, for instance, their electrical or optical properties.

For the last 75 years several studies have been reporting on the physical properties of niobium oxides, but there is still many contradictory, inconsistent and insufficient information on these metal oxides. While many works can be considered important building blocks, there has been a lack of coordinated efforts and a solid foundations towards the construction of a recognised structured knowledge of these materials.

Like many electron correlated materials, Niobium Oxides show a uncommon combination of interesting physical properties. These materials can find application in solid electrolytic capacitors, catalysis, photochromic devices, transparent conductive oxides or memristors. This complexity and versatility makes it obvious that a good understanding of niobium oxides physical properties and their control is essential and urgent.

1 — Department of Physics & I3N, University of Aveiro



New Mystery of Deuteron radius

João Veloso[1], Daniel Covita[1], *et al.*

1 — Department of Physics & I3N, University of Aveiro

In agreement with previous results obtained for the proton radius and published by the team in Nature in 2010 and in Science in 2013, new results published in Science 2016 prove that the deuteron radius is also smaller than previously established.

Deuteron, the nucleus of the deuterium atom, is composed by one proton and one neutron, being the second simplest nucleus, just after the hydrogen nucleus, the proton. Deuteron radius is an important property for the understanding of the nuclear forces and its structure. These new results were obtained by measuring three 2S-2P transitions, in muonic deuterium (the exotic atom formed by a deuteron and a negative muon instead of an electron). They lead to a deuteron radius value r(d) = 2.12562(78) fm, which is 2.7 times more accurate but 7.5σ smaller than the CODATA-2010 value r(d) = 2.1424(21) fm. Also, r(d) is 3.5σ smaller than in its electronic deuterium form. The assessment of the proton radius, by using the values obtained from muonic deuterium [3], results in a similar value to the one obtained in the former publications using muonic hydrogen, reinforcing the so called "proton radius puzzle".

This achievement was only possible at Paul Scherrer Institute (PSI), near Zurich (Switzerland), where the most intense proton beam in the world exists, capable of generating the required muon beam for the production of muonic hydrogen and deuterium. This work was performed by a multidisciplinary collaboration of 33 researchers from different countries in which each team has brought its own expertise in the fields of accelerator physics, atomic physics, laser technologies and detectors. The Portuguese team, which includes I3N-Aveiro researchers (João Veloso and Daniel Covita), had a crucial contribution in the development of the X-ray detector system needed to achieve the successful experimental measurement.

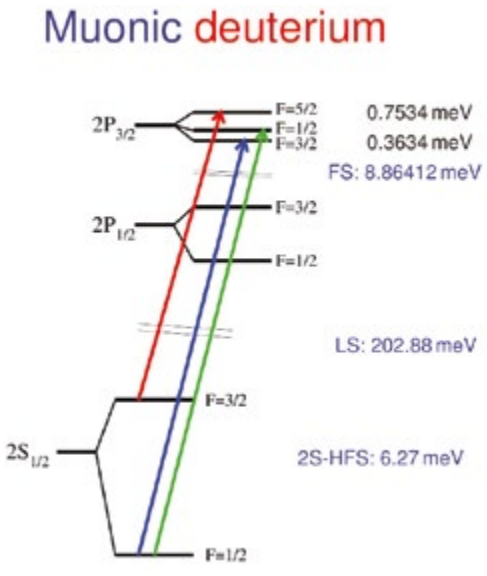


FIGURE 1
n = 2 levels in muonic deuterium. The three measured transitions are indicated.

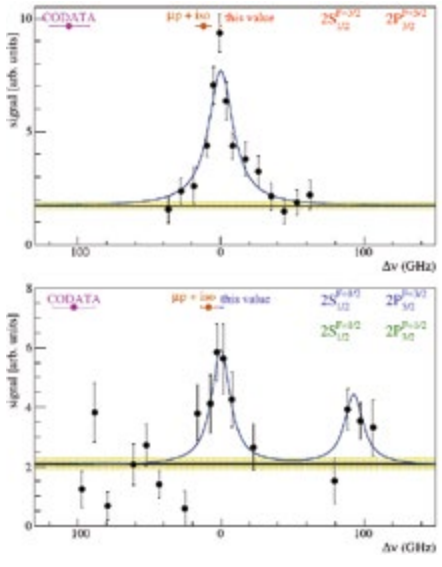


FIGURE 2
Three measured resonances in muonic deuterium.

Hepatitis C virus and Cytomegalovirus use peroxisomes as signaling platforms for evasion of the cellular immune response

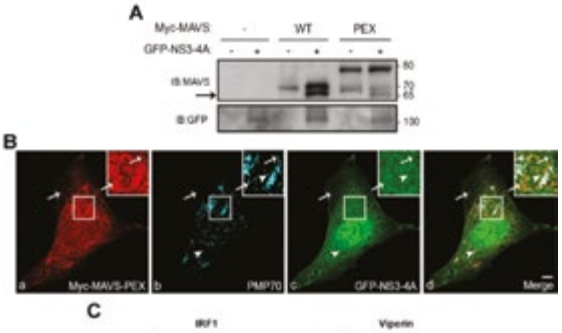
Ana Rita Ferreira[1], Ana Cristina Magalhães[1], Sílvia Gomes[1], Marta Vieira[1], Ana Gouveia[1], Fátima Camões[1], Isabel Valença[1], Markus Islinger[2], Rute Nascimento[3], Michael Schrader[4], Jonathan C. Kagan[5], Daniela Ribeiro[1]

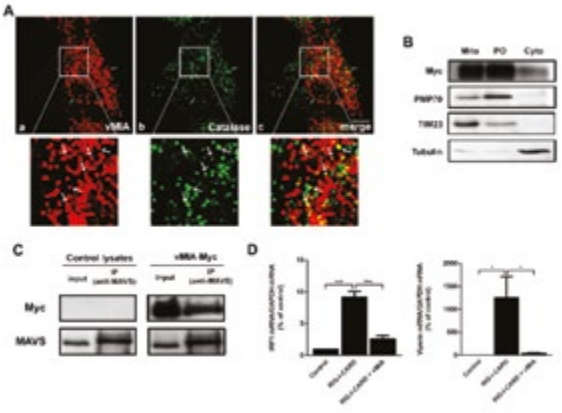
The antiviral defense in mammalian cells can be triggered upon recognition of viral genetic material by soluble proteins such as RIG-I (retinoic acid inducible gene-I), which interacts with MAVS (mitochondrial antiviral signaling adaptor) at peroxisomes and mitochondria. This initiates a signaling cascade that culminates with the production of interferons and ISGs (interferon stimulated genes), preventing important steps in viral propagation. However, in a constant adaptation to their host cells, viruses have developed several different strategies to evade antiviral defenses.

We have recently demonstrated that the hepatitis C virus (HCV) protein NS3-4A is able to specifically cleave the peroxisomal MAVS, leading to the production of a smaller fragment (Fig. 1 A) that is relocated to the cytosol (Fig. 1 B). This cleavage leads to an inhibition of the production of ISGs of such as IRF1 and viperin (Fig. 1 C), consequently disrupting the cellular antiviral defense.

Our results have also recently revealed that the human cytomegalovirus (HCMV) protein vMIA (viral mitochondria-localized inhibitor of apoptosis), localizes at peroxisomes (Fig 2 A, B), where it interacts with MAVS (Fig. 2 C) and specifically inhibits the peroxisomal MAVS-dependent pathway (Fig. 2 D).

Our studies demonstrate that both viruses have developed mechanisms by which they specifically interfere with peroxisomes in order to evade the immune response. Components of this signaling machinery may, hence, prove to be valuable targets for the development of broad-spectrum antiviral combat strategies by the pharmaceutical industry.





1 — Department of Medical Sciences & iBiMED, University of Aveiro
2 — Center for Biomedicine and Medical Technology Mannheim, University of Heidelberg, Germany
3 — Instituto Gulbenkian de Ciência
4 — College of Life and Environmental Sciences, University of Exeter, UK
5 — Division of Gastroenterology, Boston Children's Hospital and Harvard Medical School, USA

FIGURE 1
Peroxisomal MAVS cleavage by HCV NS3-4A evaluated by Western blot (A) and immunofluorescence confocal microscopy analyses (B). Inhibition of the peroxisome-dependent MAVS pathway by NS3-4A in cells that contain MAVS solely at peroxisomes, evaluated by RT-qPCR (C).

FIGURE 2
Peroxisomal localization of vMIA in HFF cells infected with HCMV demonstrated by immunofluorescence and confocal microscopy analyses (A) and cellular fractionation (B). Interaction between vMIA and peroxisomal MAVS demonstrated by co-immunoprecipitation analysis (C). Inhibition of the peroxisomal dependent antiviral signaling by vMIA in cells that contain MAVS solely at peroxisomes, demonstrated by RT-qPCR analysis (D).

The histone H2A isoform Hist2h2ac is a novel regulator of proliferation and epithelial--mesenchymal transition in mammary epithelial and in breast cancer cells

Fátima Monteiro[1], Rui Vitorino[2], Jun Wang[3], Hugo Cardoso[1], Hugo Laranjeira[1], Joana Simões[1], Margarida Caldas[4], Rui Henrique[4], Francisco Amado[1], Cecilia Williams[6], Carmen Jerónimo[5], Luísa Helguero[2]

1 — Department of Chemistry & QOPNA, University of Aveiro
2 — Department of Medical Sciences & iBiMED, University of Aveiro
3 — Department of Biology and Biochemistry, Center for Nuclear Receptors and Cell Signalling, University of Houston, USA
4 — Department of Pathology, Portuguese Oncology Institute of Porto
5 — Cancer Biology and Epigenetics Group, Portuguese Oncology Institute of Porto
6 — Science for Life Laboratory, Division of Proteomics, School of Biotechnology, KTH - Royal Institute of Technology, Sweden

Genetic programs determine cell function. Understanding how accessibility to genetic information occurs in the normal functional differentiation process helps us understand the deregulations observed in diseases such as cancer. Genetic information is encoded in our DNA, which is packaged and compacted into the cell´s nucleus. Histones are a class of proteins used to package the DNA; the level of packaging is regulated by multiple chemical modifications in these proteins and determines whether the genetic information contained in our genes can be accessed by the cell. There are four canonical histone families H2A, H2B, H3, and each one of these families comprises several isoforms. Until recently, canonical histone isoforms were assumed to be functionally redundant and intercheangeable within each class. This is mainly due to their high degree of homology which does not allow straight forward analysis.

AIM: In this study, we aimed to identify changes in the canonical histone profiles throughout the normal cell differentiation process and correlate findings with alterations observed in breast cancer.

RESULTS: Using a combined mass spectrometry and transcriptomics approach, we were able to identify over 23 histones differentially expressed in highly proliferating/poorly differentiated cells as compared to functionally differentiated cells. Among these proteins, Histone H2A type 2-C (Hist2h2ac) was particularly high in undifferentiated cells with high division rate (highly proliferative) cells. Poor differentiation and high proliferation are characteristics of cancer cells and we found that Hist2h2ac is necessary for the cells to keep their undifferentiated phenotype (by decreasing the cell adhesion protein E-cadherin and increasing the oncogenic protein Zeb-1). We also established that high Hist2h2ac levels are maintained by stimulation of MAPK/ERK and PI3K/AKT intracelular pathways, which are activated by epidermal growth factor (EGF). EGF plays an important role in cancer, through stimulation of proliferation and we observed that by inhibiting Hist2h2ac expression, breast cancer cells could not proliferate when stimulated by EGF. Finally, we also studied Hist2h2ac expression in human breast cancer samples and observed that it is mutated or upregulated in about 16% breast cancers analysed.

CONCLUSION: Cannonical histone isoforms are specifically regulated according to the differentiation stage of the cells. Therefore, they are not interchangeable. Moreover, we propose that Hist2h2ac is signalling hub which is kept in high levels by EGF and at the same time is needed to allow the cells to respond to this growth factor and proliferate. In the future, we plan to study in more detail the genetic programs regulated by Hist2h2ac in human breast cancer so we can determine if blocking its expression can inhibit tumour growth.

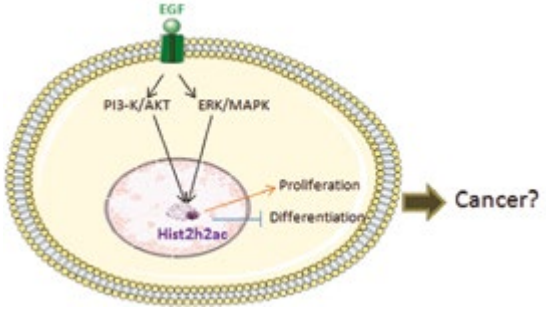


FIGURE 1
Schematic representation of main findings from the study.

