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PAULO JORGE FERREIRA
University of Aveiro

A WORD FROM THE RECTOR

The oceans contain 97% of the planet's water, absorb about 30% of the carbon dioxide produced, are the largest source of protein in the world and are estimated to be able to provide 10% of the European Union's energy needs by 2050. The Sea sector is absolutely crucial for sustainable development and a resource with enormous economic and social potential.

For some decades now, marine sciences and technologies have been a priority for the University of Aveiro. With an internationally recognized multidisciplinary pro□le, the University of Aveiro has been investing in the integrated study of maritime systems, in the technological development of the sector and in the sustainable exploitation of marine resources, seeking to transfer this knowledge to society, through close collaboration with various local, regional, national and international entities. Investing in the conservation and sustainable use of the Sea is investing in the future.

ARTUR SILVA
University of Aveiro

MESSAGE FROM THE VICE-RECTOR

The University of Aveiro keeps reaffirming itself not only as one of the Portuguese research powerhouses, but as an important player within the international setting. The numbers are there to prove it in what comes to: the impact of research, as measured by citations and other research outcomes; the approval rate of projects within international, national and regional calls; or the capability to attract high quality faculty, researchers and PhD students, of diverse nationalities. Ever increasingly, the UA is responding to national and regional challenges, in a multitude of domains, requiring novel approaches and, particularly, new research team configurations and partnerships with companies, state organisations and third sector institutions.

These results are only made possible by the outstanding engagement of UA's community members – we all -, a shared belief in the importance of all domains of knowledge, and an ability and willingness to embrace new challenges and to reconfigure teams accordingly. All this is facilitated, better even, promoted, by our unique institutional organization, based on departments and schools, with all the research units within the University structure. And by the support personnel, either at central or unit level structures, ensuring a continuous support for the detection of new opportunities, training and information dissemination, proposal development and project management.

In 2019, we successful embraced a new project, the ECIU European University, building upon two decades of institutional international collaboration with counterparts all across Europe. This initiative, launched by the European Commission, has the potential to lead to far-reaching impacts, both for the learning dimension of Universities in Europe and for the research and cooperation dimensions, as for, needless to say, our own University and our common future lying ahead. With a focus on challenge-based education and on Sustainable Development Goal 11 - Make cities and human settlements inclusive, safe, resilient and sustainable, it will require a deep commitment for the years to come.

2019 did not end without the emergence of a new threat that shaped 2020, so far, and the next few years, without a doubt: the coronavirus pandemic. Yet again, the UA Community excelled in its response. Firstly, by swiftly adopting the necessary prevention measures, safeguarding health and lives. Then, by adapting and preserving teaching, research and support activities, to the extent possible under new, unpredictable, and ever-changing circumstances. But, above all, through an active engagement in the joint effort to tackle the pandemic, especially by partnering with regional and local health institutions, providing Covid testing, and distributing personal protective equipment. While at the same time, even with our researchers physically dispersed, preserving the capacity to submit innovative research proposals, again tapping our multidisciplinary pool of competences, in a response of a series of calls related to prevention, adaptation and mitigation to Covid and Covid-related effects.

This major disruptor, with a depth and scale beyond the financial crisis of a decade ago, is also the reason why the 2020 Research Summit will be held, not in a physical setting, but remotely. Nevertheless, the main structure of the event is maintained, bringing together international guests, UA's research and PhD presentations. In the year Portugal was scheduled to host the United Nations Ocean Conference, we will showcase our competences and diverse approaches to the theme Sea and Sustainability, faithful to our bonds with the Aveiro region and beyond, and underlining the national importance of sea-related features and activities.

Our track record within this subject includes, to name just a few: the participation in "Campus de Excelência Internacional Campus do Mar" and the doctoral program DO*MAR, in partnership with institutions from Galicia and Northern Portugal; the participation in Euromarine, the European Marine Research Network; the coordination of the Erasmus+ FISHAQU programme - Knowledge Exchange in sustainable Fisheries management and Aquaculture in the Mediterranean region; a new ERA Chair, BESIDE - Institutional, BEhavioural, critical and adaptive economics towards SustaInable Development, management of natural capital and circular Economy; the participation on the Collaborative Laboratory B2E – the Association for Blue Economy; the trailblazing ECOMARE project, the single Portuguese project to reach the prestigious European Regiostars Awards, in 2019; and the active role played within the preparatory meetings for the already above mentioned United Nations Ocean Conference.

The challenge that lies ahead is to build upon all the existing knowledge being developed, the partnerships established and the intertwining with the regions, to more effectively contribute to an even better understanding of our common seas, and how we affect them, and to foster a decisive use of science in decision-making!

3

RESEARCH UNIVERSE

Interdisciplinary research centres and facilities

The University of Aveiro hosts 20 research units, acting in many different scientific areas. 95% of these research centres have been classified as very good or excellent in the last evaluation process promoted by the National Foundation for Science and Technology.

Our research matrix character is the basis of an interdisciplinary and transdisciplinary research, based on the sharing of experiences, the exchange of information, the improvement of practices and the promotion of joint projects among researchers from the different scientific areas at the campi. This integrated structure permits the articulation and harmonization of the teaching and research environments, as well as the association with innovative science outreach activities.

Furthermore, our continuous capacity-building effort in terms of infrastructure (buildings and scientific equipment) and lines of research, including human resources and people, has been essential to improve its competitiveness and thus ensure a better future and a greater and more effective contribution to regional development.

Research centres

CESAM
Centre for Environmental and Marine Studies

CESAM's interdisciplinary expertise on environmental and marine sciences enables an active contribution to science-based knowledge supporting socio-ecological systems sustainable management and smart specialization.

Unit coordinator: Ana Lillebø

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

http://www.cesam.ua.pt

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

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

Pole coordinator: Fernando Ramos

Media and Technology, Society, Culture and Arts, Information and Communication

http://www.cicdigital.org

*Terminated in December 2019.
Replaced by DigiMedia from January 2020 onwards.

CICECO
Aveiro Institute of Materials

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

Unit coordinator: João Rocha

Research areas: Inorganic Functional Nanomaterials and Organic-Inorganic Hybrids, Multifunctional Ferroic Ceramics and Nanostructures, Carbon Materials, Composites and Functional Coatings, Biorefineries, Biobased Materials and Recycling, Biomedical and Biomimetic Materials and Computer Simulation and Multiscale Modeling.

http://www.ciceco.ua.pt

CIDTFF
Research Centre on Didactics and Technology in the Education of Trainers

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

Unit coordinator: Helena Araújo e Sá

Research areas: Education; Multiliteracies and Sustainability; Diversities and Curriculum; Professional and Human Development; Educational Policies, Quality and Evaluation; Multimodal Educational Resources; Professional and Organizational Practices.

https://www.ua.pt/cidtff

CINTESIS
Center for Health Technology and Services Research

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

Pole coordinator: Óscar Ribeiro

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

http://www.cintesis.eu

CIDMA
Center for Research and Development in Mathematics and Applications

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

Unit coordinator: Delfim Torres

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

http://cidma.ua.pt

CLLC
Centre for Languages, Literatures and Cultures

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

Unit coordinator: Anthony David Barker

Research areas: Between Texts – Literary Hermeneutics; Between Cultural – Cultural Hermeneutics; Between Languages – Variation, Translation, Learning.

https://www.ua.pt/cllc

CIPES
Center for Research in Higher Education Policies

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

Pole coordinator: Teresa Carvalho

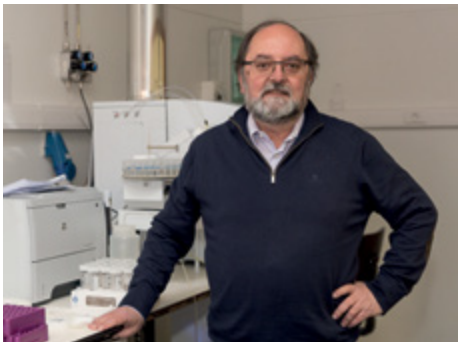
Research areas: Higher Education, System Level Policies, Institutional and Organisational Analysis and Resources, Performance and Human Capital.

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

GEOBIOTEC
GeoBioSciences, GeoTechnologies and GeoEngineering

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

Unit coordinator: Fernando Rocha



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

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

IBIMED
Institute of Biomedicine

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

Unit coordinator: Manuel Santos

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

http://www.ua.pt/ibimed

IEETA
Institute of Electronics and Informatics Engineering of Aveiro

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

Unit coordinator: Armando Pinho

Research areas: Information Processing, Information Systems, Biomedical Informatics, Biomedical Tecnologies, Intelligent Robotics, Intelligent Systems.

http://wiki.ieeta.pt/wiki/index.php/Research

GOVCOPP
Governance, Competitiveness and Public Policies

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

Unit coordinator: Anabela Botelho

Research areas: Competitiveness, Innovation, Sustainability, Public Policy, Institutions, Decision Support Systems, Territory, Development and Tourism.

http://www.ua.pt/govcopp

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

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

Unit coordinator: Vasco Branco

Research areas: Design, Art, Media and Culture.

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

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

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

Pole coordinator: Susana Sardo

Research areas: Ethnomusicology and Popular Music Studies; Historical and Cultural Studies in Music; Dance Studies; Creation, Performance and Artistic Research; Education and Music in Community; Musical Acoustics and Sound Studies.

http://www.inetmd.pt/

IT
Instituto de Telecomunicações

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

Pole coordinator: José Neves

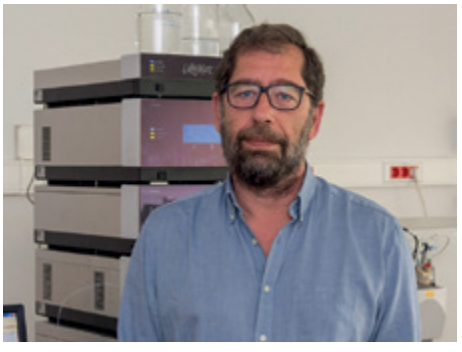
Research areas: Wireless Communications, Optical Communications, Networks and Multimedia and Basic Sciences and Enabling Technologies.

https://www.it.pt

QOPNA
Organic Chemistry, Natural Products and Agro-food Stu□s

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

Unit coordinator: Francisco Amado



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

https://www.ua.pt/qopna

*Terminated in December 2019.
Replaced by LAQV- REQUIMTE from January 2020 onwards.

TEMA
Centre for Mechanical Technology and Automation

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

Unit coordinator: António Bastos

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

https://www.ua.pt/tema

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

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

Pole coordinator: João Veloso

Research areas: Modelling of materials behaviour, Nanofabrication and micro-technologies and exploit of their multi-functionalities, Physical characterization of self-assembled nanostructures, Development of (opto)electronics and photonics devices and systems.

https://www.i3n.org

RISCO
Aveiro Research Centre of Risks and Sustainability in Construction

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

Unit coordinator: Paulo Cachim

Research areas: mitigation of risks in the built environment; efficiency of the use of resources in the built environment; built heritage conservation.

http://www.ua.pt/risco

Note from the editor:
From January 2020 onwards, the creation or integration in the following research units were approved by FCT:

DigiMedia
LAQV-Requimte
William James Research Center

Strategic projects

NeuroStimSpinal – A Step Forward To Spinal Cord Injury Repair Using Innovative Stimulated Nanoengineered Sca□olds

4 years; € 3.5 M; 7 Partners

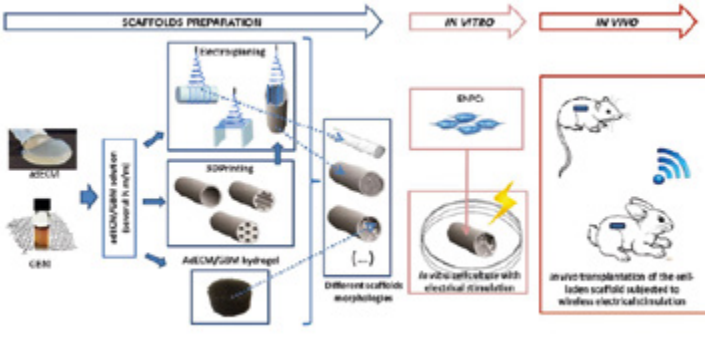
The NeuroStimSpinal was one of the 3 FET (Future and Emerging Technologies) Open projects coordinated by Portuguese institutions funded in 2018 and the first year of the project was completed last April. FET Open, an Horizon2020 scheme, funds and supports early-stage and high-risk science and technology actions with a radical vision, breakthrough technological target and ambitious interdisciplinary research.

The consortium is composed by 4 institutions and 3 companies from 4 different countries and gathers researchers from areas ranging from biomedical engineering, biomechanics, electronics, biology to neurosurgery. The project coordinator Paula Marques is a Principal Researcher at the Center for Mechanical Technology and Automation (TEMA) and in UA's Department of Electronics, Telecommunications and Informatics, CICECO-Institute of Materials and iBiMED-Institute of Biomedicine, are also involved. Graphenest SA and Stemmatters SA are the two national companies involved. Internationally, the partnership includes Universidad Complutense de Madrid and Fundacion Tecnalia Research & Innovation both in Spain, the Founddation for Research and Technology Hellas in Greece, and Radboud University in Netherlands.

The goal of NeuroStimSpinal is to contribute with a solution for spinal cord injury (SCI). SCI results in para- and tetraplegia caused by the partial or complete disruption of descending motor and ascending sensory neurons. The aim is to develop an innovative, stimulus responsive, and cell-laden biomaterial, capable to overcome the inhibitory environment following the injury and induce the repair of the nervous tissue. The proposed scaffold for implantation at the injury site is composed of graphene-based materials and a decellularized biopolymeric matrix (from the human adipose tissue) coupled with a wireless electrical stimulation device to promote the growth and reconnection of the ruptured nerves. While the biopolymeric matrix offers an excellent supportive structure with more than 139 proteins and 5 types of collagen, the graphene-based materials present biocompatibility, electrical activity, possibility for biofunctionalization and high surface to volume ratio for drug delivery. Therefore, this new hybrid approach offers great potential to generate substantial breakthrough for SCI.

https://www.neurostimspinal.eu/
https://cordis.europa.eu/project/id/829060

This project has received funding from the European Union Horizon 2020 research and innovation programme under grant agreement No 829060.

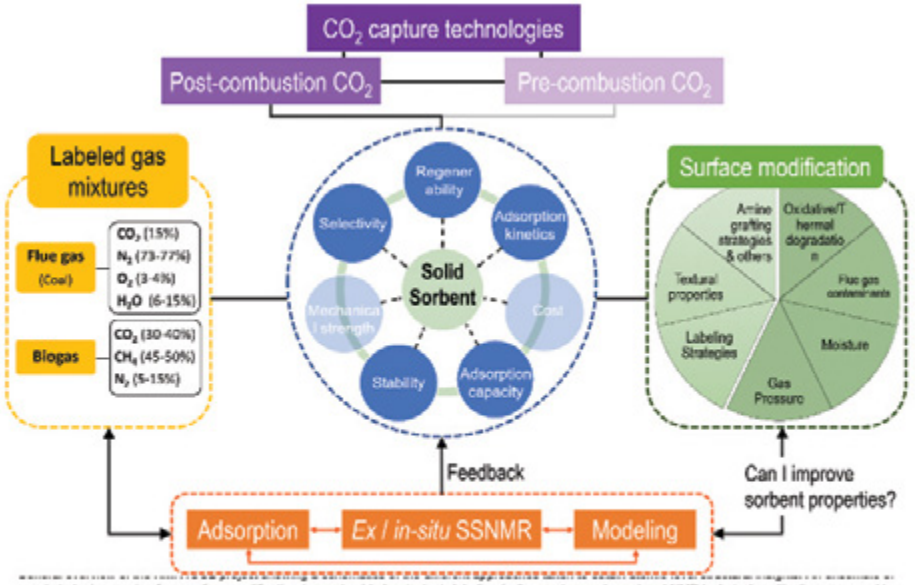


NMR4CO_2 - Unveiling CO2 chemisorption mechanisms in solid adsorbents via surface-enhanced ex(in)-situ NMR
60 months; € 2 000 000

The European Research Council (ERC) has awarded Luís Mafra, researcher from CICECO-Aveiro Institute of Materials and Chemistry Department of the University of Aveiro, a prestigious ERC Consolidator Grant (ERC-CoG) to explore Nuclear Magnetic Resonance (NMR) spectroscopy for studying gas-solid interfaces and gas sorption mechanisms in modified solid adsorbent materials for gas capture. This funding scheme supports innovative ideas proposed by researchers pursuing frontier research that are in the stage of consolidating their independence by establishing a research team and continuing to develop a success career.

Motivation: the improvement of CO2 removal technologies plays a critical role to tackle the environmental challenge humankind is facing. Because of their lower regeneration cost, modified porous silica-based solid materials are among the most promising CO2-adsorbents for replacing the decades-old liquid amine scrubbing technology as they are moisture-tolerant and selectively chemisorb CO2 from low-concentration mixtures, important features for operating under large-point CO2 emission source conditions. The nature of CO2 species formed on adsorbent surfaces determines the gas adsorption capacity/kinetics, selectivity, stability, and regenerability. However, a molecular-scale understanding of the CO2-surface adsorption process and thermal / oxidative degradation mechanisms remain elusive, hindering our ability to design improved sorbents.

The EU-funded NMR4CO2 project addresses this need, using – for the first time – state-of-the-art surface-enhanced solid-state NMR to study the chemistry of acidic gases (mainly CO2) adsorbed on adsorbent materials and of gas-solid interfaces using simulated industrial gas mixtures. This interdisciplinary project combines the expertise of spectroscopists, chemists, and engineers to tackle this grand challenge.



smart strategies ranging from surface modification (green box) to key isotopic labeling (yellow and green boxes) and NMR technical modications are used to enable surface-enhanced solid-state NMR spectroscopy. This multidisciplinary charcterization approach (orange box) aims at providing atomic level insight about confined gas dynamics and gas-solid interactions at materials surfaces thus providing feedback on i) key surface modifications and ii) sorbent degradation mechansims that will tailor target phisico-chemical properties of the studied solid sorbents (middle circle).

https://cordis.europa.eu/project/id/865974

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the grant agreement No 865974.

ThermoRise - Rise of the 3rd dimension in nanotemperature mapping

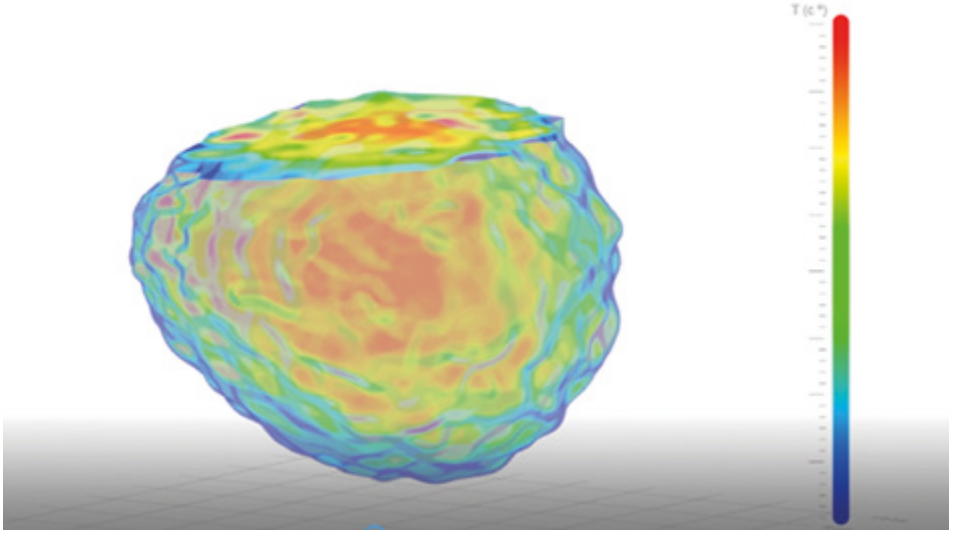
60 months; € 1 9 88 353,75

The European Research Council grants support researchers at different career stages: starting, consolidator and advanced levels. Nuno Silva is at the consolidator stage and, together with his team at CICECO -Aveiro Institute of Materials and Department of Physics of University of Aveiro, they have been working on the development of temperature sensitive and temperature-recording magnetic nanoparticles that open the door for a three dimension temperature mapping with high space resolution approaching the nanoscale and well below the surface of Human body.

The ERC consolidator grant will support the establishment of a research group with the appropriate resources to make three-dimension temperature mapping with nanoscale resolution a reality. ThermoRise is a project designed to develop nanoparticles and methods to determine temperature without using contacts, in depth, in three space dimensions and with a space resolution approaching the nanoscale. This will impact both on fundamental and application levels, including understanding the thermal properties of nanostructures and temperature control during tumor ablation and during heat-controlled release of drugs.

https://cordis.europa.eu/project/id/865437

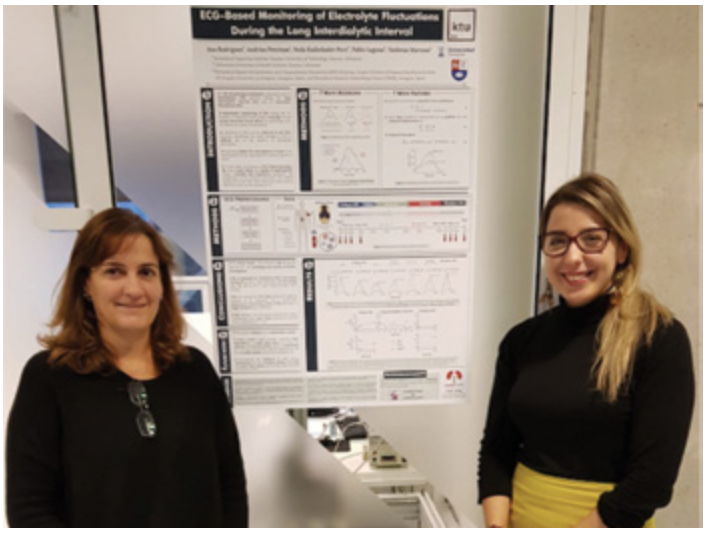
This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 865437.



Envisaged 3D temperature mapping and at distance ad in-depth, using the magnetic field created by nanoparticles.

ECIU Mobility Fund

The European Consortium of Innovative Universities (ECIU) recognizes the importance of cooperation in science, technology and innovation for universities to become world-leading research institutions. This scheme is intended to work as an incentive to explore and deepen research collaboration within the ECIU network, for instance, in terms of joint research funding grant applications, scientific publications and research projects. Ultimately it supports professional development of ECIU researchers, by supporting know-how exchange in an international high-quality research environment. 8 UA researchers were awarded with this support in 2019.