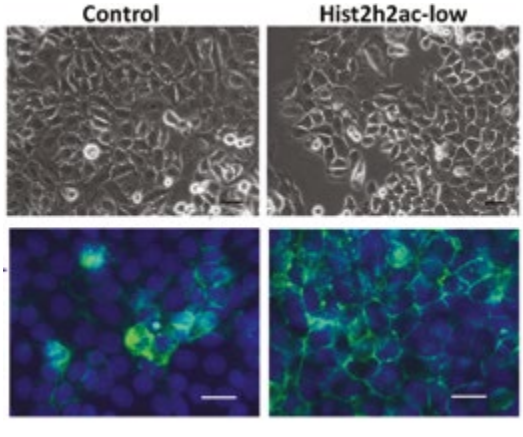


FIGURE 2
Hist2h2a inhibition (Hist2h2a-low cells) results in enhanced cell differentiation correlating to higher E-cadherin levels (green). Blue: nuclei.

Profiling signaling proteins in human spermatozoa: biomarker identification for sperm quality evaluation

Joana Vieira Silva[1], Maria João Freitas[1], Bárbara Regadas Correia[1], Luís Korrodi-Gregório[1], António Patrício[2], Steven Pelech[3], Margarida Fardilha[1]

The molecular biology of the spermatozoa has been neglected in the last decade due to the use of assisted reproduction technologies (ART) that bypassed the need for a "normal" ejaculated sperm sample. However, it is preferable to rise sperm quality and avoid ART. Identification of the male infertility factors and biomarkers will improve fertility management and even allow for conception through intercourse.

In this study, we unraveled the signaling pathways involved in regulating human sperm function and correlated them with clinical data. A total of 37 semen samples, obtained from a randomized group of donors, were included in this study. We examined 18 signaling proteins for their phosphorylation or cleavage status. Data was then correlated with basic semen parameters and spermatozoa DNA integrity. The results indicated that the activity of several proteins was significantly correlated with spermatozoa clinical parameters (Figure 1, green and pink nodes). Moreover, we established a profile for the expression of a large number of protein kinases in human spermatozoa. Thirty-four protein kinases were identified as expressed in their total levels in normozoospermic samples (Figure 1, orange and pink nodes). From those, 8 kinases (CDK2, PAK3, KSR1, BMX, DAPK1, CSNK1D, MAP4K2 and ZIPK) were identified for the first time in human spermatozoa.

We have identified several proteins that showed a high degree of differential activity and have the potential to integrate a quantitative array, which may have several applications: explain idiopathic infertility, failure in ART or repeated abortion; choice of the appropriate ART; and assess the efficacy of medical interventions.

1 — Department of Medical Sciences & iBiMED, University of Aveiro
2 — Hospital Infante D. Pedro E.P.E., Aveiro
3 — Kinexus Bioinformatics Corporation, Vancouver, British Columbia, Canada

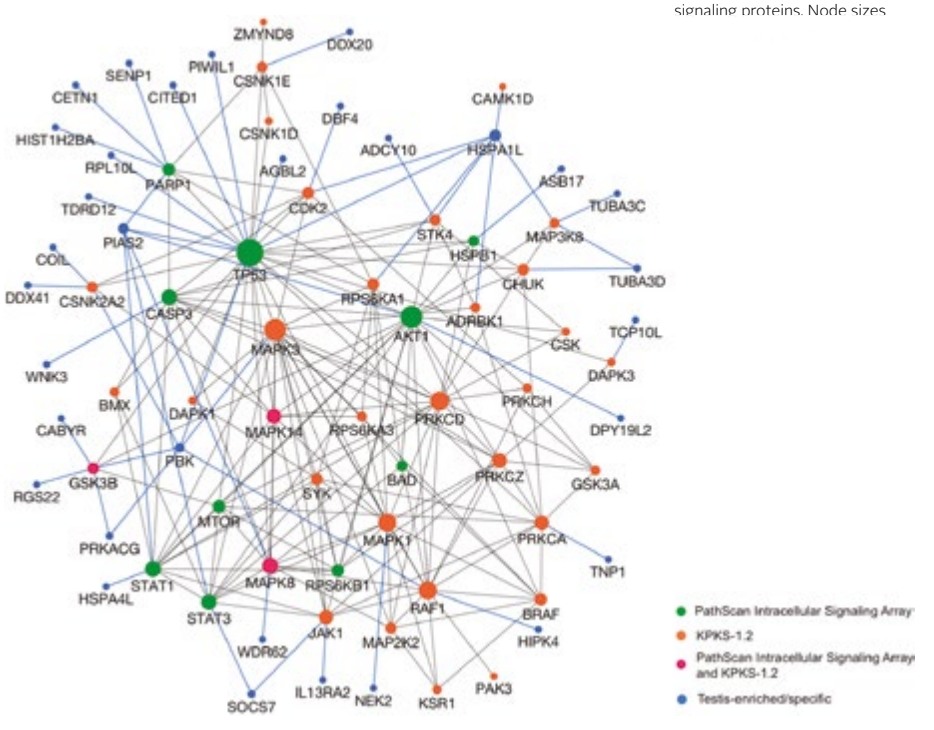


FIGURE 1
Network of the signaling proteins identified as correlated with clinical sperm parameters (green and pink nodes) and in the kinases screen (orange and pink nodes). Blue nodes and edges represent direct testis-enriched/specific interactors/interactions of those signaling proteins. Node sizes

Learning to decode human emotions

Petia Georgieva[1], Lachezar Bozhkov[2], Petya Koprinkova-Hristova[3]

1 — Department of Electronics Telecommunications and Informatics & IEETA, University of Aveiro
2 — Technical University of Sofia, Bulgaria & IEETA
3 — Bulgarian Academy of Sciences, Bulgaria

Affective Computing (AC) is a research field that aims to automatically detect and quantify human emotions. Mainstream techniques for affect detection are voice or facial expressions, text, body posture or language. Affective Neuroscience is a recent AC approach that attempts to find the neural correlates between human emotions and the brain activity registered by Electroencephalography (EEG). Learning to decode human emotions (Fig.1) across multiple subjects is a challenging problem due to the high EEG variability between individuals.

In the present work we developed a new deep learning algorithm, Echo State Network (ESN) with Intrinsic Plasticity, as a general framework for extracting the most relevant AC discriminative features. ESN belongs to the class of recurrent neural networks where the parameters of the hidden recurrent layer (called reservoir) are generated randomly and only the ESN output parameters (the readout) are trained. This ESN property speeds up the model training however there is a risk to become unstable. We applied the biologically inspired adaptation rule Intrinsic Plasticity (IP) to guarantee the reservoir parameters tend to equilibrium states and observed that these states are concentrated in different regions depending on the inputs. If two input vectors are close in the input space, they will result in close equilibrium points in the reservoir state. These findings defined the feature selection approach: the EEG recordings are mapped into the reservoir equilibrium states. The dominant features are extracted iteratively from low dimensional combinations of these states. The proposed ESN-based software sensor was demonstrated for detecting the positive and negative valence of human emotions across individuals.

AC systems (Fig.2) are useful for brain studies, psychology research and clinical applications as a complement to other statistical methods. This work is part of a joint project that involves researchers from University of Aveiro, Technical University of Sofia and Bulgarian Academy of Sciences.

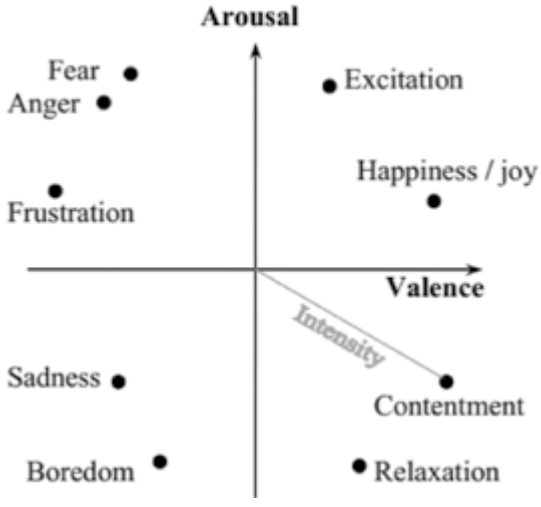


FIGURE 1
Human emotions in valence-arousal space.

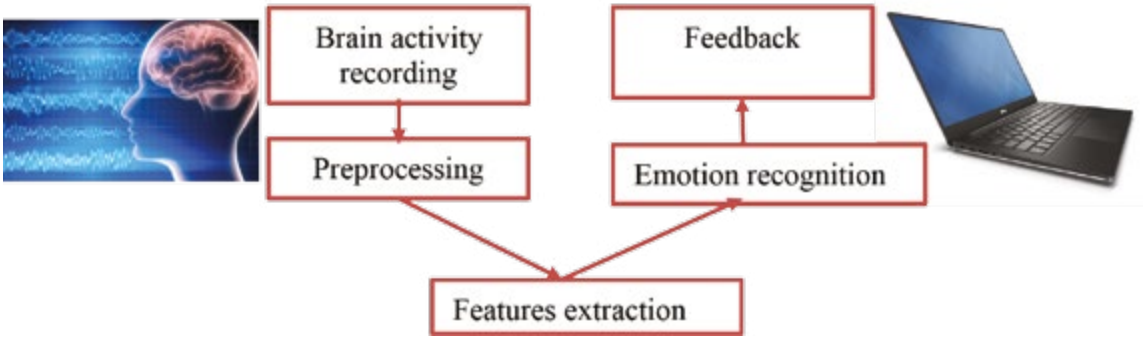


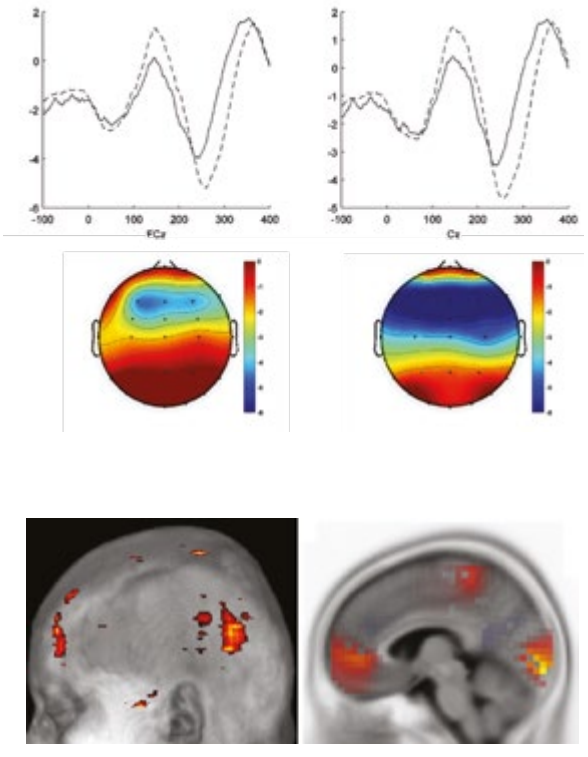
FIGURE 2
Emotion decoding architecture.

Extraction of Relevant Components of Electroencephalogram Signals During Cognitive Tasks

Ana Maria Tomé[1], Karema Al-Subari[2], Saad Al-Baddai[2], Ana Rita Teixeira[3], Isabel M. Santos[4], Elmar W. Lang[2]

The electroencephalogram (EEG) and functional magnetic resonance (fMRI) are widely used tools in cognitive brain studies. A combination of both profits from high a temporal resolution of the EEG and a high spatial resolution of fMRI. However due to interferences of other biomedical signals or due to the low amplitude of the interesting events the signals need to be processed. The most widely used methodologies involve the signal decomposition into components whose goal might be to extract interferences or the significant components. Event-related potential (ERP) studies associated with the Halstead Category Test (HCT) are only possible if the high amplitude ocular and movement artifacts during performance of the test are removed. The decomposition of the EEG signal inspired on Singular Spectrum Analysis (SSA) allows the enhancement of the feedback-related negativity (FRN) wave, which is related to error-processing (fig. 1). This preliminary study show the importance of the pre-processing step in a scenario where the interferences are very difficult to avoid.

Lately, Ensemble Empirical Mode Decomposition (EEMD) techniques receive growing interest in biomedical data analysis. Event-Related Modes (ERMs) represent the relevant features extracted by an EEMD from electroencephalographic (EEG) recordings. Then, based upon the problem at hand, the most closely related ERM, in terms of frequency and amplitude, is combined with inverse modeling techniques for source localization. Bidimensional Empirical Mode Decomposition(BEMD) interprets an image as a superposition of Intrinsic Modes. This study introduces a new technique to extract the latter based on Green's function with tension(fig.2).



1 — Department of Electronics Telecommunications and Informatics & IEETA, University of Aveiro
2 — CIML – University of Regensburg- Germany
3 — IEETA, University of Aveiro
4 — Department of Education and Psychology & CINTESIS, University of Aveiro

FIGURE 1
HCT test data analysis: Top: Grand-average waveforms of individual ERPs for two channels considering two subsets of trials: Wrong responses (dash line) and Right responses (solid line). Bottom: Head topography of the grand-average waveforms considering a visualization window centered at 250 ms: left: Wrong response and right: Correct responses.

FIGURE 2
EMD decompositions of fMRI and EEG. Left: The intrinsic mode as extracted with Bi-dimensional EEMD from fMRI data, and right: data reconstructed from ERM5 of the EMD decomposition of EEG data. The comparison concentrates on the late ERP N200.