Olena Okhay

Department of Mechanical Engineering
Research unit: TEMA
Position: Researcher
Mobility period: 15-26 July 2019
Host Institution: Tampere University
Contact: Sampo Tuukkanen, Associate Professor
School/Department: Faculty of Medicine and Health Technology (MET)
Outcomes: *"Deep study / measurements / analyse of piezoelectric materials and materials for the electrodes for the supercapacitors as well as discussion of obtained results."*

Alexandra Ambrósio Polido

Department of Social, Political and Territorial Sciences
Research unit: GOVCOPP
Position: Researcher
Mobility period: 22 September-5 October 2019
Host Institution: University of Aalborg
Contact: Lone Kørnøv
School/Department: Department of Planning, The Danish Centre for Environmental Assessment
Host Institution: Linköping University
Contact: Eva Lövbrand
School/Department: Department of Thematic Studies: Environmental Change
Outcomes: *"The mobility fund allowed me to network with two eminient scholars, helping me to develop my career in terms of international collaborations for future project calls and high-impact papers"*

Maria Teresa Ferreira Herdeiro

Department of Medical Sciences
Research unit: Ibimed
Position: Professor
Mobility period: 24-30 November 2019
Host Institution: Kaunas University of Technology
Contact: Vaidotas Marozas
School/Department: Biomedical Engineering Institute
Contact: Veysel Kayser
School/Department: Clinical Pharmacy
Outcomes: *"Meetings with the staff ofthe Biomedical Engineering Institute and with the Faculty of Pharmaceutical Sciences, Department of Clinical Pharmacy and Institute of Physiology and Pharmacology"*

Vanda Alexandre Marques dos Santos

Department of Education and Psychology
Research unit: CIDTFF
Position: Researcher
Mobility period: 1-23 June 2019
Host Institution: Dublin City University
Contact: Gabriel–Miro Muntean
School/Department: DCU Glasnevin Campus/Electronic Engineering
Outcomes: *"The result of the mobility plans and opportunities for funding applications is a proposal for Horizon 2020 together."*

Nuno Miguel Freitas Ferreira

Department of Physics
Research unit: I3N
Position: Researcher
Mobility period: 11-24 August 2019
Host Institution: Aalborg University
Contact: Alireza Rezaniakolaei
School/Department: Department of Energy Technology
Contact: Lasse Rosendahl
School/Department: Department of Energy Technology
Outcomes: *"Mutual knowledge transfer regarding the processing and assembling approaches for thermoelectric materials and modules built/test."*

Eskilla Venkata Ramana

Department of Physics
Research unit: I3N
Position: Researcher
Mobility period: 6-26 October 2019
Host Institution: University of Twente
Contact: Evert Houwman
School/Department: Department of Science and Technology
Contact: Monica Morales-Masis
School/Department: Department of Science and Technology
Outcomes: *"Very useful discussion with the experts in the field was commenced in this mobility. This in future could strengthen the collaboration between the two groups".*

Jorge Manuel Alexandre Saraiva

Department of Chemistry
Research unit: LAQV-REQUIMTE
Position: Researcher
Mobility period: 25 October-14 November 2019
Host Institution: Tecnologico de Monterrey
Contact: Jose Antonio Torres
School/Department: School of Engineering and Sciences
Outcomes: *"As the more immediate opportunities, 1 or 2 PhD students are expected to start the PhD on 2019 in cotutelle with Tecnologico de Monterrey."*

Paula Celeste da Silva Ferreira

Department of Materials and Ceramic Engineering
Research unit: CICECO
Position: Researcher
Mobility period: 6-7 June/ 8-11 July 2019
Host Institution: University of Twente
Contact: A.J.H.M. Rijnders
School/Department: Faculty of Sciences and Technology, IMS, Mesa+
Host Institution: Dublin City University
Contact: Silvia Giordani
School/Department: School of Chemical Sciences
Outcomes: *"Enlargement of European network to strengthen personal career and open opportunities to the research group collaborations".*

4

SPOTLIGHT ON RESEARCH DISSEMINATION

Research Summit 2019

"Energy and Sustainability" was the theme of the second edition of the Research Summit at the University of Aveiro, which was held last July, 3-5, 2019.

Energy is a priority for the University of Aveiro, both in terms of education and research. The objectives of Research Summit 2019 involved, thus, the strengthening of the network among the faculty members, researchers and students at the campus, developing sustainable research partnerships, for a more sustainable use of infrastructures, sharing of know-how and contacts and offering early career researchers the opportunity to pitch their work, so as to improve communication and networking skills.

The programme included 3 keynote talks by highly-reputed speakers. Dr. Ashley Nunes, senior Research Associate/Lecturer at Harvard Law School, earned his Ph.D from the University of Illinois at Urbana Champaign, where his research explored the scientific merit of raising retirement ages. He has written for the Financial Times, The Washington Post and The Atlantic, among others, and his work has been covered by The Economist, The Guardian and the BBC. At the Research Summit he presented a lecture entitled "The Long Road to Autonomy". Carlos Pascoal Neto, Director General at RAIZ - Forest and Paper Research Institute, the Navigator Company, gave a lecture on "Pulp and paper mills: forest-based emerging biorefineries". Sérgio Salústio, R&D Director Water treatment appliances and technologies, Bosch Termotecnologia presented the work "Smart Green Homes: A collaborative learning approach for fascinating and sustainable home comfort".

The Research Summit also hosted 15 scientific oral talks by UA researchers, where, in an informal setting, they presented the audience with work developed within the thematic in their Research Units. The Vice-Rector for Research, Innovation and 3rd Cycle, Professor Artur Silva, moderated, afterwards, a debate on the perspective of these coordinators on the global theme of Energy and Sustainability. Also of relevance in this edition of Research Summit were the ca. 330 PhD students who participated in the PhD pitch contests.

The Research Summit was attended by graduation and post-graduation students, researchers and professors from the University of Aveiro, which enriched the event with their presence and active contribution.

Academia de Verão

SUMMER ACADEMY

The Summer Academy, an initiative of the University of Aveiro (UA) that provides, every year, a first contact with academic life and a diverse set of scientific, sports and leisure activities, especially for students from the 5th to 12th grades, already has had 14 editions. This great contact party with science, which normally takes place during the first two weeks of July, was attended by 455 participants in 2019 from various Portuguese districts.

The scientific activities are organized by the organic units and research units - a total of 16 departments, four polytechnic schools and about 20 research units - which propose programs for each annual edition of the event. In addition to the scientific aspect, there is also a social program with sports and leisure activities. Summer Academy participants can enroll with or without accommodation.

The promotion of the public understanding of science, the concern in communicating the scientific advances at UA, the development of "science to all" initiatives is a strong focus of UA's organizational culture. Since its foundation UA promoted an Open Day, lately transformed into an Open Week, and recently as the Summer Academy, dedicated to strengthening the ties between society and the scientific world and promoting the scientific areas and the different offer of study cycles. The creation of a dedicated communication structure for UA, in the mid-90s of the 20th century, and the Fábrica – Live Science Centre in 2004 were very innovative and pioneer enterprises in the context of the Portuguese universities. Nowadays, the efforts of these structures are permanent and the commitment was strengthened to the global university community.

UA's concerns about science outreach and public engagement with scientific and technological issues is also seen as an opportunity of improvement of the citizenship and welfare of our society. This is an all-year round premise that is also true during the Summer Academy.

5

RESEARCH HIGHLIGHTS

Modelling the impacts of citizens-led scenarios in European urban areas

Vera Rodrigues[1], Kevin Oliveira[1], Sílvia Coelho[1], Sandra Rafael[1], Joana Ferreira[1], Ana Patrícia Fernandes[1], Johnny Reis[1], Ana Isabel Miranda[1], Carlos Borrego[1], Kris Vanherle[2], Iason Diafas[3], Angreine Kewo[4], Carlo Trozzi[5], Joana Soares[6], Jo Barnes[7], Enda Hayes[7], Laura Fogg-Rogers[7], Margarida Sardo7, Sophie Laggan[7], Stephan Slingerland[8], Hans Bolscher[8], Myriam Lopes[1]

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4 — Danmarks Tekniske Universitet, Denmark
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6 — Norsk Institutt for Luftforskning, Norway
7 — University of the West of England, Bristol, United Kingdom
8 — Trinomics BV, Netherlands

ClairCity is a research project funded by the EU Horizon 2020 programme, which aims to improve future air quality and carbon policies in European cities by initiating new modes of engaging citizens, stakeholders and policymakers. Six partner cities directly shaped the project: Amsterdam in the Netherlands; Bristol in the UK; Ljubljana in Slovenia; Sosnowiec in Poland; the Aveiro region in Portugal and the Liguria region in Italy. ClairCity assessed environmental, health and economic impacts, through a quanti□cation framework. This framework consists of an integrated urban module based on household and dwelling characteristics, atmospheric emissions, air quality patterns, health-related impacts and costs, and carbon footprint estimates. The ClairCity framework contributed to apportion air pollution not only by technology, but also by citizens' behaviour, considering the baseline as well as future scenarios translating the expectations of citizens and local experts. For the Aveiro region, a □nal Uni□ed Policy Scenario was designed, leading to a maximum reduction of the nitrogen dioxide (NO2) concentrations of 87%, and a maximum reduction of only 17% of the fine particulate matter (PM2.5) in the air, in 2050. The slight decrease of the PM2.5 concentrations is associated with the fact that citizens have not come up with one single energy/ heating measure. Although residential heating is a main source of PM2.5 emissions, this is not perceived as an air pollution source by citizens in the Region.

Furthermore, in each ClairCity pilot, the air quality will distinctly improve in the future depending on the distinct levels of ambition set to the citizens-led scenarios. Three cities targeted the pollutants with the highest health impact on their population, namely Amsterdam (NO2), as well as Bristol and Sosnowiec (PM2.5), while Aveiro Region and Liguria are mostly targeting the pollutant with the least health impact (NO_2).

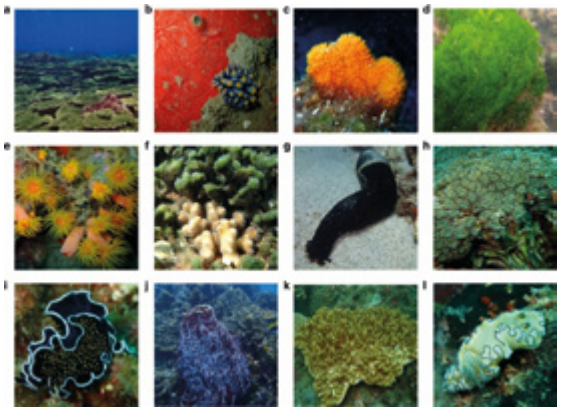
FIGURE 1
Engagements throughout the ClairCity project: a total of 8302 people from ClairCity cities and regions directly engaged with the project over its duration. More information on ClairCity can be found at the website www.claircity.eu.

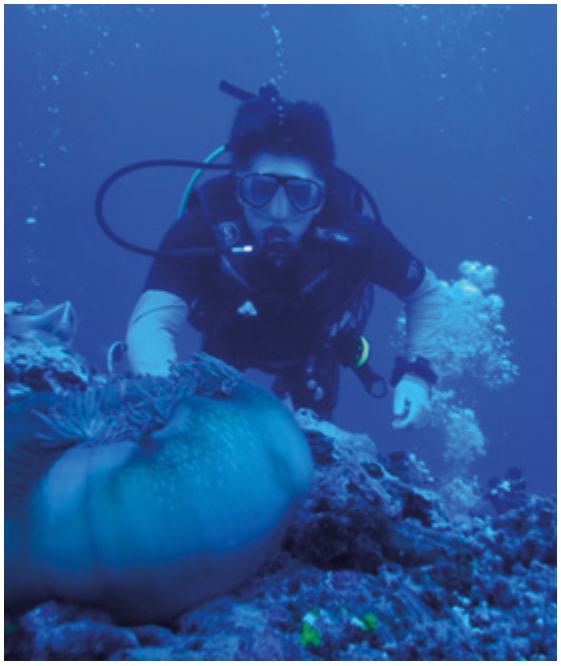
The sponge microbiome within the greater coral reef microbial metacommunity

Daniel F.R. Cleary[1,2,3], Thomas Swierts[4,5], Francisco J.R.C. Coelho[1,2], Ana R.M. Polónia[1,2], Yusheng M. Huang[3,6], Marina R.S. Ferreira[1,2], Sumaitt Putchakarn[7], Luis Carvalheiro[2], Esther van der Ent[4,5], Jinn-Pyng Ueng[3,8], Newton C.M. Gomes[1,2], Nicole J. de Voogd[4,5]

One of the most recent and fascinating developments in biology has been the realisation of how important microbiomes are to the healthy functioning of organisms and entire ecosystems. In marine environments, sponges have been considered a model organism to study host-microbiome relationships. Sponges are the most ancient of metazoans and are considered a reservoir of microbial diversity in the world´s oceans. However, until now, it was not clear if and to what extent microorganisms found in sponges are also present in other coral reef biotopes.

The research team of the Laboratory for Molecular Studies of Marine Environments (LEMAM), from CESAM/Dbio, in collaboration with researchers from different institutions in Taiwan, Thailand and the Netherlands, carried out an extensive and ambitious study that aimed to characterise the microbiome of more than 200 coral reef samples from multiple taxa in the Indo-Paci□c region. Using high-throughput DNA sequencing and the computer cluster from the University of Aveiro (Argus), the microbiomes from algae, chitons, stony corals, sea cucumbers, sponge denizens, □atworms, nudibranchs, soft corals, sponges, sea urchins, seawater and sediment were analysed. The researchers found that a high number of microorganisms are shared among di□erent biotopes, supporting the hypothesis of Baas Becking that “everything is everywhere but the environment selects”. Contrary to what was believed until now, sponges are not the main contributors to total prokaryote diversity in coral reefs. They are only one, albeit an interesting, component of a much larger coral reef metacommunity.