Understanding leadership in community music-making projects behind bars: Three experiences in Portuguese prisons

Inês Lamela[1], Paulo Maria Rodrigues[1]

1 — Department of Communication and Art & INET-md, University of Aveiro

Based on participant observation of three projects differing in duration, target audience, theme, objectives and resources, this article seeks to contribute to a reflection about the role of a leader of community music projects in a prison context. We briefly describe three different musical projects that took place during 2013 in two Portuguese prisons: two projects associated with the Casa da Música (CdM) in Porto – (1) A Casa vai a Casa at the Estabelecimento Prisional do Porto (six sessions between January and March 2013) and (2) Consagração da Primavera at the Estabelecimento Prisional Especial de Santa Cruz do Bispo (twelve sessions between January and May 2013) – and (3) the project of Magna Tuna Cartola at the Estabelecimento Prisional Regional de Aveiro (three sessions in February 2013). From these experiences and based on a comparative analysis of data collected in the different projects, we seek to identify the working strategies used by each of the musical leaders and present a reflection on how they were used in different dimensions ofeach project. The discussion takes place around two main aspects: (1) the strategiesused to guide the musical work itself; and (2) the strategies used to promote the relationship and interaction with and between inmates. With the first aspect we include as important ideas: the search for musical refinement, aural and memory work and the use of signs and gestures. With the second aspect, we identify the following issues: group work, creation of bonds, affection and trust and open leadership.

Mobility and Multihoming in Vehicular Networks: Connecting simultaneously to all available networks and technologies

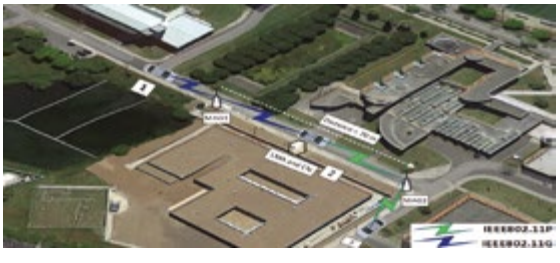
Nelson Capela[1], André Martins[1], Marco Oliveira[1], Francisco Castro[1], Rui Lopes[1], Susana Sargento[1]

Our vision of a vehicular network is the one that extends our communications from the home, office and coffee to the roads. The scenarios we envision are the following. When a vehicle moves along the road, it will be a user of the available fixed access points in the roads, and will also be able to work as a mobile router capable of spreading the Internet connection not only to its passengers, but also to the other vehicles nearby. This will allow extending the range of the Internet access connection through multi-hop over the vehicular network reducing the need of fixed infrastructures, and therefore, the costs of deploying a vehicular network. In our previous work we designed and implemented a mobility protocol capable of providing mobility to the vehicles and all their dependents to provide mobility in vehicular networks handled distributively between the vehicles and the access points.

In this work we go further than providing seamless mobility and connection to the best network: we include the concept of multihoming and enable the connection of a vehicle to multiple networks and technologies simultaneously, being able to choose the optimal path for each service and flow, through a road side unit, cellular station, or through another vehicle in multi-hop. The concept of optimal may consider the objective of load-balancing of traffic between different networks and technologies, or may consider the traffic split between different networks according to its characteristics in terms of bandwidth and delay. The integration of multihoming in a vehicular scenario will enable a more seamless and transparent handover between different networks, since the handover becomes a traffic movement between different networks. A typical scenario is, for example, a vehicle moving along a road and with two interfaces, IEEE 802.11p and WiFi. This vehicle initiates services from its users through the IEEE 802.11p interface to a road side unit, but the bandwidth requirements of the active flows in this IEEE 802.11p network are significant, and the vehicle is requested to use both interfaces simultaneously to receive the service. Then, while the vehicle moves, the multihoming approach decides to send all the traffic through the IEEE 802.11p network; after some seconds, the vehicle starts losing the connection to the first WiFi network and detects a new WiFi connection, performing a handover between these two WiFi networks (although not sending traffic to this network). Finally, the vehicle stops at a traffic light and decides to send the sensors information that it gathered before through the WiFi network, maintaining the previous services in the IEEE 802.11p network and using both simultaneously. This represents a complete paradigm shift, since the connection of a new network does not represent the need to execute handover but the possibility to use more resources; and a connection loss does not represent the loss of service, but the reconfiguration of the services through the available networks.

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

FIGURE 1
Vehicles connecting through different access networks simultaneously in multihoming.



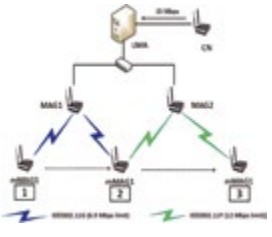


FIGURE 2
a) Real scenario;
b) schematic of the real scenario.

Gigabit Backscatter Modulator with Wireless Power Transmission Capabilities

Ricardo Correia[1], Nuno Borges Carvalho[1]

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

The rapid increase in the progress and development of wireless communications and identification has led to the increase of billions of devices figuring the Internet of Things (IoT). Low power wireless sensors, passive-backscatter radios such as passive RFIDs, RFID-enabled sensors and passive wireless sensors are seen as key-enabling technologies to realize the future ubiquitous IoT.

Our work presents a system composed of a backscatter modulator at 2.45 GHz with data rates up to gigabit which is shown in Figure 1. Moreover, a rectifier that is capable of converting the RF signal into DC power also composes the system. The proposed system enables low power consumption, while maintaining a high modulation bandwidth (16-QAM).

This system will improve the design of novel wireless communication techniques to achieve higher data rates while simultaneously minimize the energy consumption. The energy consumption per bit of this modulator can be as low as 0.33 pJ for a data rate of 960 Mb/s with an EVM of 12.8% as can be seen in Figure 2. The EVM can be decreased if the data rate is lower thereby increasing the energy consumption per bit. The system, due to the rectifier block has demonstrated some WPT capabilities. With all these features this system is suitable for providing high-bandwidth for future low power devices.

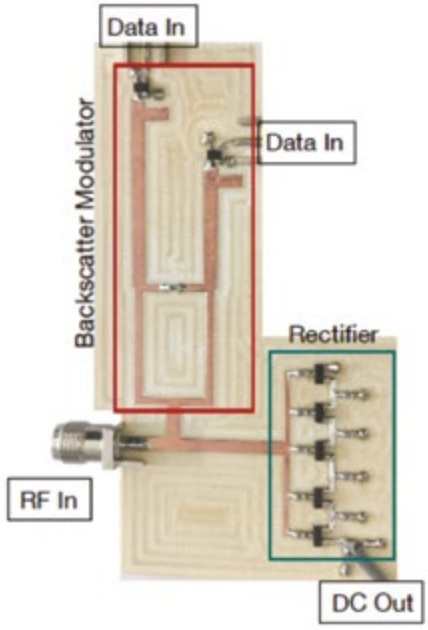


FIGURE 1
Photograph of the proposed system, composed by a 16-QAM modulator and a rectifier.

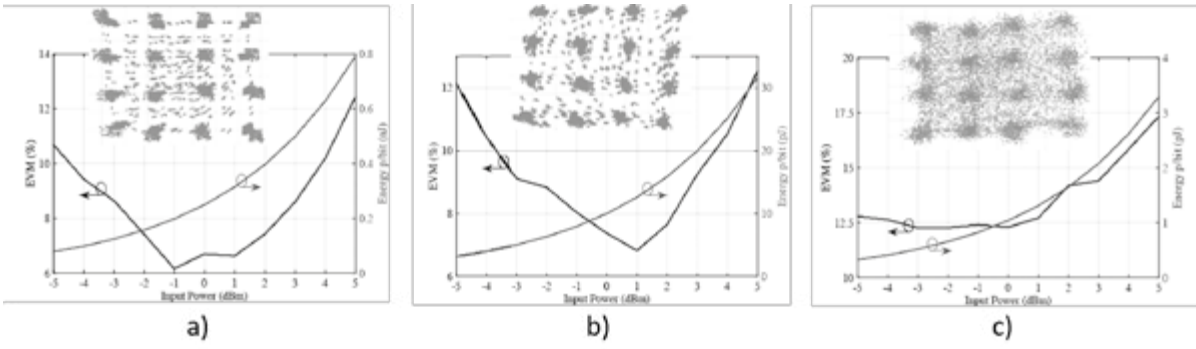


FIGURE 2
Received constellations with EVM and energy per bit consumption as function of input power for different data rates. (a) 4~Mb/s. (b) 100~Mb/s. (c) 960~Mb/s.

Scalable Semantic Aware Context Storage

Mário Antunes[1], Diogo Gomes[1], Rui L. Aguiar[1]

When we think about the Internet we mostly consider servers, laptops, routers and fixed broadband that have penetrated almost every household. But the fact is that the Internet is diversifying as we speak. IoT has made it possible for everyday devices to acquire and store contextual data, in order to use it at a later stage. This allows the devices to share data with one another, and even services on the Internet in order to cooperate and accomplish a given objective. A cornerstone to this connectivity landscape is machine-to-machine (M2M). M2M generally refers to information and communication technologies able to measure, deliver, digest and react upon information autonomously, i.e. with none or minimal human interaction.

Context-awareness is an intrinsic property of IoT and M2M scenarios. Context- aware communications and computing has played a critical role in understanding sensor data. In Iot/M2M scenarios, an entity's context can be used to provide added value: improve efficiency, optimize resources and detect anomalies. The following examples illustrate the importance of context information in M2M scenarios. Fusing data from several sensors makes it possible to predict a driver's ideal parking spot. Projects such as Pothole Patrol and Nericell use vehicular accelerations to monitor road conditions and detect potholes. TIME (Transport Information Monitoring Environment) project combines data from mobile and fixed sensors in order to evaluate road congestion in real time.

However, recent projects follow a vertical approach, devices/manufacturers cannot share context information because each one uses a different structure, leading to information silos. This has hindered interoperability and the realisation of even more powerful IoT and M2M scenarios.

Common definitions of context information are so broad that any data related to an entity can be considered context information. These definitions also do not provide any insight about the structure of context information. Currently there is no uniform way to share/understand vast amounts of IoT/M2M data. Usually, each context-aware platform defines its own context representation based on the platform requirements. This breaks compatibility between platforms and limits the quantity of context information that can be used in M2M applications, impairing future developments.

It is unlikely that in the future a context representation standard will be widely adopted. First, the diversity of context representations, each one of them was designed for a specific usage and/or data types. Second, a widely adopted context representation does not completely solve the issue of knowledge extraction. Due to the vast amount of data it is extremely difficult to define a priori all the relations between information sources, patterns, and even possible optimizations.

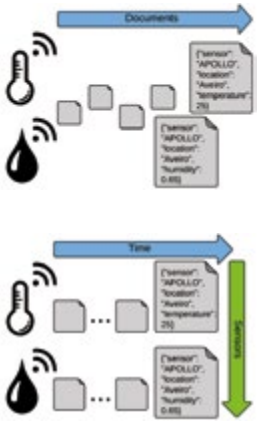
In order to deal with these issues, we de ned the basic context storage requirements, analysed the impact of context organization models and proposed a new context organization model for generic IoT/M2M applications. The simplest way to model context information is through a 1-dimension model (see Figure 1). Each piece of data is characterized by a single key, stored and indexed individually.

The 1-dimension model leads to poor performance and scalability. We devised an d-dimensional model (see Figure 2) to overcome the limitations of the former. Instead of storing documents independently, they are organized by device id. The platform stores all the documents, but only needs to index the sources. The remaining d – 1 dimensions are used to filter data from a specific source. Our organization model was evaluated with a stress simulation based on three M2M projects, outperforming the competition.

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

FIGURE 1
Representation of a 1-dimension field

FIGURE 2
Representation of a d-dimension model, with 2 dimensions. The first and second dimensions are device id and time respectively.

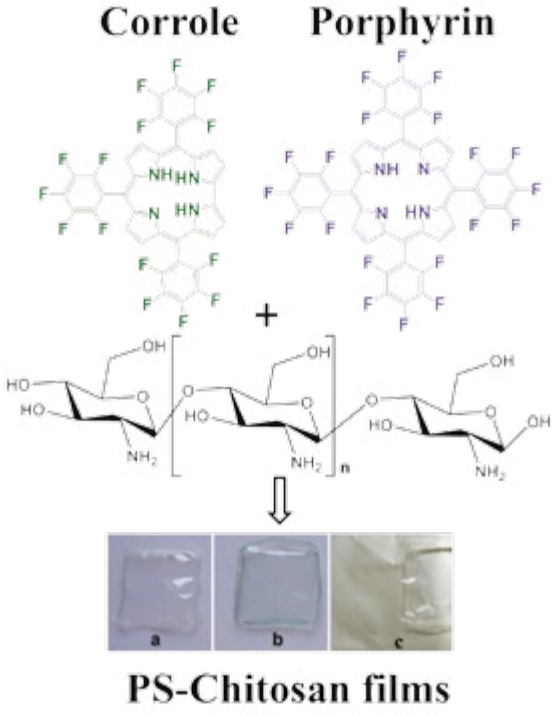


New functional bio-based materials with promising photodynamic antifouling and bacteriostatic activity

Joana F.B. Barata[1], Kelly A.D.F. Castro[1], Nuno M.M. Moura[1], Vanda I.R.C. Vaz Serra[1], Maria A.F. Faustino[1], Mário M.Q. Simões[1], Maria da Graça P.M.S. Neves[1], José A.S. Cavaleiro[1], Ana Fernandes[2], Adelaide Almeida[2], Ângela Cunha[2], Ricardo J.B. Pinto[3], Armando J.D. Silvestre[3], Tito Trindade[3], Carmen S.R. Freire[3]

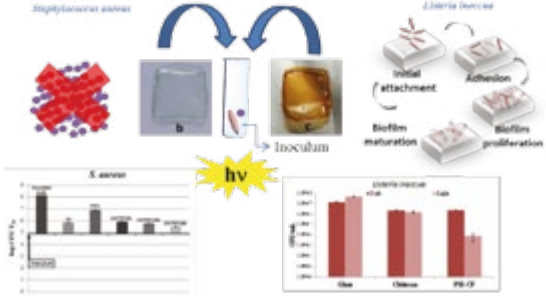
1 — Department of Chemistry & QOPNA, University of Aveiro
2 — Department of Biology & CESAM, University of Aveiro
2 — Department of Chemistry & CICECO, University of Aveiro

In the past decade, rapid and increasing advances in the design and fabrication of functional biobased materials afforded new solutions for biomedicine and high-tech applications. In particular, extensive research has been carried out on the development of cutting-edge materials through the use of biopolymers, like polysaccharides and proteins, due to their abundance, biodegradability, biocompatibility, and specific properties. In this perspective, the use of the non-toxic and biodegradable chitosan, the deacetylated derivative of chitin, is an excellent choice due also to its intrinsic antimicrobial properties, biocompatibility, and film forming ability. The antimicrobial activity of chitosan based materials can be further improved by the incorporation of bioactive compounds.



Porphyrins and other tetrapyrrolic macrocycle systems are fairly spread in nature in different biological systems playing important roles. These compounds are already applied in a wide variety of areas, including biomedicine. Corroles are aromatic tetrapyrrolic macrocycles belonging to the porphyrinoid family, with distinctive structural properties, conferred by their lower symmetry. In the last years, porphyrins and derivatives have also been successfully explored as photosensitizers for the photodynamic inactivation of microorganisms, namely viruses, Gram-negative and Gram-positive bacteria, and fungi.

In the present study, new functional materials were obtained through the incorporation of porphyrins and/or corroles adequately substituted into chitosan films. The corrole grafted-chitosan films demonstrated potential bacteriostatic effect against S. aureus, with an increased response when compared with chitosan and corrole controls.1 The efficiency of these films to prevent Listeria innocua biofilm development was verified on the phases corresponding to cell adhesion and biofilm maturation.2 The antiseptic effect of chitosan, associated with the efficiency of porphyrins to inactivate planktonic cells resulted in promising photodynamic materials.



Terameprocol, a new therapeutic strategy for the management of pulmonary arterial hypertension

Rita Nogueira-Ferreira[1,2],Manuel J. Ferreira-Pinto[2], Ana Filipa Silva[2], Rui Vitorino[2,3], Joana Justino[1], Raquel Costa[4], Daniel Moreira-Gonçalves[2,5], Jean-François Quignard[6], Thomas Ducret[6], Jean-Pierre Savineau[6], Adelino F. Leite-Moreira[2], Rita Ferreira[1], Tiago Henriques-Coelho[2]

Pulmonary arterial hypertension (PAH) is a severe cardiopulmonary disease with a high mortality rate and limited therapeutic options. Pulmonary artery smooth muscle cells (PASMCs) play a central role in PAH pathophysiology, presenting a hyperproliferative and apoptotic-resistant phenotype. In order to evaluate the potential therapeutic role of terameprocol (TMP), an inhibitor of cellular proliferation and promoter of apoptosis, in PAH, we used an iTRAQ-based proteomic approach to study the biological pathways modulated by TMP in PASMCs collected from rats with PAH induced by monocrotaline (MCT) administration. Data showed that TMP significantly reduced pulmonary and cardiac remodeling and improved cardiac function in MCT rats. Additionally, it decreased proliferation and induced apoptosis of PASMCs, which seem to be related with the modulation of proteins involved in the regulation of DNA transcription, RNA metabolic process, transforming growth factor beta pathway and response to endoplasmic reticulum stress. Our results suggest that TMP may be an effective therapeutic option to be considered in the management of PAH.

1 — Department of Chemistry & QOPNA, University of Aveiro
2 — Department of Surgery and Physiology, Faculty of Medicine, University of Porto
3 — Department of Medical Sciences & iBiMED, University of Aveiro
4 — Department of Biochemistry, Faculty of Medicine, University of Porto
5 — CIAFEL, Faculty of Sports, University of Porto
6 — Université Bordeaux Segalen, France; Inserm, U1045, Centre de Recherche Cardio-Thoracique, France

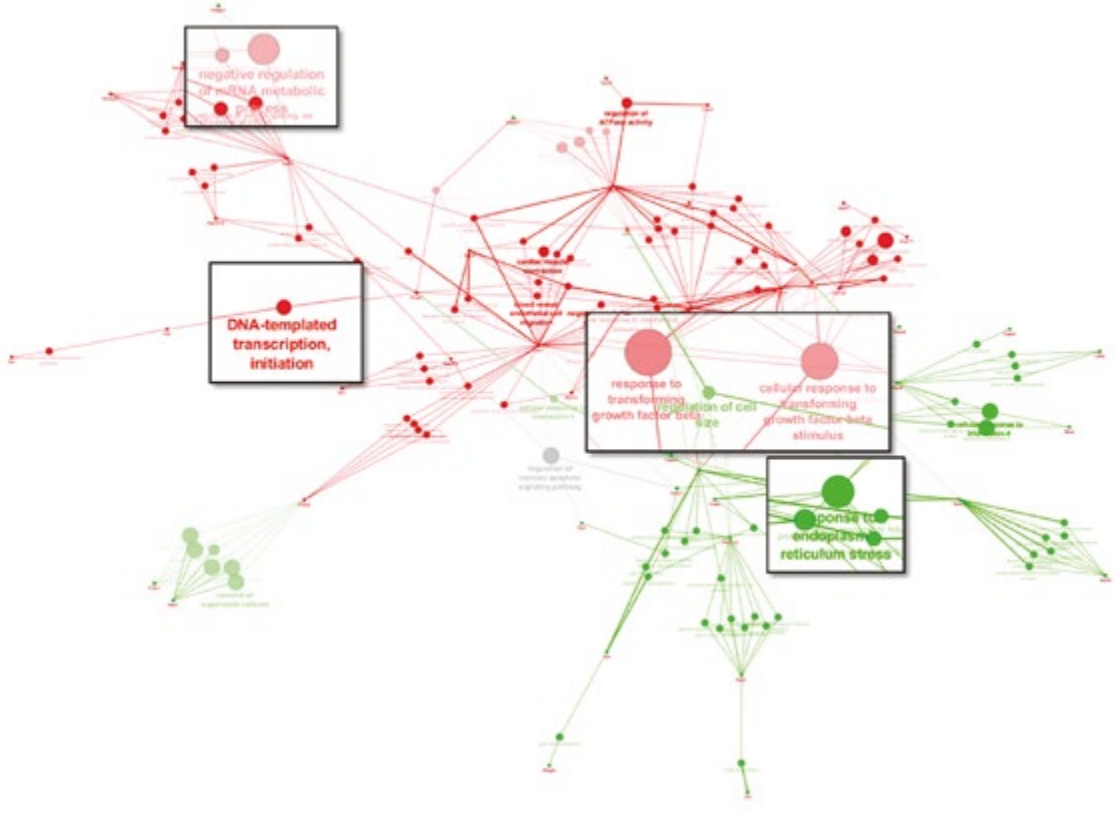


FIGURE 1
Biological processes modulated by terameprocol in pulmonary artery smooth muscle cells from rats with pulmonary arterial hypertension induced by monocrotaline. Green nodes represent the over-represented biological processes and red nodes refer to the ones under-represented (network constructed using Cytoscape v3.1.1).

Quasi energetically costless shelf-life extension of raw watermelon juice by hyperbaric storage compared to refrigeration

Carlos Pinto[1], Álvaro T. Lemos[1], Ana C. Ribeiro[1], Sílvia A. Moreira[1], Liliana G. Fidalgo[1], Mauro D. Santos[1], Ivonne Delgadillo[1], Jorge A. Saraiva[1]

1 — Department of Chemistry & QOPNA, University of Aveiro

Currently, the preservation of many food products is highly dependent of refrigeration (RF), which is energetically expensive and environmentally harmful. In fact, it was estimated that more than 380 megatons of CO_2 were released into the atmosphere in 2008 due to RF processes, being the food industry the third major source of CO_2. Thus, environmentally-friendlier food preservation methodologies are needed to reduce the carbon footprint while ensuring food quality and safety.

Hyperbaric storage (HS) at room temperature (RT), a concept that arose by chance after the recovery of the Research Submarine Alvin (that sunk and remained at 1540 m in deep sea (≈15 MPa) over 10 months), is currently being studied as a possible alternative to RF. The main advantages of HS/RT over RF are the reduction of energy consumption, since energy is only needed during the compression and decompression phases of the pressure vessel, and no additional energy is required to maintain foods under pressure along storage, as well the needless of temperature control, potentiates a lower carbon footprint.

Recent data from our research group hinted, as an additional advantage, the possibility to achieve higher shelf-lives by HS/RT compared with RF. A first trial showed that HS/RT of raw watermelon juice (a highly perishable food) at 100 MPa reduced the microbial load and maintained the fresh-like juice characteristics for up to at least 7 days, while by RF the juice was unacceptable for consumption after 3 days. Further experiments at a slightly lower temperature (15 ºC) and pressure (62.5 MPa) resulted in a higher shelf-life extension (up to at least 58 days), reducing the microbial load and maintaining the juice fresh-like characteristics (Figure 1).

So far, HS/RT showed to be a new promising quasi energetically costless food preservation process, allowing a considerable shelf-life extension compared to RF, being necessary further broader and deeper research in HS/RT.

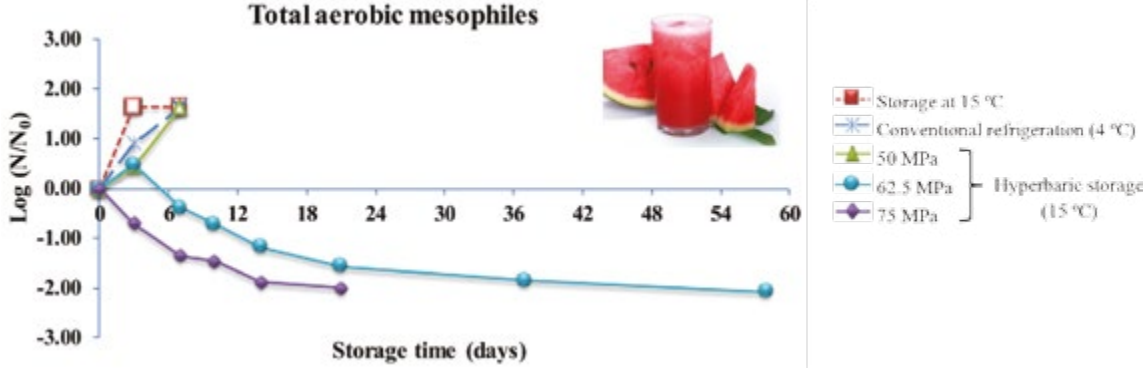


FIGURE 1
Total aerobic mesophiles load evolution (N), compared to the initial value (No), stored under different conditions. Unfilled symbols represent juice spoilage.

Development of a rigid polyurethane foam incorporating phase change material microencapsulated in a calcium carbonate shell for thermal energy storage

Cláudia Amaral[1,3], Romeu Vicente[1], Paula A.A.P. Marques[2], Ana Barros-Timmons[3]

The use of phase change materials (PCMs) and rigid polyurethane foams (RPU) in building solutions and components to improve the thermal performance and to enhance the energy efficiency of the building is an up-to-date challenge. These two materials are widely used in buildings for thermal insulation and thermal storage purposes, respectively. Taking the joint advantages of the excellent thermal insulation performance of RPU foams and the thermal energy storage capacity of PCMs, the development of RPU composite foams can be designed to function as a latent heat thermal energy storage (LHTES) system. The major aim of the present study is to improve the thermal characteristics of RPU foams which have been almost exclusively used for thermal insulation purposes but can also find application as potential thermal energy storage components.