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8 —Department of Aquaculture, National Penghu University of Science and Technology, Taiwan

FIGURE 1
Pictures of sampling sites and organisms sampled during this study. a. Coral reef in the southern Penghu islands, Taiwan, b. the nudibranch Phyllidia cf. coelestis, c. the sponge Ptilocaulis spiculifer, d. the green alga Chlorodesmis fastigiata in shallow water, e. the sun coral Tubastraea coccinea, f. the green sponge Haliclona cymaeformis, g. the sea cucumber Holothuria leucospilota, h. the stony coral Galaxea astreata, I. the spotted □atworm Thysanozoon nigropapillosum, j. the barrel sponge Xestospongia testudinaria covered by sea cucumbers (Synaptula sp.), k. the soft coral Cladiella sp. and l. the nudibranch Doriprismatica atromarginata. All photographs were taken by D.F.R. Cleary or N.J. de Voogd

FIGURE 2
Diving in Taiwan.

Ecosystem-based management planning across aquatic realms at the Ria de Aveiro Natura 2000 territory

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Ria de Aveiro represents a coastal territory, in which its natural capital, mostly classi□ed under a Natura 2000 network of protected areas, is of paramount importance for the regional and national economy. Current and foreseen changes connected to human activities, namely land and water uses and potential con□icts, in frame of environmental policies, sustainable economic development and human well-being, require the implementation of Ecosystem-based management (EBM) planning processes. The main objective was to elaborate on the co-development of the EBM planning process across three water domains (inland, transitional and marine waters) for the mitigation of unintended impacts from the management plan under implementation. The management options considered in the prospective scenarios were the dredging programme, named "Sediment Transposition for Optimization of Hydrodynamic Equilibrium in the Ria de Aveiro" and the extension of the □oodbank to prevent surface saltwater intrusion into agricultural areas, at the con□uence of the Vouga River and the coastal lagoon. The approach used followed a stepwise procedure in frame of resilience principles, considering the analysis of the relationship between the social and ecological components and on how these can be connected through risk assessment and a spatial multi-criteria analysis (SMCA) based on the delivery of ecosystem services. Stakeholders' perception matched the ES provisioning risk assessment and supported planning the EBM response that consists in saltmarshes and seagrasses meadows restoration programs. Compliance of the proposed measures is achievable regarding policies (policy targets and policy instruments) and feasibility (scienti□c and technological knowledge and □nancial resources). The EBM response can support the Vouga estuary management plan and regional smart specialization (RIS3 Centro).

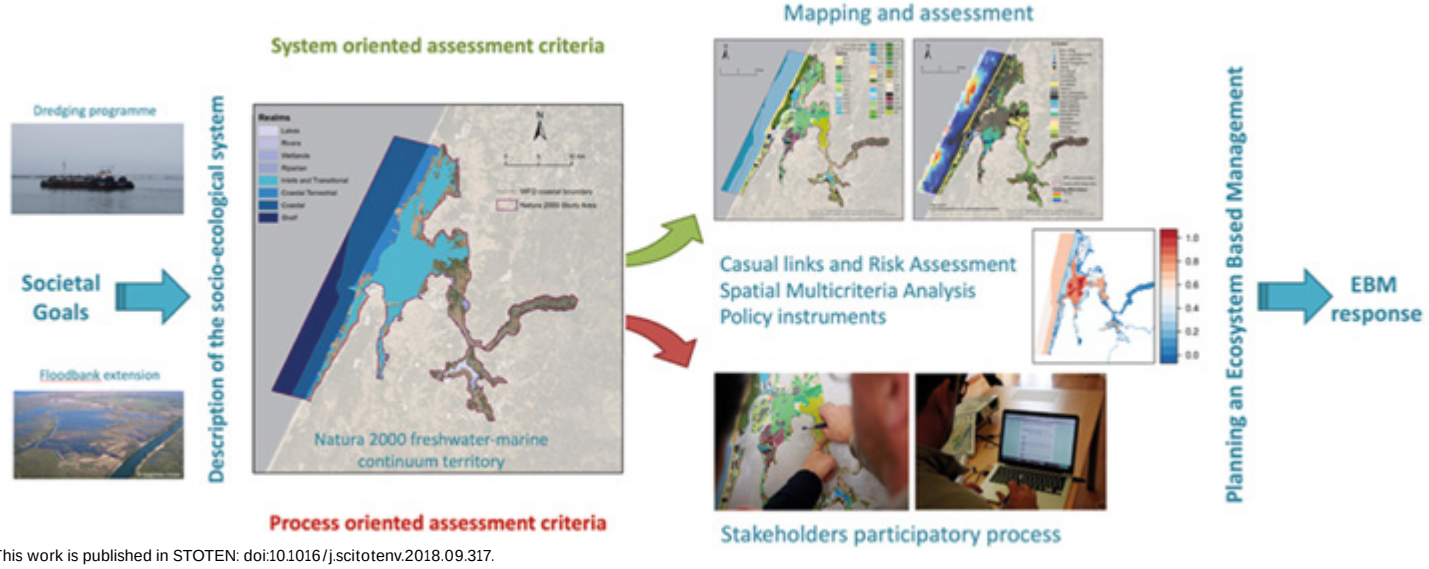

FIGURE 1
Schematic representation of the Ecosystem-based management planning processes across aquatic realms at the Ria de Aveiro Natura 2000 territory.

This work is published in STOTEN: doi:10.1016/j.scitotenv.2018.09.317.

Revisiting Kekulene: Synthesis and Single-Molecule Imaging

Iago Pozo[1], Zsolt Majzik[2], Niko Pavliček[2], Manuel Melle-Franco[3], Enrique Guitián[1], Diego Peña[1], Leo Gross[2], Dolores Pérez[1]

By the end of the 19th century, August Kekulé, inspired by a dream, was the first to understand the peculiar structure of benzene. Benzene, the smallest and archetypical aromatic compound, is a planar molecule which has a delocalized π electron cloud instead of discrete alternating single and double bonds. Kekulene is an artificial porous aromatic compound which shares the hexagonal shape of benzene yet it is made by joining together 12 benzene rings. It was first synthesized in 1978 and named after Kekulé to honour his achievements, Figure 1. In kekulene, as in other aromatic compounds, the way the π electrons populate the molecule results in particular molecular and electronic properties revealing their quantum chemical origin.

From benzene and kekulene to graphene, computer models are fundamental to understand and predict the properties of aromatic molecules and materials. Now, the applied computer modelling group lead by Manuel Melle-Franco at CICECO, a team of organic chemists from the University of Santiago de Compostela (Spain) and IBM Research Zurich (Switzerland) have proposed a new and simpler synthesis for kekulene. Besides, they have sublimated kekulene onto a metal surface and imaged it with ultra-high-resolution Atomic Force Microscopy (AFM), Figure 1.

The observation of single molecules of kekulene with exquisite detail backed-up by highly accurate computer models provides additional support for a molecular structure of kekulene, showing a clear and significant degree of bond localization, in accordance with the resonance structure predicted by the Clar model, Figure 2.

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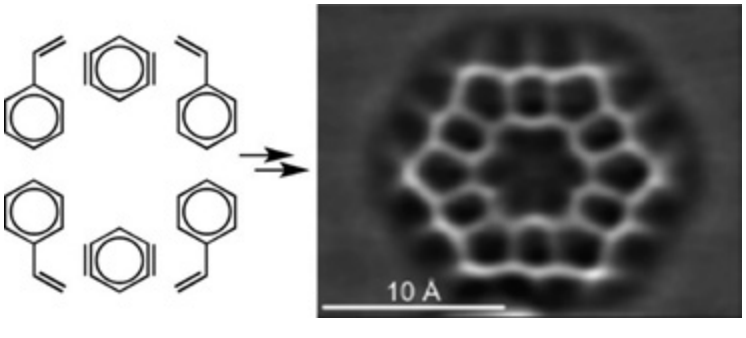
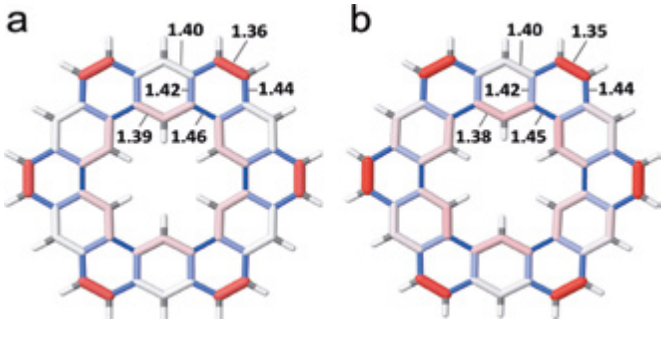
FIGURE 1
Schematic synthesis of kekulene and constant-height AFM image with a CO-functionalized tip of kekulene on a copper surface.

FIGURE 2
Computed (a) versus experimental (b) molecular structure of kekulene. The colours grade with distance from 1.33 Å (red) to 1.40 Å (white) to 1.47 Å (blue). Bond lengths are in Å.





Sol gel graphene/TiO2 nanoparticles for the photocatalytic-assisted sensing and abatement of NO_2

Andrea Giampiccoloa[1], David Maria Tobaldi[2], Salvatore Gianluca Leonardi[3], Billy James Murdoch[1,4], Maria Paula Seabra[2], Martin P. Ansell[1], Giovanni Neri[3], Richard J. Ball[1]

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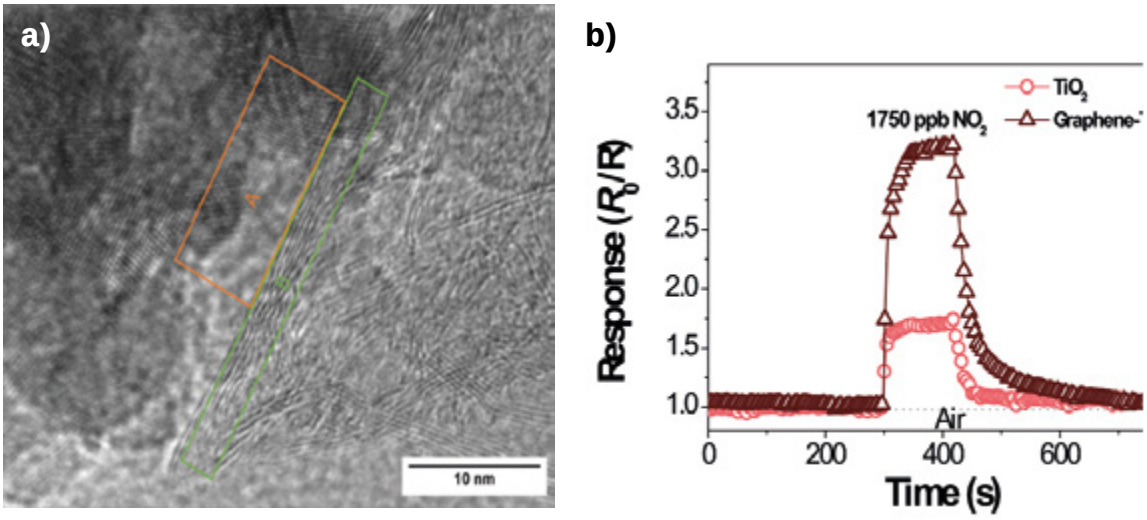
Outdoor air pollution adversely a□ects human health and is estimated to be responsible worldwide for severe health problems. Nitrogen oxides (NO_x) are common (indoor and outdoor) anthropogenic air pollutants. NO_x emissions come from the combustion processes in stationary and mobile units, thus they are commonly related to tra□c-sources. As such, NO_x are related to several short- and long-term health e□ects, even to carcinogenity. Simultaneous sensing and abatement are approaches which could both neutralise and monitor these species, providing a safer environment and warning occupants of harmful NOx levels. In this work, graphene/TiO_2 hybrids were synthesised via a sol-gel route. This led to an intimately mixed composite material (Figure 1a). Under UV-vis photo-excitation generated by a low power LED, the graphene/TiO_2 hybrid sensor prepared in this work showed a remarkably enhanced response to 1750 ppb NO_2, about double the response in the dark, and a limit of detection of about 50 ppb of NO_2 (Signal/Noise=3), Figure 1b. Our material, excited by the same wavelength, was also able to photocatalytically neutralise NO_x gases at indoor concentration levels. The signi□cant improvement in sensitivity and photocatalytic at room temperature under the UV–vis excitation was attributed to higher surface area (smaller particle size), and to the increase in the separation of the photogenerated exciton compared to unmodi□ed TiO_2. This makes our material very much suitable for multipurpose environmental applications, o□ering a safer environment through providing a warning of the presence of NO_x whilst also reducing their levels.

FIGURE 1
a) TEM micrograph showing the interface of atomic planes of TiO2 [A box], and graphene □ake [B box].

b) response, under UV excitation, to 1750 ppb of NO2 of the synthesised TiO2 and graphene/TiO2 hybrid.



Learning from Imperfections: Predicting Structure and Thermodynamics from Atomic Imaging of Fluctuations

Lukas Vlcek[2], Maxim A. Ziatdinov[3], Artem Maksov[3], Alexander Tselev[1], Arthur P. Baddorf[3], Sergei V. Kalinin[3], Rama K. Vasudevan[3]

An equilibrium phase diagram of a chemical system or an alloy graphically shows regions, usually in respect to temperature and chemical composition, where single phases or structures are stable, and regions where two or more phases must coexist. A phase diagram is an indispensable tool for understanding and predicting system behavior under di□erent conditions. Phase diagrams are generally based on experimental data or thermodynamic calculations with a single sample being used to derive information on a single point in a diagram. Therefore, construction of phase diagrams and identi□cation of special points on phase diagrams demand signi□cant experimental e□orts, and frequently not all compositions can be investigated in equal detail. Construction of phase diagrams based on fewer experimental data would signi□cantly facilitate the search for and discovery of new materials.

This work demonstrates an approach where an atomically-resolved image of a single sample is used for determination of structural and chemical variations of a compound, which then analyzed with methods of statistical testing, statistical physics, as well as machine learning algorithms to obtain a predictive model of the material for a range of chemical compositions. The approach makes a direct use of the imperfections, impurities, and stochastic details of material structure present in atomically resolved microscopic images. The developed framework (Figure 1) was applied to infer e□ective atomic interactions driving Ca and La segregation in a La5/8Ca3/8MnO3 thin □lm. The results demonstrate that atomic-scale studies of a single composition can provide information on a □nite area of the chemical space, and this information can be used to reconstruct material properties in a □nite composition and temperature range. The optimized model is further analyzed by a variational autoencoder to detect anomalous behavior in the composition phase.

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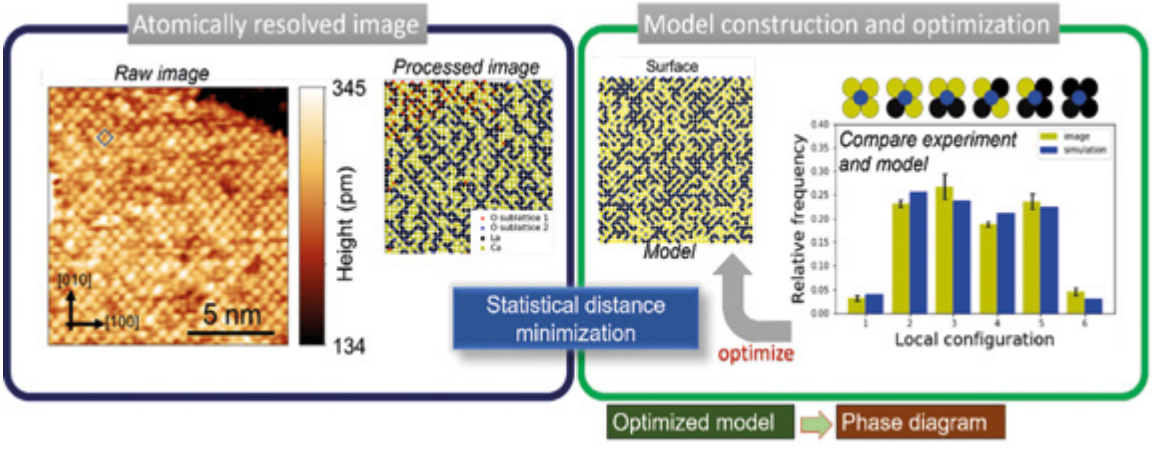

FIGURE 1
a) TEM micrograph showing the The proposed work□ow involves processing the data from atomic-scale imaging with account of data from macroscopic measurements and □rst-principles theory. Atomic resolution images (such as the scanning tunneling microscopy image shown on the left) provides information on location and composition of the atoms. The image is processed to facilitate the comparison with the generative model. The generative model is optimized to minimize the statistical distance between the model and the experimental data. The result after optimization is a model that can be used to predict the system behavior as a function of, e.g., chemical potential or temperature. These data can be fed directly into arti□cial intelligence algorithms to determine any anomalies in the phase diagram and to highlight points for further investigation.

Spontaneously Scalarized Kerr Black Holes in Extended Scalar-Tensor–Gauss-Bonnet Gravity

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2 —Department of Mathematics & CIDMA, University of Aveiro

Black holes are mysterious spacetime regions that populate the Universe. In Einstein's general relativity they are described by a canonical solution of the vacuum □eld equations found by Roy Kerr in 1963 and known as the "Kerr black hole". This black hole model is completely speci□ed by the black hole mass and angular momentum (spin).

Although theoretically supported, the claim that astrophysical black holes abide by this canonical model is an hypothesis in need of observational con□rmation.

The □rst image of a black hole released in 2019 by the Event Horizon Telescope collaboration provides new observational data to test the Kerr hypothesis. Einstein's general relativity, and the Kerr model are consistent with the data. But, within the present accuracy, how much can these data distinguish alternative black hole models that may be, theoretically, also viable?

In this letter the authors show how a spin selection e□ect may mask non-Kerrness. In a class of alternative models, which are dynamically viable, only small spin black holes deviate signi□cantly from the canonical model, whereas high spin black holes are observationally indistinguishable, or exactly equal, to the Kerr model. This yields a novel and concrete realization of a richer landscape of black holes which may exhibit di□erent properties only for certain ranges of mass or spin.

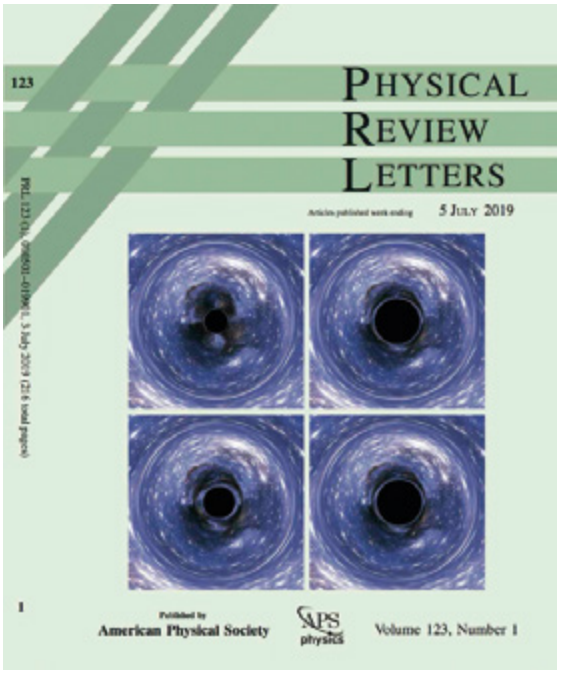

FIGURE 1
The □gure, selected to feature on the cover of the journal issue wherein the paper was published, exhibts a comparison between the lensing properties of the canonical Kerr black hole (right columns) and the alternative model (left columns). The centre of each panel features the black hole "shadow", surrounded by a lensed sky. The top columns are for non-spinning black holes and the di□erence in the shadow size is notorious. The bottom columns are for slowly spinning black holes and the di□erence starts to become less noticeable.

CGO-Faddeev approach for complex conductivities with regular jumps in two dimensions

Ivan Pombo[1]

One of the fundamental problems in the area of Inverse Problems is the so-called Calderón problem, which asks if it is possible to reconstruct uniquely the conductivity of a body from boundary measurements. In the last decades, the need for non-invasive imaging has been key in diverse areas such has geological prospecting, civil engineering and medical imaging and this problem is the basis of many such modern methods.

Unfortunately, besides the well-known case of A. Astala and L. Paivarinta (Annals of Mathematics, 2006) who solve the problem for non-physical situation of zero frequency, mathematicians were not able to overcome the requirement of the conductivity being at least one-time differentiable in solving this problem. This condition is never fulfilled in practical applications where changes between tissues and materials are common. In this work a novel approach was proposed which is based on a new original concept of admissible points which allows to study conductivities with jumps. This work combines the problem with transmission problems and achieves a reconstruction result for positive frequencies. It is based on the introduction of a new set of complex geometrics optic solutions, essential in the literature for the proofs of reconstruction and uniqueness, and on the adaptation of the scattering data. In this work indications were given that the problem is solvable if the proposed line of research is developed.

This work is part of the master thesis of Ivan Pombo and has been so well received by the community that it is now published as a paper in the journal „Inverse Problems“, the principal journal in the field with Ivan Pombo as the sole author.

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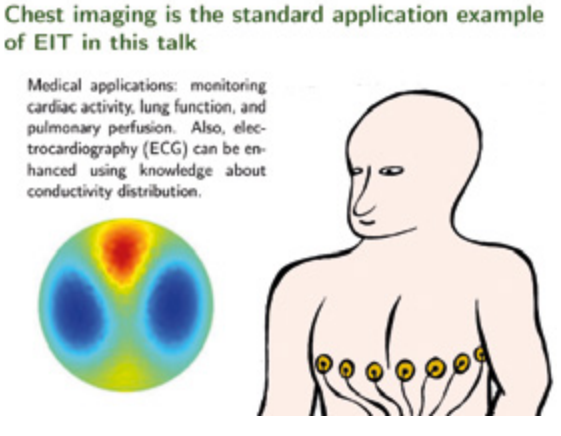

FIGURE 1
One can see the potential medical applications of reconstructing the conductivity through a measuring system consisting of electrodes around the body.

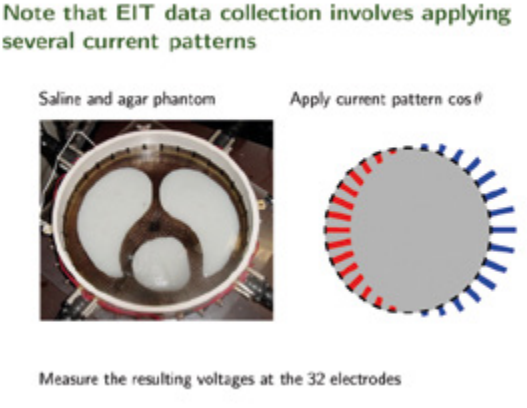

FIGURE 2
Application of diverse linear independent current patterns and measure of the corresponding voltages, through a set of electrodes, allows the reconstruction of a saline and agar phantom simulating the lungs and heart.

Assessment of plurilingual competence: intercomprehension as a focus

Maria Helena Araújo e Sá[1], Ana Isabel Andrade[1], Ana Raquel Simões[1], Cristina S[1]á, Filomena Martins[1], Luísa Álvares Pereira[1], Maria Helena Ançã[1], Maria João Loureiro[1], Mónica Lourenço[1], Rosa Faneca[1], Susana Pinto[1], Ângela Espinha[1]

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There has been much research about plurilingual competences in the last 20 years, especially concerning intercomprehension as a didactic approach due to the publication of the first version of the Common European Framework of Reference for Languages: learning, teaching, assessment (2001). The results show that approaches related to intercomprehension contribute to the development of multiple dimensions of language competences (attitudes, motivation for learning, cognitive and metalinguistic strategies, skills, ...), but are not used in the schools, namely because there are no validated tools to assess the plurilingual performance.