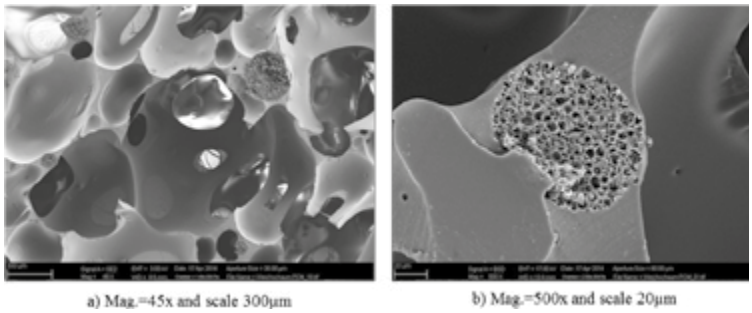
To overcome the low thermal conductivity of the RPU foam matrix, a method to prepare PCM microcapsules (mPCMs) based on paraffin core and calcium carbonate shell ($CaCO_3$) has been developed to enhance the thermal conductivity and thus achieve a more effective charging and discharging process.

Additionally, a numerical analysis was used to determine the optimal wt% of mPCMs to add to the RPU foams. The determined value was 1.8 wt% of mPCMs and this amount was then incorporated in RPU formulations to yield composite foams. Figure 1 reveals that the morphology of mPCMs was kept intact during the preparation of the composite foams and were well dispersed in the RPU matrix. Comparing the indoor temperature curves results obtained for the RPU foam layer with and without mPCM (see Figure 2), it can be observed that the thermal amplitude reduction attained is about 0.5-1°C for the peak maximum temperature and 0.1-0.3°C for the peak minimum temperature. The indoor curve profile obtained ranges between 18.1°C and 25.2°C for the RPU foam layer without mPCM and 18.3°C and 24.1°C for the RPU foam layer with mPCM.

1 — Department of Civil Engineering & RISCO, University of Aveiro
2 — Department Mechanical Engineering & TEMA, University of Aveiro
3 — Department of Chemistry & CICECO, University of Aveiro

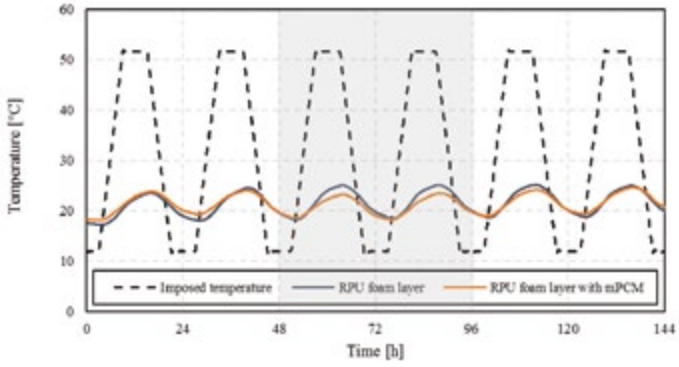
FIGURE 1
SEM images of the RPU foams with mPCMs.

FIGURE 2
Temperature profiles.



a) Mag.=45x and scale 300µm

b) Mag.=500x and scale 20µm



Geopolymers for the conservation of tiled facades

Ana Velosa[1,2], Sara Moutinho[2]

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

Glazed ceramic tiles from the 19th and 20th centuries cover a significant amount of facades in Portugal's built heritage. Production and exposure conditions, linked to differential expansion characteristics cause degradation of the ceramic body and glaze. Conservation actions must frequently intervene using reintegration techniques that fill gaps and cracks. For this purpose, a variety of materials have been used, from lime pastes to organic resins, but the achievement of compatible solutions is still an issue in need of further research. Geopolimeric materials are a possible solution as they may be formulated using similar raw materials and may achieve a variety of properties that must be in accordance with those of old tiles in order to produce successful reintegrations.

For this study, geopolimeric materials were developed and tested and a comparison was performed in relation to traditionally used polymers. Geopolymers were developed with a metakaolin base and three different basic formulations were studied. Formulations GEO-MKZL, GEO-MK1000 and GEO-MK1000C are described in Table 1 and further variations were performed in terms of the final pH of these materials. The main drawbacks were ageing and cracking of some compositions as well as salt formation (Figure 1). Therefore, pH control was performed in order to minimize cracking, influencing the aggregation of the membrane and matrix during geopolymer processing. The testing procedure encompassed artificial ageing, mechanical strength, water absorption and water vapour permeability. Adhesion of the geopolymers to the ceramic body was also evaluated. With results from this set of tests, compatibility issues may be evaluated. Results showed that the used geopolymers present a significant variation of properties, that may be adapted to the range of properties exhibited by glazed tiles of semi-industrial production. In comparison with materials of current use in conservation practice, geopolymers may constitute a valid substitute for use in reintegration procedures.

GEOMETRIC COMPOSITION		
GEO-MKZL	GEO-MK1000	GEO-MK1000C
– Metakaolin and natural zeolite – Sodium Hydroxide	– Metakaolin – Sodium Hydroxide and calcium hydroxide	– Metakaolin – Cork Ash

FIGURE 1
Geopolymer compositions.

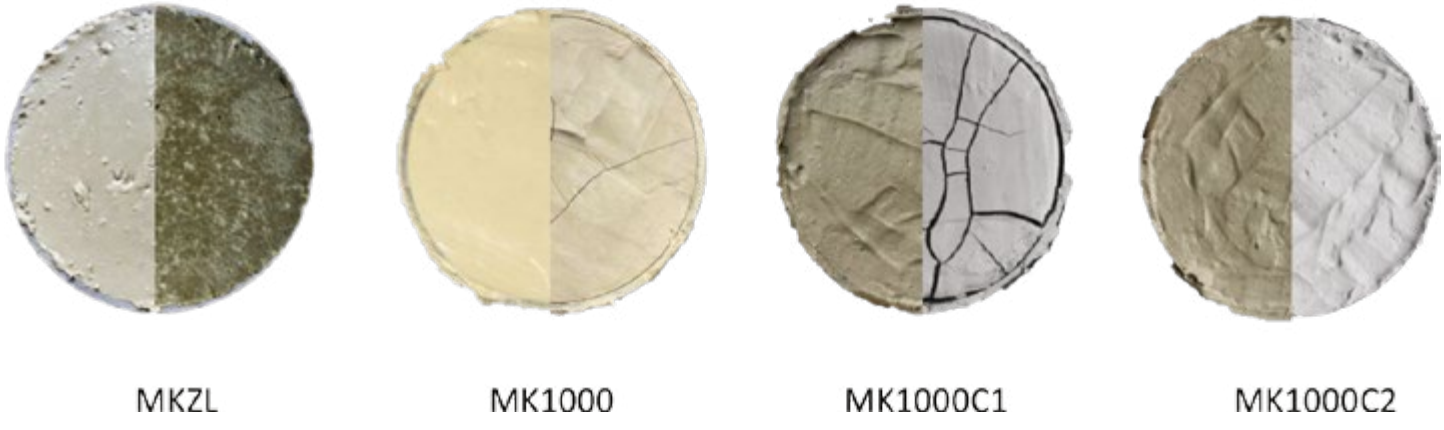


FIGURE 2
Geopolymer compositions at day 1 and 15.

Empirical assessment of route choice impact on emissions over different road types, traffic demands, and driving scenarios

Jorge M. Bandeira[1], Dário O. Carvalho[1], Asad J. Khattak[2], Nagui M. Rouphail[3], Tânia Fontes[1], Paulo Fernandes[1], Sérgio R. Pereira[1], Margarida C. Coelho[1]

Eco-routing is a promising strategy to reduce pollutant emissions. However, the eco-friendliness of different routes may change, especially in roads with capacity constraints and high traffic demand. We have explored this issue empirically by covering about 13,300 km, in 3 different areas: medium sized-city (Aveiro), intercity region (Aveiro-Oporto Corridor), and a metropolitan area (Norfolk, VA, USA). A total of 222 hours of GPS data were collected and a microscopic emission model was used to generate emissions information during off-peak and peak periods according to the site-specific characteristics. This study has reinforced the relevance of the eco-routing concept, namely:

· The selection of an appropriate route can lead to significant emissions reduction, regardless of demand period: CO2 up to 25%, and local pollutants (NOX, HC and PM) up to 60%, for these case studies (FIG 1).

· A slight decrease in the differences of total emissions among routes during peak periods was observed. However, for each origin-destination (O-D) pair, the eco-friendliness rating of routes was shown to be constant under different traffic volume levels (FIG 2). This fact suggests that the infrastructures analyzed could have enough capacity to accommodate a limited extra demand of drivers who would like to select a route with lower emissions levels.

Nevertheless, some limitations must be considered when implementing these systems, namely:

· The eco-route could depend on the type of vehicle used;

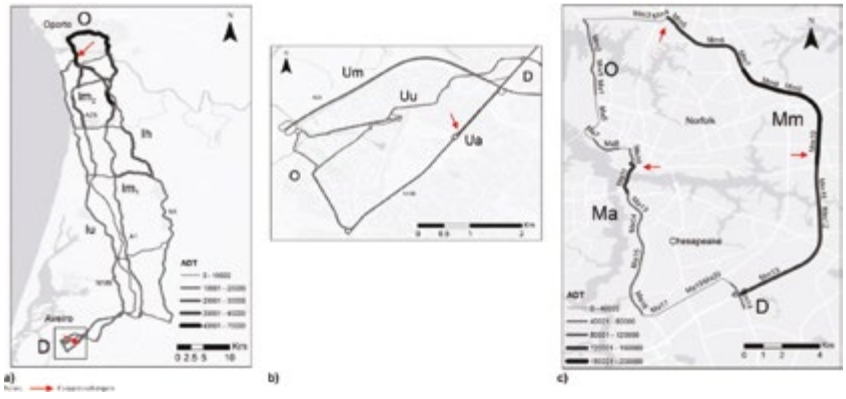
· Frequently, the routes that allow a minimization of pollutants can cross urbanized areas. This fact will involve a careful assessment of potential externalities that may arise from a purely dedicated navigation system based on emissions minimization;

· In the intercity OD pair, a trade-off between CO2 and local pollutants minimization was observed. Therefore, it must be emphasized that the concept of "eco-friendly" should not be strictly confined to CO2/fuel consumption. In similar cases, strategies for assigning relative weights to pollutants should be considered to optimize traffic operations with a maximum environmental net benefit.

1 — Department of Mechanical Engineering & TEMA, University of Aveiro
2 — Department of Civil & Environmental Engineering, The University of Tennessee, Knoxville, TN, USA
3 — Institute for Transportation Research and Education, North Carolina State University, Raleigh, NC, USA

FIGURE 1
Study routes map and average daily traffic: a) Intercity (Oporto–Aveiro): Im1, Im2, Ih, and Iu; b) Urban routes (Aveiro center and suburbs): Um, Ua, and Uc; and c) Metropolitan (Norfolk–Chesapeake): Ma and Mm. Route type: m-motorway, a-arterial, h-highway, u urban).

FIGURE 2
Eco-friendly route indicator based on environmental damage costs for Diesel (LLDV) and Gasoline (LDGV) passenger cars..



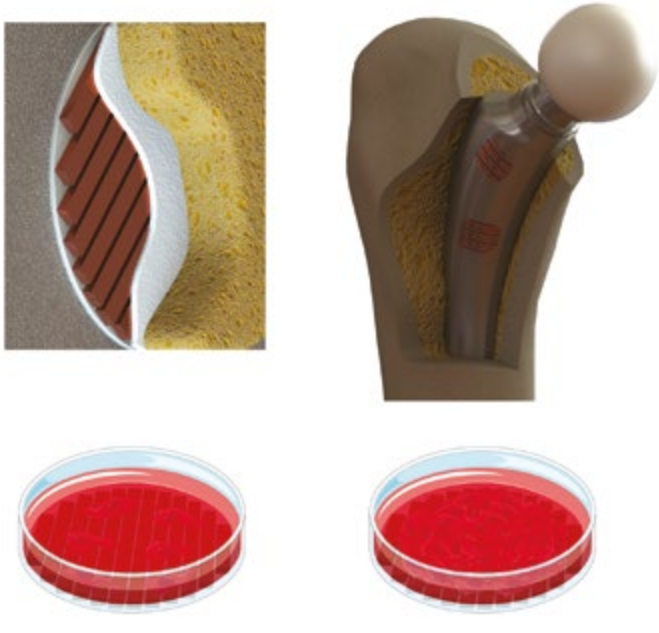
New cosurface capacitive stimulators for the development of active osseointegrative implantable devices

Marco P. Soares dos Santos[1], Ana Marote[2], T. Santos[1,3], João Torrão[1], António Ramos[1], José A. O. Simões[1], Odete A. B. da Cruz e Silva[2], Edward Furlani[4], Sandra I. Vieira[2], Jorge A. F. Ferreira[1]

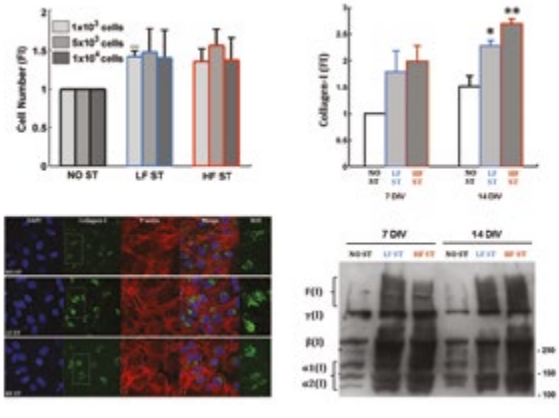
1 — Department of Mechanical Engineering & TEMA, University of Aveiro
2 — Department of Medical Sciences & iBiMED, University of Aveiro
3 — Department of Physics, University of Aveiro
4 — Department of Chemical and Biological Engineering, of Electrical Engineering, University at Buffalo, USA

Osteoarthritis is a disorder with a global prevalence around 4% and the most common indication for total hip replacement (THR) and total knee replacement (TKR). An increasing trend in the incidence of primary and revision THRs and TKRs has been observed throughout the last decades, mainly among patients under 65 years old. These patients account for approximately 30% of the overall patients, and sustained increases exceeding 50% are expected by 2030. Even today, the number of revisions can exceed 10% of these joint replacements.