Therefore, a group of researchers coming from 7 European countries speaking 6 languages developed tools to assess plurilingual competence through intercomprehension . This concept refers to a way to communicate in multilingual situations using competences in several languages including some transversal ones (metalinguistic, cognitive, strategic, among others) to promote the interaction between people speaking different languages who are not supposed to master one another's languages.

As the Figure shows, these tools include dimensions of plurilingual competence, criteria for assessment, and descriptors for 6 levels in reception and interaction accompanied by a protocol designed to certify plurilingual competence and validated tests with guidelines for the jury and the candidates.

These products adaptable to assessment and certification programs received the seal of approval of the European Commission, in 2019, and the attention of international agencies related to linguistic politics due to their important contribution to the promotion of the linguistic and cultural diversity of today's societies.

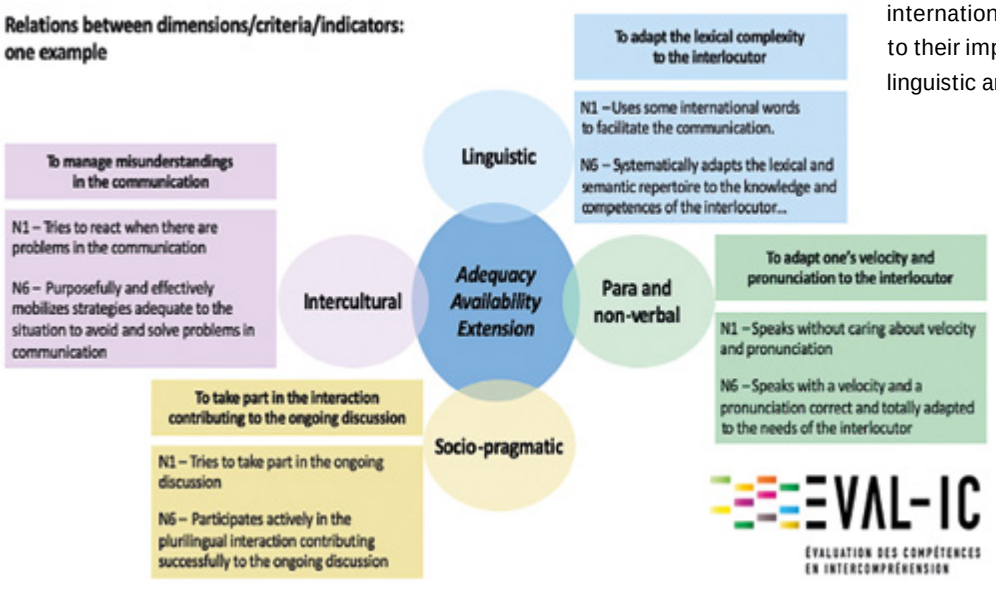

FIGURE 1
Dimensions, criteria, indicators and levels to assess intercomprehension.

TangIn Project – Converging tangible programming, STEM and inclusion

Isabel Cabrita[1], Maria José Loureiro[1], Cecília Guerra[1]

The TangIn[1] Project emerges from a network of partners, with distinct pro□les, connected to businesses, universities, schools and other educational institutions from 4 European countries: Bulgaria, Latvia, Spain, and Portugal.

Pursuing a true iterative and R&D approach, this consortium co-created, co-implemented, co-assessed and co-reformulated the *TangIn toolbox*, which integrated a teacher's handbook[2] and a set of lesson plans[3] designed for elementary education[4], focused on tangible programming, as a captivating, fun, playful and collaborative support of a STEM (*Science, Technology, Engineering e Mathematics*) curricular approach, in an inclusive perspective. The development of these documents occurred cyclically, thus leading to successive reformulations of the Kit – Desk research, literature review and the application of an international questionnaire; Creation of a □rst draft of the didactic kit; Testing of the Kit in a real Portuguese scenario; International TangIn course and □nal version of the teachers' training handbook[4]; Testing of the results in real scenarios in all countries; Development of the □nal teachers' package; National dissemination events in all of the involved countries. The international TangIn course was led by the University of Aveiro and the trainees became "TangIn embassadors", promoting multiplier training events, disseminating the project among teachers, researchers, businesspeople, and political decision makers.

The results highlighted i) the advantages in using this methodology to achieve the □nal product and also ii) the importance of the tasks for the development of computational thinking skills in STEM as well as in the inclusion of the children involved. During the extension of the project one intends to assess the sustainability of the achieved results, especially regarding the adaptation and/or recreation of the toolbox content and its consequent exploration by other professionals with interest in this area.

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FIGURE 1
International TangIn course.

FIGURE 2
Tangible programming in real Bulgarian, Latvian, Spanish, and Portuguese contexts.

[1] http://www.tangin.eu/
[2] http://www.tangin.eu/download-area/
[3] http://www.tangin.eu/lesson-plans-toolbox
[4] Elementary education is di□erent in the countries involved but includes children aged 6 to 10.
[5] http://hdl.handle.net/10773/27302

Living with end stage renal disease: Towards a *'we-disease'* perspective

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End stage renal disease (EDRD) is a life-threatening condition, with rising prevalence worldwide. Patients must undergo some form of renal replacement therapy, usually haemodialysis (HD) in order to survive. HD demands radical lifestyle changes, as patients have to adherence to a complex regime of HD sessions, medication, fluid and dietary management, vascular access care and exercise. Family support has been recognized as an important determinant of patient's adherence and self-management in chronic conditions, but a family approach to ESRD remains understudied. The project "Together We Stand" (POCI-01-0145-FEDER-030228) aims to add some light to this issue. In 2019, the research team observed that patients and families are aware about the vascular access care demands, crucial to patients' survival, but lack of knowledge and skills was also evidenced, suggesting the need of educational interventions on a family base within a close cooperation approach with healthcare providers in dialysis settings. This work was distinguished at the International Congress of Vascular Access and published in *The Journal of Vascular Access*. Furthermore, support from family, friends and significant others has been consistently linked to better health outcomes for patients across several chronic conditions. However, social support has never been systematically investigated in relation to dialysis adherence. Our recent systematic review published in *Seminars of Dialysis* tried to fill this gap. We have found that in 75% of the included studies, social support was a significant predictor of treatment adherence. After adjusting for confounding factors, 58% of these associations remained significant. Particularly, family support was significantly associated with fluid, diet and medication adherence pointing to the need of including family in psychoeducational interventions as part of innovative renal rehabilitation programs. This work has gained attention from the Physician's Weekly.

together
we stand

Promoting adherence in end-stage renal disease
through a family-based self-management intervention

A scale to assess the methodological quality of studies assessing usability of eHealth products and services: a Delphi study followed by validity and reliability testing

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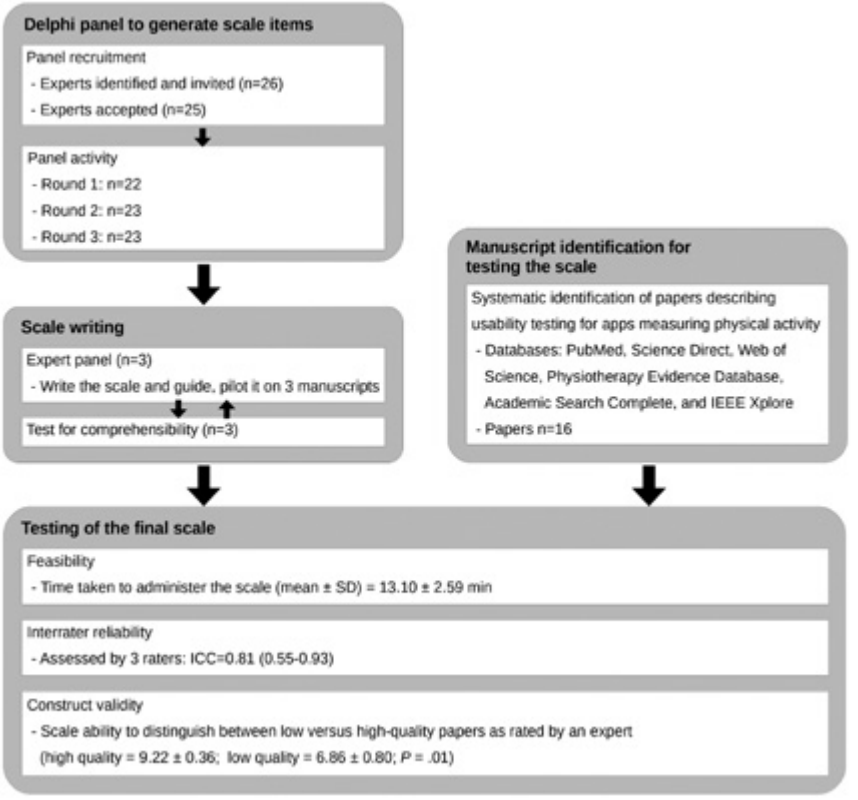
The usability of eHealth and mHealth applications is of paramount importance as it impacts the quality of care. Methodological quality assessment is common practice in the field of health for different designs and types of studies and this assessment is guided by scales or guidelines for methodological quality assessment. However, there is no validated instrument to assess the methodological quality of studies on the usability of eHealth products or services. Therefore, we aimed to develop a scale to assess the methodological quality of studies assessing usability of eHealth solutions. This scale was piloted on studies assessing the usability of mobile apps measuring aspects of physical activity and to perform a preliminary analysis of its feasibility, reliability, and construct validity on studies assessing the usability of mobile apps measuring aspects of physical activity.

The first step in the process of development of this scale was a 3-rounds Delphi panel used to generate a pool of items considered important when assessing the quality of studies on usability. These items were used to write the scale and the guide to assist its use. The scale was then used to assess the quality of studies on the usability of mobile applications for physical activity, and assessed in terms of feasibility, inter-rater reliability, and construct validity.

Twenty-five experts participated in the Delphi panel and a 15-item scale was developed. This scale was shown to be feasible (Mean±SD time of application=13.10±2.59 minutes), reliable (ICC=0.81; 95% CI=0.55-0.93) and able to discriminate between low- and high-quality studies (high quality: Mean±SD = 9.22±0.36; low quality: Mean±SD = 6.86±0.80; P=.01). In synthesis, the scale developed can be used both to assess the methodological quality of usability studies as well as to inform its planning.



Is It Still Worth Working In Academia? The Views from Portuguese Academics

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Changes and reforms in higher education, framed by managerialism, New Public Management (NPM) and neoliberalism-driven policies, are expected to have an impact over academics. Namely deprofessionalising processes and devaluation of working conditions, social prestige and status are expected to occur. Even if a relevant body of research has addressed how such policies a□ect academics' professionalisation processes and professionalism, studies tend, however, not to reveal the extent to which previously mentioned changes make academics more willing to change profession. Focusing on the Portuguese case, this study analyses academics' perceptions about their current working and employment conditions, academic profession's social prestige and their willingness to change profession.

Collected through a survey to all Portuguese academics, perceptions suggest a contradiction: while evidencing the deterioration of working conditions, academics maintain a positive view regarding the academic profession, evidenced by a predisposition to consider it as socially valued and worth to recommend. Indeed, although academics identify an increase in contractual precariousness and working hours, the reduction in permanent sta□, the primacy of management values over those of the academic profession, they still see academic profession as socially valued and prestigious and allowing for some degree of autonomy and they show a low willingness to change profession.

This contradiction is valid notwithstanding the nuances in the perceptions of di□erent groups of academics (e.g. women, junior academics, the public sector, in the profession for the longest time and with less in□uence in decision-making), some of them allegedly more a□ected by the changes induced by managerialism, NPM and neoliberalism in higher education institutions. So, despite all changes, it seems that to Portuguese academics, working in academia is still worth, at least to some extent. The question is to know for how long.

FIGURE 1
Is It Still Worth Working In Academia? - The study in brief

Looking back in anger? Putting in perspective the implementation of the Bologna process in Finnish and Portuguese higher education systems

Sara Diogo[1]

The 19th June 2019 signals the 20th anniversary of the Bologna Declaration, the greatest European intergovernmental cooperation in the area of higher education (HE). Analysing the implementation of the Bologna process through a foreign policy strategy, allows us to focus on aspects that go beyond legal frameworks and which are usually neglected by the literature on policy implementation, namely countries' cultural, political and institutional speci□cs. This study bridges this gap by comparing the implementation of the Bologna declaration in the Portuguese and Finnish HE systems, re□ecting on the di□erent permutations of cultural-political changes wrought by the Europeanisation of HE.