Current methodologies used to improve the performance of these bone implants have been focused on:
(1) the optimization of their geometry and materials;
(2) design of custom-made geometries, nanometer-scale textured surfaces and porous structures;
(3) design of therapeutic actuators based on chemical and biochemical modifications of the implants' surfaces;
(4) design of instrumented implants.



However, these implant technologies have been not able to significantly reduce the implant failure rates. Our proposal is to design instrumented active implants with ability to deliver personalized biophysical stimuli, controlled by clinicians, to target regions in the bone-implant interface throughout the patients' lifetime. This work is focused on designing innovative biophysical actuators for instrumented implants to control the bone-implant integration. In this study, the novel concept of cosurface capacitive stimulation was analyzed. It comprises a set of electrodes in the same surface, prohibiting cell-electrode contacts, such that electric fields can be delivered as required by extracorporeal commands. Electrodes were driven by two excitations, only differing by their frequency (LF: 14 Hz; HF: 60 kHz; 10 V amplitude). Tests were conducted by using anodes always surrounded by cathodes. Successful results were achieved for proliferation and differentiation of osteoblastic MC3T3-E1 cells *in vitro.* Besides, numerical simulations have shown that different stimuli (varying waveform, strength, frequency, etc.) can be delivered to bone cells. These results provide a solid basis to a paradigmatic change in the design of bone implants. A huge societal impact is expected if these novel active implants are fully implemented and successfully tested *in vivo*.



Why is quality in higher education not achieved? The view of academics

Sónia Cardoso[1], Maria J. Rosa[2], Bjørn Stensaker[3]

Whether quality assurance (QA) is actually being able of promoting quality is still an open question. The study tries to shed light on this issue by identifying the main obstacles to quality as perceived by Portuguese academics. Quality as culture, as compliance and as consistency were the theoretical lenses used to read academics' perceptions on such obstacles (Figure 1).

Quality as culture refers to the institutional commitment to quality reflected in initiatives and structures aiming at continuously improve it and even attain 'perfection'. Quality as compliance refers to quality as resulting from the alignment with external requirements aiming at increasing transparency, accountability, fitness for purpose and, even, value for money. Quality as consistency links to the use of new academic standards for the assessment and validation of higher education processes and end results.

Empirically the study uses data collected through an online questionnaire sent to all Portuguese academics with the aim to understand their positions towards QA. Specifically it addresses the answers (N=1288) given by different academics to a question about the obstacles to quality and its assurance. Answers were analysed resorting to category content analysis which implied constructing an analysis grid (Figure 2).
The analysis revealed that academics put forward several obstacles preventing quality and its assurance. Obstacles tend to be mainly connected with the view of quality as culture, with a special emphasis on those associated with institutions' governance and management. This suggests the need for institutions to build up stronger integrated quality cultures as well as to improve the link between quality work and the strategic build-up of managerial capacity.

Less relevance is given to obstacles associated with the notion of quality as consistency, highlighting processes and end results, and quality as compliance, linked to accountability. This is so despite a trend for European QA schemes to focus on these dimensions, especially the ones induced by QA agencies.
By suggesting culture, compliance and consistency as the three perspectives through which grasp quality, the study can pave the way for more systematic research on what academics think about the factors hindering quality, strengthening the understanding of the links between quality and quality assurance.

1 — University of Aveiro & CIPES, A3ES – Portuguese Agency for the Accreditation of Higher
2 — Department of Economics, Management, Industrial Engineering and Tourism & CIPES, University of Aveiro
3 — Department of Education, University of Oslo, Norway

FIGURE 1
Theoretical lenses to read academics' perceptions on the obstacles to quality and its assurance.

FIGURE 2
Distribution of academics' answers by dimensions and categories of analysis.

Dimensions of analysis		Categories of analysis	N	%
Quality as Culture	Structural element	Governance and management	395	24,8
		Infra-structures, resources and support services	189	11,8
		Internal QA mechanisms	110	6,9
		Institution's financial situation	100	6,3
		Category total	794	49,8
	Psychological element	Academics	385	24,1
		Dimension total	1179	73,9
Quality as Compliance		Public funding of HE	100	6,3
		Access	58	3,6
		HE policies	40	2,5
		External QA	24	1,5
		Bologna process	25	1,6
		Dimension total	247	15,5
Quality as Consistency		Teaching and learning	109	6,8
		Research	42	2,6
		Relations with society	18	1,1
		Dimension total	169	10,6
		Total	1595	100

Note: the number of answers does not correspond to the number of academics answering the question on obstacles to quality since some academics referred more than one obstacle.


6

QUICK FACTS AND STATS

People

FACULTY BY DEPARTMENT

	FACULTY (FTE)			
	TOTAL	TOTAL	PERCENTAGE OF WOMEN	PERCENTAGE OF FOREIGNERS
UNIVERSITY	**2015**	**2016**		
Department of Biology	32,5	32,8	43%	
Department of Chemistry	44,9	45,3	51%	
Department of Civil Engineering	15,6	15,1	20%	
Department of Communication and Art	71,2	73,5	34%	5%
Department of Economics, Management and Industrial Engineering and Tourism	54,5	54	61%	4%
Department of Education and Psychology	38,7	38,4	72%	3%
Department of Electronics, Telecommunications and Informatics	78	78	8%	
Department of Environment and Planning	17	17	59%	
Department of Geosciences	13,3	13,3	38%	
Department of Languages and Cultures	43	43,3	61%	23%
Department of Materials Engineering and Ceramics	17,3	16	44%	
Department of Mathematics	56,6	56,6	47%	9%
Department of Mechanical Engineering	24,3	24,9	12%	
Department of Medical Sciences	16,8	19,8	69%	12%
Department of Physics	44	44,3	18%	7%
Department of Social Sciences, Policy and Planning	23,4	23,3	32%	1%
POLYTECHNIC SCHOOLS				
Águeda School of Technology and Management	50,6	54,7	44%	
School of Accounting and Administration of Aveiro	67,8	68,4	52%	
School of Design, Management and Production Technologies of Aveiro North	15,4	20,9	30%	
School of Health of the University of Aveiro	39,1	39,6	64%	
TOTAL	**764**	**779,3**	**42%**	**3%**

RESEARCHERS BY DEPARTMENT

	RESEARCHERS (FTE)			
DEPARTMENT	TOTAL	TOTAL	PERCENTAGE OF WOMEN	PERCENTAGE OF FOREIGNERS
UNIVERSITY	**2015**	**2016**		
Department of Biology	91	82	66%	16%
Department of Chemistry	102	117	64%	24%
Department of Civil Engineering	3	3	67%	
Department of Communication and Art	3	6	50%	50%
Department of Economics, Management and Industrial Engineering and Tourism	1	3	67%	33%
Department of Education and Psychology	15	16	94%	
Department of Electronics, Telecommunications and Informatics	12	17	35%	24%
Department of Environment and Planning	25,6	22,6	60%	27%
Department of Geosciences	10	11	64%	18%
Department of Languages and Cultures		1	100%	
Department of Medical Sciences		7	86%	
Department of Materials Engineering and Ceramics	38	36,3	30%	34%
Department of Mathematics	10	9	33%	44%
Department of Mechanical Engineering	19,4	25,4	31%	65%
Department of Physics	51	55	29%	42%
Department of Social Sciences, Policy and Planning	1	7	71%	29%
School of Design, Management and Production Technologies of Aveiro North		1	100%	
School of Health of The University of Aveiro		1	100%	
TOTAL	**382**	**420,3**	**41%**	**37%**

STAFF BY CATEGORY

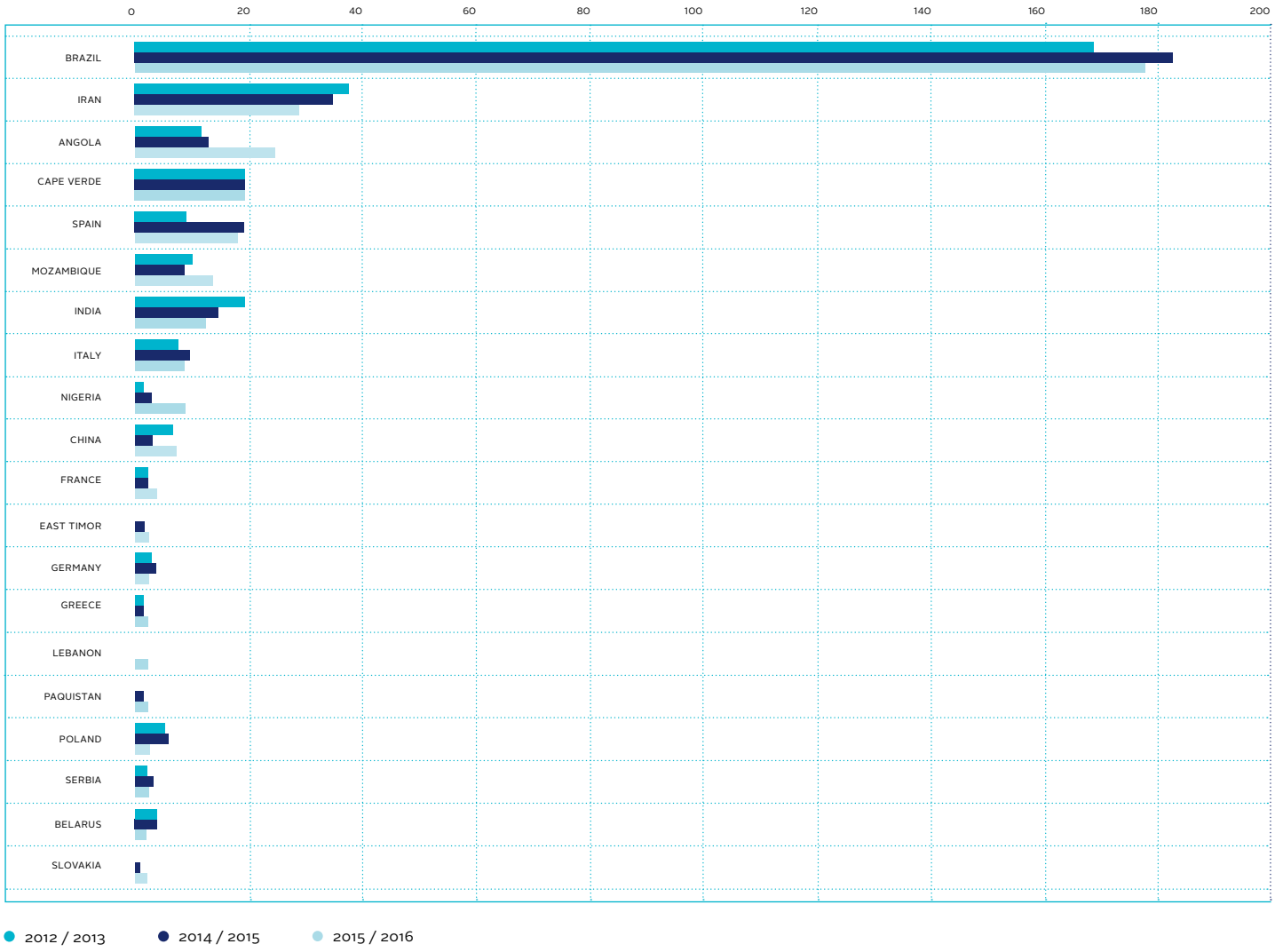
		FACULTY (FTE)		
CATEGORY	**2015**	**2016**		
UNIVERSITY	**TOTAL**	**TOTAL**	**PERCENTAGE OF WOMEN**	**PERCENTAGE OF FOREIGNERS**
Full professors	53,3	56,9	10%	4%
Associated professors	115,3	122,3	39%	2%
Assistant professors	375,2	377,2	44%	4%
Lecturers	32,3	22,9	31%	2%
Other teaching staff	15	16,3	69%	43%
Researchers	85	92,3	37%	33%
Post-doctoral students	297	328	59%	26%
POLYTECHNIC SCHOOLS				
Coordinator professors	13,6	13,9	36%	
Adjunt professors	109,8	117,6	51%	
Lecturers	49,5	52,1	50%	
TOTAL	**1146**	**1199,6**	**47%**	**12%**