Drawing on 47 interviews of system and institutional key actors in both countries, it is argued that while Portugal has a top-down tradition of policy implementation, Finland has been following a hybrid model of decision-making, combining top-down and bottom-up approaches. Empirical data challenge the importance of the national cultural dimension as interviewees' perceptions di□er more according to their role rather than their nationality. The apparent lack of visibility of national di□erences is explained by convergent trends such as managerialism and subsequent implications for the academic profession. In fact, political convergence owes much to the globalisation, internationalisation, and Europeanisation of HE as well as the EU soft law and the New Public Management ideology – disseminated by reviews and discourses of international organisations (e.g. OECD; the World Bank).

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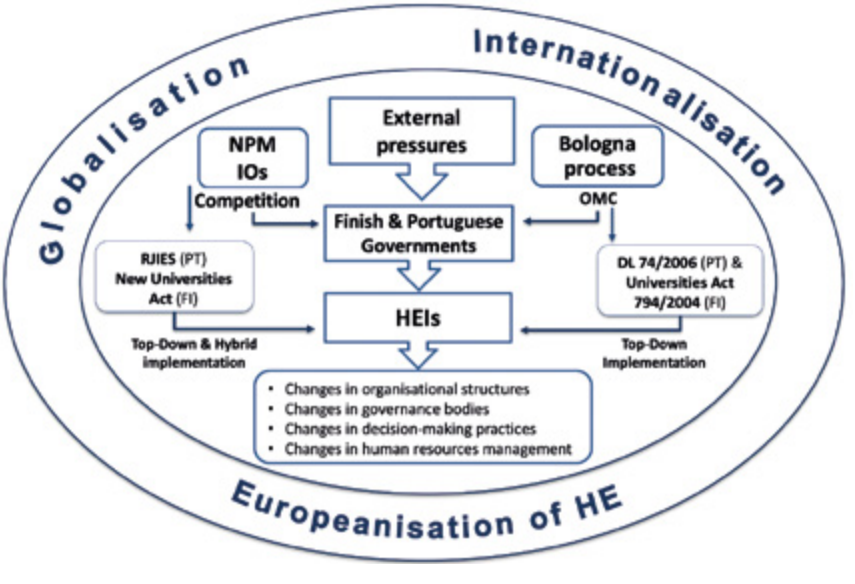
FIGURE 1
Looking back in anger? Putting in perspective the implementation of the Bologna process in Finnish and Portuguese higher education systems (in brief).



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Don’t Fear the Reapers, Fear Multiculturalism: Canadian Contexts and Ethnic Elisions in *Mass Effect*

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Canadian company BioWare's series of three Mass E□ect games (2008-12) is considered a benchmark for a type of video game invested in ethical re□ection and attempted psychological depth. Mass E□ect’s space opera environment featuring a wide variety of alien species with di□ering cultural values and priorities has legitimately been read as supporting multicultural respect through its gameplay and narrative content. Players are repeatedly forced to make decisions with respect to such issues as the morality of arbitrating upon the fate of di□erent species or the limits to which one will go in compromising one’s culturally-learnt values in the service of an objective perceived as positive.

At the same time, the games' generally sensitive treatment of di□erence can be seen to be using certain science □ction conventions to elide particular aspects of Canadian cultural history and politics which have proven resistent to self-congratulatory discourses concerning the conviviality of the non-coercive nation. This article examines the games' leveraging of the interface between cultural values by way of their status as Canadian cultural documents, and therefore as thoughtful participants in conversations about multicultural respect, and in the process highlights two issues which exemplify gaps in the games' would-be respectful politics of di□erence: 1) questions of Indigenous ownership, priority and hierarchy; 2) the common science fiction thought experiment that ethnic identity scripts will have largely disappeared as populations become more genetically mixed. Both of these thematic areas are conundra which Mass Effect, science fiction in general and multiculturalist discourses all have di□culty dealing with. Although the three initial Mass E□ects are among the most rewardingly considerate commercial video games ever made, that does not mean the games represent the last word in video game, or Canadian, processing of values, community and history.

Digital hypermediation platform to support territorial innovation

Fernando Ramos[1], Margarida Pisco Almeida[1], Luís Pedro[1], Maria João Antunes[1], Oksana Tymoshchuk, Eliza Oliveira[1], Daniel Carvalho[1], Paula Silva[1], Denis Renó

Community-led initiatives have an essential role in fostering the social, cultural, and economic dynamics of a territory. Community-based networks strengthen ties among stakeholders, promoting knowledge sharing and the emergence of synergies that may generate territory-led innovation, bene□ting local communities. Studies carried under the CeNTER program identi□ed the lack of dedicated digital platforms enabling citizens and community groups to collaborate, share resources, mediate experiences, be inspired, and learn from projects developed by other community members.

The aim of this research was to study, design and validate a mediation platform for territorial innovation in the context of the Centro region of Portugal. For this purpose, a mobile application was designed and prototyped aiming to promote collaboration between all agents involved in the territory's development process, encourage voluntary work, promote community-led initiatives, and the valorization of endogenous material and immaterial assets in the region.

The app CeNTER has a simple but innovative user interface with a card-based design, allowing the registration of data and an intuitive and quick access to di□erent features (□gure 1). One key feature is the geolocation of initiatives and events, which allows the user to search for places and points of interest and receive noti□cations about events in a speci□c location or territory (□gure 2). The prototype of the CeNTER platform underwent extensive validation by experts and users, including usability and accessibility aspects.

The app CeNTER will help develop a large diversity of activities including the creation, mediation and sharing of ideas, organization of events, and many other speci□c activities relevant to the development of community-led initiatives, contributing to the sustainability of the territory, based on the active promotion of the potential of local communities and the valorization of local endogenous resources.

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FIGURE 1
Sample of screens from the CeNTER app: (from left to right) main menu and details of an event.

FIGURE 2
Sample of screens from the CeNTER app: (from left to right) main menu with map peek and map.

Treating Children with Speech Sound Disorders: Development of a Tangible Artefact Prototype

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A prototype of a tangible user interface (TUI) for a □shing game, which is intended to be used by children with Speech Sound Disorders (SSD), speech and language therapists (SLTs), and kindergarten teachers and assistants (KTAs) and parents alike, has been developed and tested.

The aim of this study was to answer the following question: How can TUIs be used as a tool in interventions for children with SSD?

In order to obtain feedback and to ensure that the prototype was being developed according to the needs of the identi□ed target users, an exploratory test was prepared and carried out. During this test, using an ethnographic approach, an observation grid, a semistructured questionnaire, and interviews were used to gather data. A total of 4 di□erent types of stakeholders (sample size of 10) tested the prototype: 2 SLTs, 2 KTAs and 6 children.

The analysis of quantitative and qualitative data revealed that the prototype addresses the existing needs of SLTs and KTAs, and it revealed that 5 out of 6 (83%) children enjoyed the activity. Results also revealed a high replay value, with all children saying they would play more.

Serious games and tangible interaction for learning and problem solving serve SLTs, KTAs and children, as children enjoy playing, and, through a playful approach, learning is facilitated. A clear pattern was observed: Children enjoyed playing, and numerous valid indicators showed that the transposition of the traditional game into the TUI artefact was successful. The game is varied and rich enough to be attractive and fun. There is a clear need and interest in similar objects from SLTs and educators.

The current research phase of the project aims to use TUI at-home, as a form to supplement the post-intervention periods and involves all end users as co-designers.

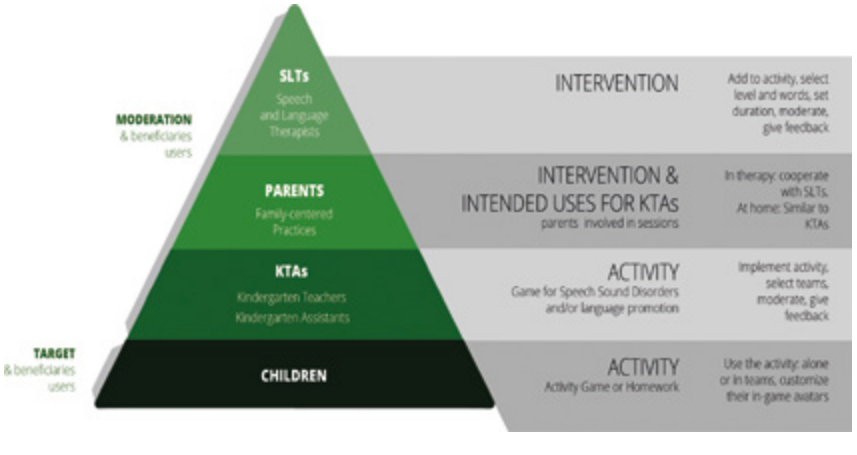


FIGURE 1
Pyramid with types of users, their role and possible actions within the prototype.

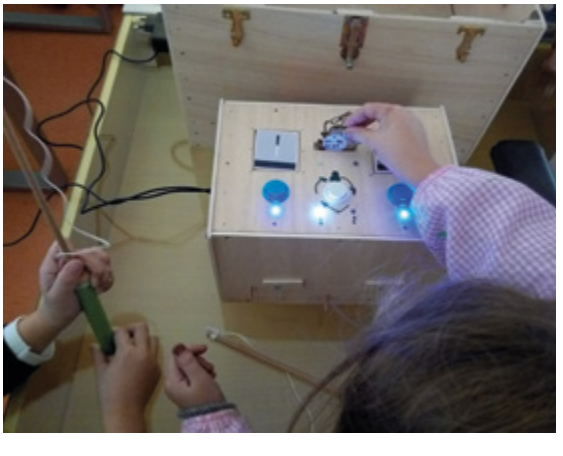
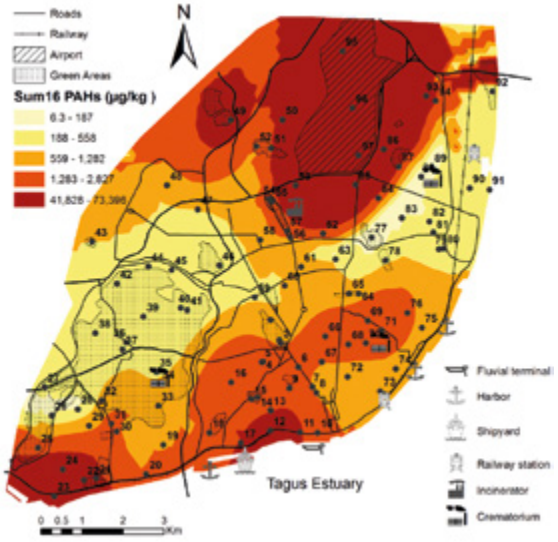


FIGURE 2
Two users during the exploratory test interacting with the artefact.

Multivariate analysis for assessing sources, and potential risks of polycyclic aromatic hydrocarbons in Lisbon urban soils

Anabela Cachada[1,2], Ana Cláudia Dias[3], Amélia Paula Reis[3,4], Eduardo Ferreira da Silva[3], Ruth Pereira[5], Armando da Costa Duarte[1], Carla Patinha[3]

Urban soils may be severely a□ected by the presence of complex mixtures of organic and inorganic contaminants resulting from di□use pollution caused by urban activities. However, the assessment of soil quality and characterization of potential risks to the environment and human health can be a very di□cult task due to the complexity of the matrix, heterogeneity, and patchy nature these soils. For compounds such as polycyclic aromatic hydrocarbons (PAHs), which are probably the most relevant and widely studied compounds in urban soils, these di□culties are enhanced by the poor understanding about the fate of contaminants in the soil matrix, scarcity of toxicological/ecotoxicological data and variability of guidelines. Thus, the traditional risk assessment (RA) frameworks may have to be adapted for urban areas, for example through a □rst tier based on a chemical screening in combination with geostatistical tools. This is what was done in the present study, which aimed to assess the levels of PAHs in soils from Lisbon (Portugal), their potential risks to the environment and human health, and to identify their major sources. Results showed that geostatistical tools are very useful to obtain a characterization of the entire urban area, allowing to evaluate the spatial distribution and major inputs of contaminants in urban soils (Fig. 1). As a □rst tier of the RA process it was proposed to calculate risks using the chemical data (based on existing models and soil quality guidelines) and build prediction maps which allowed to identify areas of potential concern for both human health (Fig. 2) and to the environment, where a more detailed risk assessment should be performed. These maps can be very useful for urban planning, for example, by crossing information obtained with land uses, it is possible to de□ne the most problematic areas (e.g., playgrounds and schools).