PHD STUDENTS BY DEPARTMENT

		PHD STUDENTS			
UNIVERSITY	**TOTAL**	**TOTAL**	**PERCENTAGE OF WOMEN**	**PERCENTAGE OF FOREIGNERS**	**PERCENTAGE OF NEW STUDENTS**
DEPARTMENT	**2014 / 2015**	**2015/2016**			
Department of Biology	172	166	70%	24%	17%
Department of Chemistry	109	114	70%	16%	32%
Department of Civil Engineering	45	51	20%	35%	37%
Department of Communication and Art	238	214	51%	43%	21%
Department of Economics, Management and Industrial Engineering and Tourism	202	173	51%	29%	24%
Department of Education and Psychology	216	219	73%	28%	27%
Department of Electronics, Telecommunications and Informatics	113	111	14%	32%	32%
Department of Environment and Planning	68	74	54%	41%	27%
Department of Geosciences	10	11	64%	45%	36%
Department of Languages and Cultures	62	46	70%	33%	9%
Department of Materials Engineering and Ceramics	77	74	38%	36%	23%
Department of Mathematics	19	26	73%	12%	46%
Department of Mechanical Engineering	60	78	41%	22%	45%
Department of Medical Sciences	48	28	71%	7%	14%
Department of Physics	106	83	41%	22%	19%
Department of Social Sciences, Policy and Planning	39	41	46%	22%	44%
TOTAL*	**1411**	**1316**	**56%**	**29%**	**25%**

* 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 (20%)
- Asia (16%)
- America (50%)

MSC THESES IN 2016 PER AREA

- Arts and Humanities (21%)
- Social Sciences (15%)
- Exact Sciences (4%)
- Health Sciences (10%)
- Life Sciences (13%)
- Engineering and Technology (37%)

PHD THESES IN 2016 PER AREA

- Arts and Humanities (11%)
- Social Sciences (25%)
- Exact Sciences (13%)
- Health Sciences (4%)
- Life Sciences (14%)
- Engineering and Technology (33%)

Sci Papers

TOP 10 SUBJECT AREAS FOR PAPERS PUBLISHED IN 2016	RECORD COUNT	% OF 2019
ENGINEERING	347	17.19%
CHEMISTRY	324	16.05%
ENVIRONMENTAL SCIENCES ECOLOGY	287	14.22%
MATERIALS SCIENCE	242	11.99%
PHYSICS	169	8.37%
COMPUTER SCIENCE	148	7.33%
SCIENCE TECHNOLOGY OTHER TOPICS	139	6.89%
MATHEMATICS	85	4.21%
MARINE FRESHWATER BIOLOGY	81	4.01%
TOXICOLOGY	69	3.42%

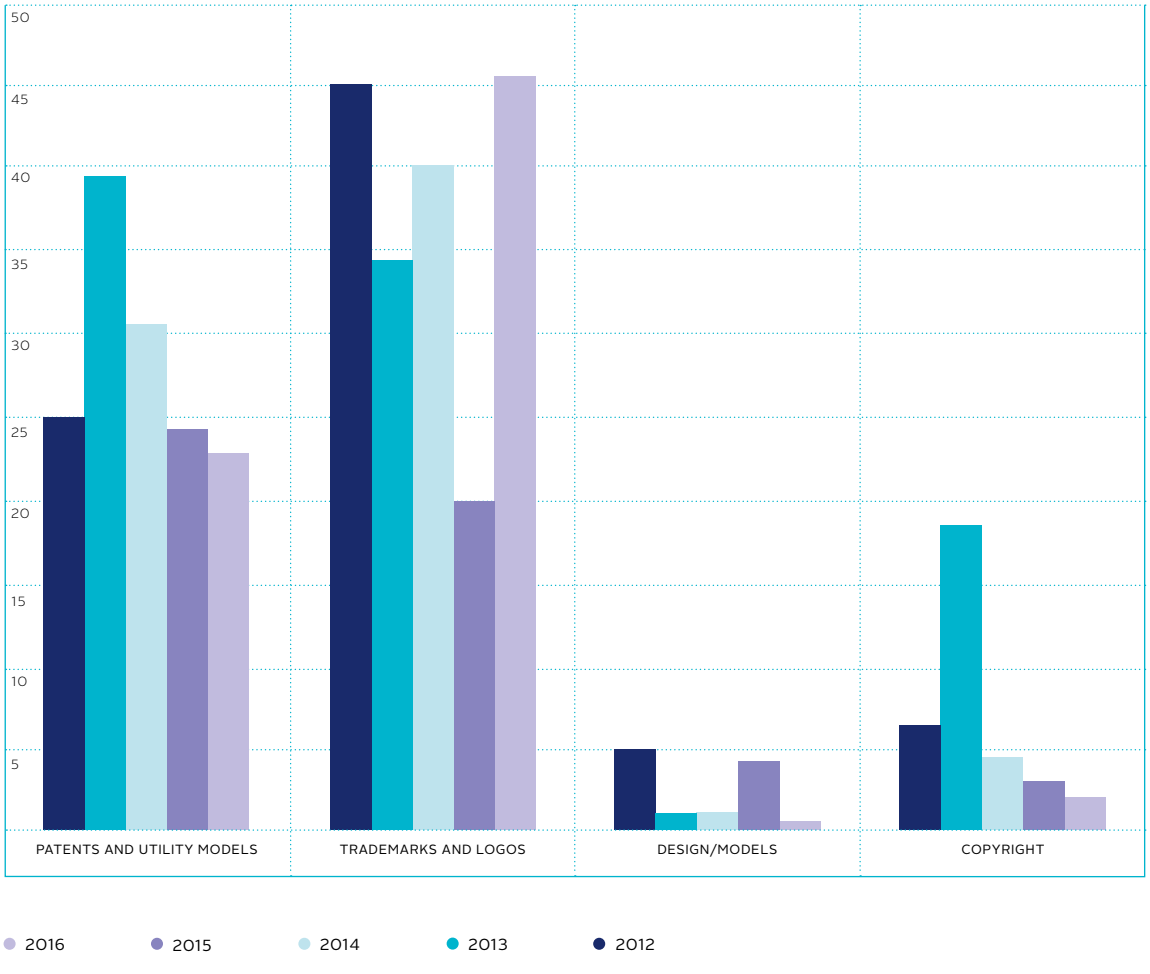
Data retrieved from ISI Web of Knowledge SM (Thomson Reuters) in 8 May 2017

TOP 10 CITED PAPERS	TOTAL Nº CITATIONS (2012 - 2016)
Price, Nathan L.; Gomes, Ana P.; Ling, Alvin J. Y.; et al. (2012). SIRT1 Is Required for AMPK Activation and the Beneficial Effects of Resveratrol on Mitochondrial Function. CELL METABOLISM, 15: 675-690	411
Pullar, Robert C. (2012). Hexagonal ferrites: A review of the synthesis, properties and applications of hexaferrite ceramics. PROGRESS IN MATERIALS SCIENCE, 57: 1191-1334	410
Klionsky, Daniel J.; Abdelmohsen, Kotb; Abe, Akihisa; et al. (2016). Guidelines for the use and interpretation of assays for monitoring autophagy (3rd edition). AUTOPHAGY. 12: 1-222	354
Almeida Paz, Filipe A.; Klinowski, Jacek; Vilela, Sergio M. F.; et al. (2012). Ligand design for functional metal-organic frameworks. CHEMICAL SOCIETY REVIEWS, 41: 1088-1110.	345
Brites, Carlos D. S.; Lima, Patricia P.; Silva, Nuno J. O.; et al. (2012). Thermometry at the nanoscale. NANOSCALE, 4: 4799-4829	320
Gomes, Ana P.; Price, Nathan L.; Ling, Alvin J. Y.; et al. (2013). Declining NAD(+) Induces a Pseudohypoxic State Disrupting Nuclear-Mitochondrial Communication during Aging. CELL, 155 1624-1638.	255
Hubbard, Basil P.; Gomes, Ana P.; Dai, Han; et al. (2013). Evidence for a Common Mechanism of SIRT1 Regulation by Allosteric Activators. SCIENCE, 339: 1216-1219.	251
Antognini, Aldo; Nez, Francois; Schuhmann, Karsten; et al. (2013). Proton Structure from the Measurement of 2S-2P Transition Frequencies of Muonic Hydrogen. SCIENCE, 339: 417-420.	251
Rolo, Anabela P.; Teodoro, Joao S.; Palmeira, Carlos M. (2012). Role of oxidative stress in the pathogenesis of nonalcoholic steatohepatitis. FREE RADICAL BIOLOGY AND MEDICINE, 52: 59-69	241
Freire, Mara G.; Claudio, Ana Filipa M.; Araujo, Joao M. M.; et al. (2012). Aqueous biphasic systems: a boost brought about by using ionic liquids. CHEMICAL SOCIETY REVIEWS, 41: 4966-4995.	213

Intellectual Property

INTELLECTUAL PROPERTY RIGHTS REGISTRATION

	2012	2013	2014	2015	2016
Patents and Utility Models	25	39	32	24	23
Trademarks and Logos	45	34	40	20	46
Design/Models	5	1	1	4	1
Copyright	7	18	4	3	2



International Projects

EU-FUNDED PROJECTS STARTED IN 2016

HORIZON 2020 - ERC ADVANCED GRANT	ACRONYM	PROJECT COORDINATOR
Bioengineered autonomous cell-biomaterials devices for generating humanised micro-tissues for regenerative medicine	ATLAS	João Mano

HORIZON 2020	ACRONYM	LOCAL COORDINATOR
Strong Gravity and High-Energy Physics	StronGrHEP	Carlos Herdeiro
Redesigning 2D Materials for the Formulation of Semiconducting Inks	2D INK	Manuel Melle Franco
Enabling precision chemical methodologies applied to natural -based systems for the development of multifunctional biomedical devices	CHEM2NATURE	João Mano
Minerals Policy Guidance for Europe	MIN-GUIDE	Luís Menezes Pinheiro
Long Lasting reinforced Concrete for Energy Infrastructure under Severe Operating	LORCENIS	Mário Ferreira
Citizen Led Air Pollution Reduction in Cities	CLAIR CITY	Myriam Lopes
The Role of Universities in Innovation and Regional Development	RUNIN	Carlos Rodrigues
Green Integrated Structural Elements for Retrofitting and New Construction of Buildings	GREEN INSTRUCT	Romeu Vicente
Power Semiconductor and Electronics Manufacturing 4.0	Semi40	Jonathan Gonzalez
Tailored Elastin-like Recombinamers as Advanced Systems for Cell Therapies in Diabetes Mellitus:a Synthetic Biology Approach towards a Bioeffective and Immunoisolated Biosimilar Islet/Cell Niche	ELASTISLET	João Mano

ERASMUS + PROJECTS COORDINATED BY UA	ACRONYM	PROJECT COORDINATOR
INovative and Educational INformation for the Sustainable FOREST Management by Smallholders	FOREST-IN	Carlos Fonseca
Spin Off of a Forensic Science Educational Strategy Promoting Scientific Literacy and European Students Citizenship	EURO4SCIENCE 2.0	Luís Miranda

ERASMUS +	ACRONYM	LOCAL COORDINATOR
Evaluation des Compétences en Intercompréhension: Réception et Interactions Plurilingues	EVAL-IC	Helena Araújo e Sá
Forecast Engineering: From Past Design to Future Decisions	FORECAST ENGINEERING	Uwe Kahler
Assisting Better Communication	ABC	Maria da Assunção Matos
South East Asian Social Innovation Network	SEASIN	Teresa Franqueira
Students 4 Change: Social Entrepreneurship in Academia	Students 4 Change	Marlene Amorim

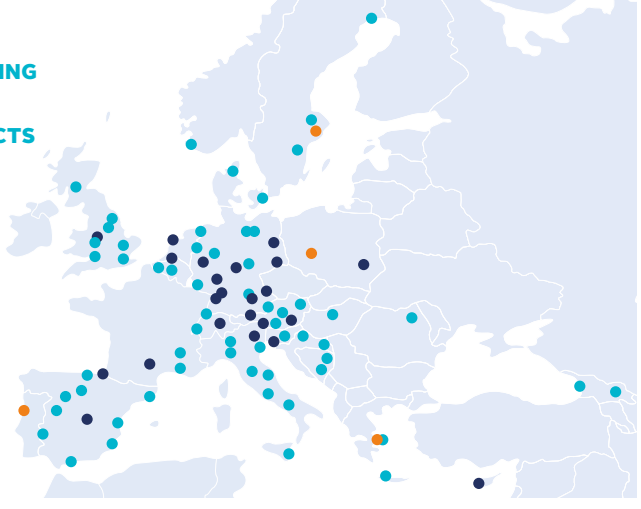
LIFE + PROJECTS COORDINATED BY UA	ACRONYM	PROJECT COORDINATOR
Management of Biomass Ash And Organic Waste In The Recovery of Degraded Soils: A pilot project Set In Portugal	LIFE No_Waste	Sónia Rodrigues

LIFE +	ACRONYM	LOCAL COORDINATOR
PAYT - Tool to Reduce Waste in South Europe	LIFE PAYT	João Paulo Barraca
Development of an Integrated Exposure - Dose Management Tool for Reduction of Particulate Matter in Air	LIFE INDEX AIR	Ana Isabel Miranda

INTERREG EUROPE - PROJECTS COORDINATED BY UA	ACRONYM	PROJECT COORDINATOR
Cooperative Information platform for low carbon and sustainable mobility	CISMOB	Jorge Bandeira

INTERREG SUDOE	ACRONYM	LOCAL COORDINATOR
Demonstração de melhorias na biodiversidade do solo, funcionalidade e serviços ambientais de locais contaminados e/ou degradados sob intervenção de fito-tecnologias dentro da região Interreg Sudoe.	PHYTOSUDOE	Eduardo Silva
Desarrollo, validación y demostración de un modelo basado en una red Transference Brokers para la transferencia tecnológica directa entre centros de I+D y empresas en el territorio SUDOE	TURBO-SUDOE	José Paulo Rainho
Diseño, construcción y puesta a punto de estaciones automáticas para el monitoraje en tiempo real de bajos niveles radiactivos de tritio en aguas	TRITIUM	João Veloso

NETWORK OF EU UNIVERSITIES AND COMPANIES WORKING WITH THE UA IN EUROPEAN PROJECTS STARTED IN 2016



AUSTRIA (EVAL-IC, MIN-GUIDE, 2D INK, GREEN INSTRUCT, ELASTISLET, SEMI 4.0, NANOFARM)
BELGIUM (LORCENIS, 2D INK)
BOSNIA HERZEGOVINA (ABC - ERASMUS +)
CYPRUS (GREEN INSTRUCT)
CROACIA (FORECAST ENGINEERING, MIN-GUIDE)
DENMARK (RUNIN)
FRANCE (EVAL-IC, STUDENTS 4 CHANGE, SEMI 4.0, TURBO-SUDOE, BATRES)
GEORGIA (ABC - ERASMUS +)
GERMANY (EURO4SCIENCE 2.0, EVAL-IC, FORECAST ENGINEERING, STUDENTS 4 CHANGE LIFE PAYT, LIFE INDEX AIR, MIN-GUIDE, LORCENIS, 2D INK, GREEN INSTRUCT, ELASTISLET, SEMI 4.0)
GREECE (EURO4SCIENCE 2.0, LIFE PAYT, LIFE INDEX AIR, MIN-GUIDE, LORCENIS, GREEN INSTRUCT)
HUNGRY (FORECAST ENGINEERING)
ITALY (EVAL-IC, STRONGRHEP, GREEN INSTRUCT, ELASTISLET, WE-NEED, MASCC)
NETHERLANDS (ABC - ERASMUS +, CLAIR CITY, RUNIN)
NORWAY (RUNIN)
POLAND (EURO4SCIENCE 2.0, GREEN INSTRUCT)
PORTUGAL (COORDINATED BY UA)
ROMANIA (EVAL-IC)
SLOVENIA (FORECAST ENGINEERING)
SPAIN (SEASIN, EVAL-IC, STUDENTS 4 CHANGE, LORCENIS, 2D INK, GREEN INSTRUCT, RUNIN, PHYTOSUDOE, TURBO-SUDOE, TRITIUM, ELASTISLET)
SWEDEN (MIN-GUIDE, LORCENIS, RUNIN, CISMOB, ELASTISLET)
SWITZERLAND (LORCENIS, CHEM2NATURE, ELASTISLET)
UNITED KINGDOM (SEASIN, STRONGRHEP, MIN-GUIDE, 2D INK, GREEN INSTRUCT, CHEM2NATURE, RUNIN)

Budget

TOTAL BUDGET OF THE PROJECTS STARTED IN 2016 BY RESEARCH CENTRES AND FUNDING AGENCY*

RESEARCH CENTRE	EUROPEAN UNION	FOUNDATION FOR SCIENCE AND TECHNOLOGY	INNOVATION AGENCY	OTHER NATIONAL	OTHER INTERNATIONAL	2015	2016
CESAM	1.513.112	3.293.916				1.753.141	4.807.028
CIC.DIGITAL		110.712	229.794			81931	340.506
CICECO	3.578.105	3.152.486	1.870.808			2.619.910	8.601.399
CIDMA	136.590	74.960				15.000	211.550
CIDTFF	37.092	262.601		269629			569.322
GEOBIOTEC	100.000	11.640					111.640
GOVCOPP	519.869	923.228		110.819		758.199	1.553.916
I3N	323.156	258.941	876.836		51.300		1.510.234
IBI-MED		1.672.005					1.672.005
ID+						67324	
IEETA		743.514	210.649			727.814	954.163
IT	639.188	1.327.186	869.065			2.129.796	2.835.439
INET-MD	55.925	334.039					389.964
NOT INTEGRATED	925.062		1.211.864	1.415.151		364.542	3.552.077
QOPNA		614.965	408.456			620.721	1.023.420
RISCO	289.250	132.189	195.086			52329	616.525
TEMA	383.555	466.990	166.726			50.000	1.017.271
TOTAL	**8.500.904**	**13.379.372**	**6.039.283**	**1.795.599**	**51.300**	**9.240.706**	**29.766.458**

*Contracts with industry not included

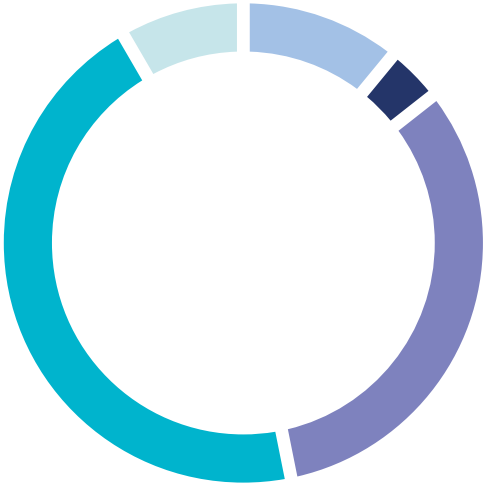
*in Euros

APPROVED BUDGET UNDER EU-FUNDED PROJECTS

EUROPEAN PROGRAMMES	2015	2016
FP7 - COOPERATION	403.680	
H2020 - ERC ADG		2.438.987
H2020 - TEAMING	43.923	
H2020 - TWINNING		203.717
H2020 -FETOPEN		244.250
H2020 - ITN-EJD	476.713	
H2020 - ITN-ETN	953.425	476.713
H2020 - RISE	652.500	58.500
H2020 - NMP	222.560	691.150
H2020 - EEB		289.250
H2020 - ICT	412.625	237.563
H2020 - ECSEL	661.453	583.750
H2020 - SC5	479.245	566.586
ERASMUS +	657.313	451.130
LIFE+	189.244	1.138.876
INTERREG EUROPE		383.555
INTERREG SUDOE		634.626
3RD HEALTH PROGRAMME	274.134	
EDA		102.250
TOTAL	**5.426.815**	**8.500.904**

*in Euros

DISTRIBUTION OF RECEIVED FUNDS, BY FUNDING AGENCY*



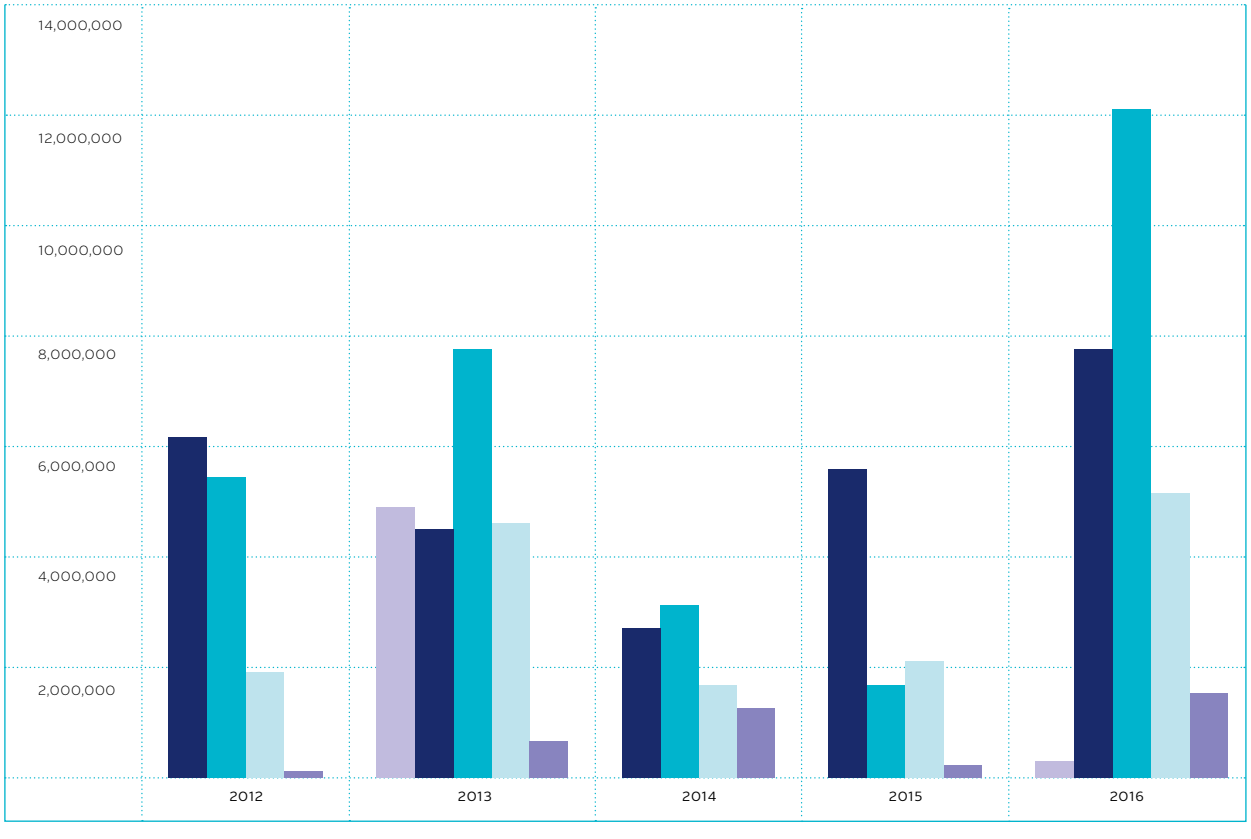
* Contracts with industry not included

APPROVED BUDGET UNDER FCT PROJECTS

RESEARCH CENTRE	ARTS, HUMANITIES AND SOCIAL SCIENCES	ENGINEERING	SCIENCES	2015	2016
CESAM			3.293.916	434.051	3.293.916
CIC.DIGITAL	110.712			61.243	110.712
CICECO	58.368	35.848	3.058.270	368.981	3.152.486
CIDMA			74.960	15.000	74.960
CIDTFF	262.601				262.601
GEOBIOTEC			11.640		11.640
GOVCOPP	923.228				923.228
I3N			258.941		258.941
IBIMED			1.672.005		1.672.005
IEETA		545.255	198.259	50.000	743.514
INET-MD	334.039				334.039
IT		1.327.186		561.457	1.327.186
QOPNA			614.965		614.965
RISCO	17.172	115.017			132.189
TEMA		279.311	187.679	50.000	466.990
TOTAL	**1.706.120**	**2.302.617**	**9.370.635**	**1.540.732**	**13.379.372**

*in Euros

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



7

RESEARCH SUPPORT

Support for researchers

The University of Aveiro (UA) is a highly regarded institution of research led education, organized in university departments, research units, polytechnic schools, interface units, and a vocational education network. Excellence in research is one of the hallmarks of UA and supports its aim to become one of the foremost research organizations in Europe in terms of involvement in European collaborations and a major player in the construction of the European Research Area.

To pursue these objectives, the Research Support Office (GAI/RSO), provides UA researchers with aid in the development and implementation of national and international research projects, either in the pre-award phase, during the submission or with the management of the project in post-award phase, working closely with the Office of Financial Management of Programs and Projects, responsible for the monitoring and economic-financial management of the projects.

RSO tasks include providing researchers with up-to-date information on research programs and fellowship programs (via email, webpage and Facebook), to continuously screen and scan specific calls and events relevant to UA community, to offer one-to-one coaching and support on proposal preparation and project management and also to organize dissemination and training events on important topics.

Other activities of the RSO include the “Researcher of the Month” and the Research@UA magazine initiatives, highlight high-level research developed at UA, both internally to the academy and externally, to the society in general.2016 was the starting year of a new initiative, the weekly newsletter, which aims at showing new achievements of UA faculty, researchers and graduated students, research project awards, contracts and grants and also facts and figures of the research activities at the campus. This newsletter is available by subscription to everybody who is interested in the research activity at UA and that wants to be aware of research developments that may be explored for technological development and economic growth.

The RSO team is continuously available to the UA community, so please contact if you need guidance and support or if you have any comments and suggestions.

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