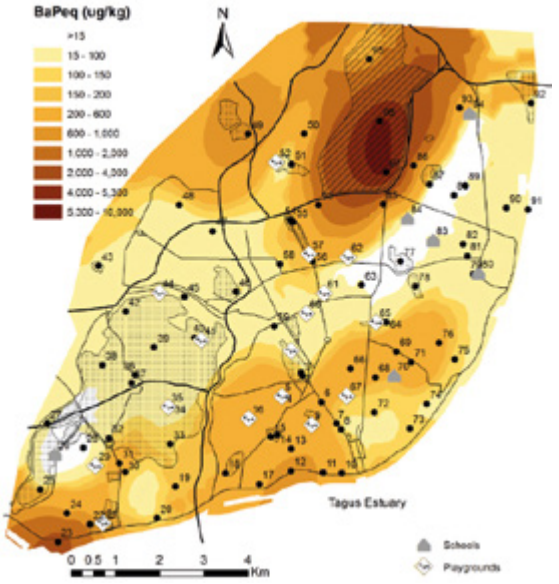


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FIGURE 1
Location of the sampling sites and contour map interpolated by ordinary kriging of the distribution of PAHs in Lisbon urban area. The class limits correspond to the minimum, the quartiles (25, 50 and 75), the upper outlier limit, and the maximum value. Source: https://doi.org/10.3390/min9030139

FIGURE 2
Contour map for Benzo(a)Pyrene equivalent levels in Lisbon area, which was interpolated by ordinary kriging; the class limits correspond to the di□erent guideline values for human health protection. Source: https://doi.org/10.3390/min9030139

New geochemical and Sr-Nd isotopic data for the Caramulo pluton (Central Iberian Zone)

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The Caramulo granite pluton is a Variscan syntectonic intrusion, emplaced into metasediments of Ediacaran–Early Cambrian age of the Schist and Greywacke Complex (Central Iberian Zone) at the end of collisional mountain building processes involving the convergence between Laurussia and Gondwana. At map scale, the intrusion shows a zonal pattern de□ned by the occurrence of four distinct facies of muscovite-biotite leucogranites (Caramulo, Paredes, Almijofa e M. Alcoba) (Fig. 1). The whole-rock Rb-Sr isochron obtained in this study suggests that the pluton emplacement age (311 ± 8 Ma) may be slightly younger than previously proposed (326 ± 17 Ma). Combined whole-rock major- and trace element data and Sr-Nd isotopic compositions for the di□erent granite units (A/CNK > 1.1; high SiO_2 contents, low CaO, MgO, Ba, Sr, $^{87}Sr/^{86}Sr_i$ > 0.710, εNd_{310} = -3.4 to -5.1; T_{DM} = 1.1 – 1.2 Ga) support a major involvement of old crustal metasedimentary sources in the genesis of these granite magmas (S-type origin). From the signi□cant degree of overlap between the Nd isotopic signatures and T_{DM} ages of the studied granites and those of the adjoining country rocks, it is proposed that these magmas formed by partial melting of metasediments with similar composition.

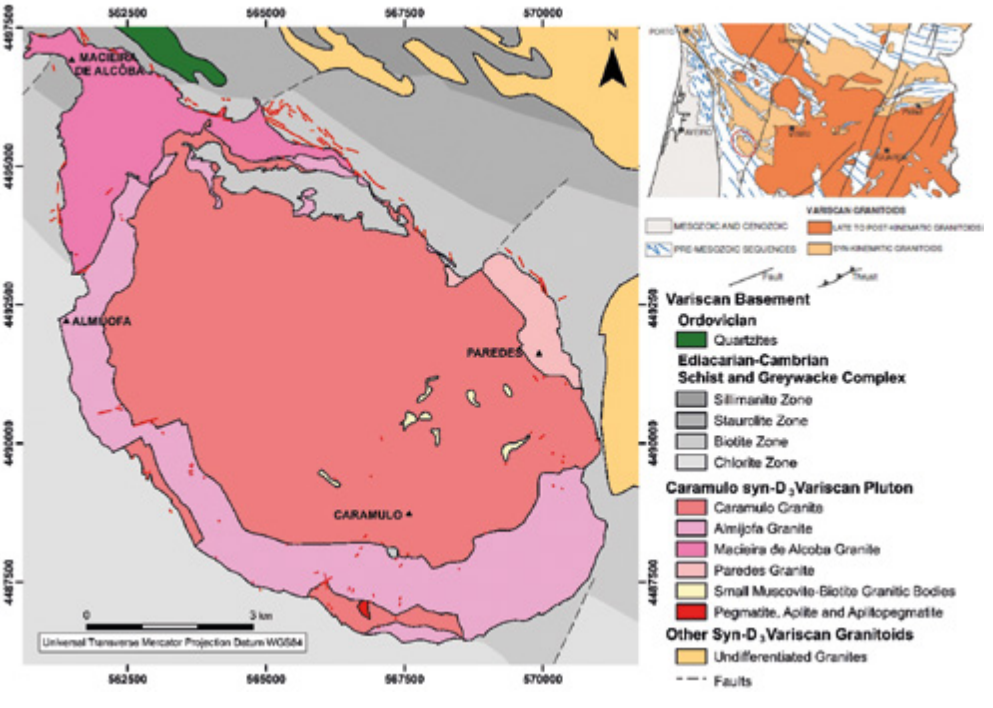

FIGURE 1
Geological sketch map of the Caramulo pluton, showing sample locations (modi□ed from Godinho, 1980). Inset on the right shows the location of the studied area (modi□ed from Azevedo & Valle Aguado, 2006).

Identifying sustainable options from the household appliance industry, suitable to consumer's needs and preferences

Ricardo Santos[1], João Matias[2], Antonio Abreu[3]

Sustainable development, plays nowadays an important key role in our society, given its rising needs with energy and other resources, caused by factors such as population's growth, economic development, and technology progress.

Such needs, a□ects our sustainability, on its di□erent dimensions, namely, economic, social and environment. Thus, the reduction of energy consumption is crucial to achieve sustainability, with buildings accounting for about 39 % of consumed energy, which represents an important sector to promote sustainability, by developing a set of solutions/measures.

Despite the existence of retro□tting measures within household appliances (e.g. Energy labeling), which were established in all over the world to promote energy e□-ciency and sustainability, there is a lack of approaches to support the consumer, by achieving sustainable appliances from the market, and suitable to their needs and preferences. The need of such support, arises, given the diversity of brands and models available on market, as well as the diversity of trade-o□s, regarding the appliance's own features (e.g. energy and water consumption, cloth capacity, investment cost, etc.) as well as the consumer's preferences (e.g. design, reliability, perceived quality, etc.) and needs (e.g. heating, cooling, illuminance, etc.), speci□c associated with its case. To tackle the problem, we have developed an approach, based on Multi Attribute Value Theory (MAVT) and by using evolutionary algorithms (NSGAII), to provide the consumer with sustainable solutions from the market, suitable to its needs and preferences. Issues, such as the consumer's comfort (visual, thermal, and acoustic), are also considered here, as well as the product life cycle assessment.

Furthermore, the approach developed here, allows the consumer to have di□erent sustainable solutions from the market (also regarding the same energy service), to prevent situations such as the out of stock within some appliance.

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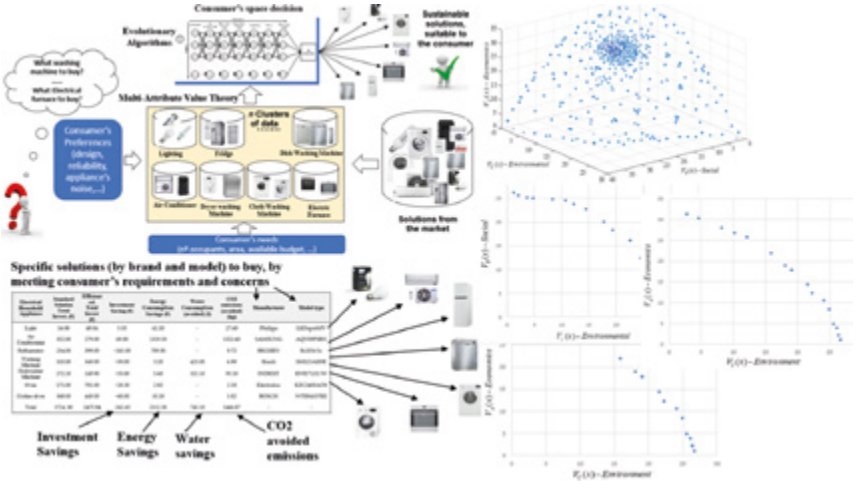

FIGURE 1
Proposed approach .

Beyond the glass ceiling: Gendering tourism management

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3 — Unit of Gender Studies, Department of Thematic Studies, Linköping University
4 — ISCSP (Higher Institute for Social and Political Sciences), Technical University of Lisbon

This study analyses the career of women top-level managers in tourism in Portugal, and the in□uence of organizational factors on their career paths. It considers how Acker's (1990, 2012) framework of gendering processes can be a tool for the analysis of women managers' careers in tourism organizations. Gendering processes can be de□ned as often-invisible processes in organizations which may seem to have nothing to do with gender, but which re□ect embedded gendered assumptions about women and men, masculinities and femininities. The fact that they are often concealed prevents gender inequality from being perceived as such. A mixed methods approach was followed, including interviews with twenty-four women top-level managers in tourism.

The analysis of gendering processes in the organizations where these women work revealed that hidden discrimination is more pervasive than overt discrimination. Overt discrimination was most visible in organizing processes related with recruitment, promotions, salaries, and pregnancy-related discrimination. Hidden discrimination was more subtly ingrained in organizational beliefs and gendered interactions, where inequalities were less visible and harder to pinpoint. Most research participants were reluctant to label such situations as 'discrimination'. Hidden discrimination may thus be regarded as harmless and normal behavior. Three main gender subtexts underlie the gendering processes identi□ed: the notion of the 'ideal' unencumbered worker and assumptions of women's greater family-orientation; the expectation that women are less competent than men; and male homosocial ties and exclusionary practices. This study also sought to expand on Acker's framework, by analyzing the interdependence of gendering processes, how sexuality □ts Acker's framework, and how gendering processes span across organizations.

INNOVATION – Investigating lon non-coding RNA regulated pathways driving cardiac regeneration

Magda Correia[1*], Francisco Santos[1*], Sandrina Nóbrega-Pereira[1], and Bruno Bernardes de Jesus[1]

One of the main causes underlying the high death toll of cardiovascular disease is the lack of signi□cant cardiac regeneration of the adult heart. In marked contrast, for a short period of time after birth, newborn mice and possibly humans can fully regenerate the heart after a heart attack. INNOVATION is an interdisciplinary 3-years program □nanced at around 1.1M€, which brings together 5 European countries and aims to decipher the molecular circuitries underlying the striking di□erence between newborn heart regeneration and □brotic infarct healing of the adult heart. At University of Aveiro we are particularly focused on the "dark matter" of the genome which is comprised of tens of thousands of long non-coding RNAs (lncRNAs) and on metabolic circuitries that are required for the establishment and maintenance of normal gene expression networks, thus controlling developmental and disease processes. Here, we will translate molecular circuitries that distinguish the regenerating from the non-regenerating heart with the ultimate goal to liberate cardiomyocytes regeneration in the adult, and in particular, in the diseased heart. To do so, INNOVATON deviates from conventional studies which predominantly focus on protein coding genes. Instead, we will gain insight into the role of lncRNAs which are emerging as functionally conserved regulators of cardiac regeneration in mouse and humans. Identifying molecular pathways underlying the inability of adult cardiomyocytes to divide is of paramount importance for the development of novel, innovative treatment options aiming at regenerating the disease heart through stimulation of cardiomyocytes proliferation.

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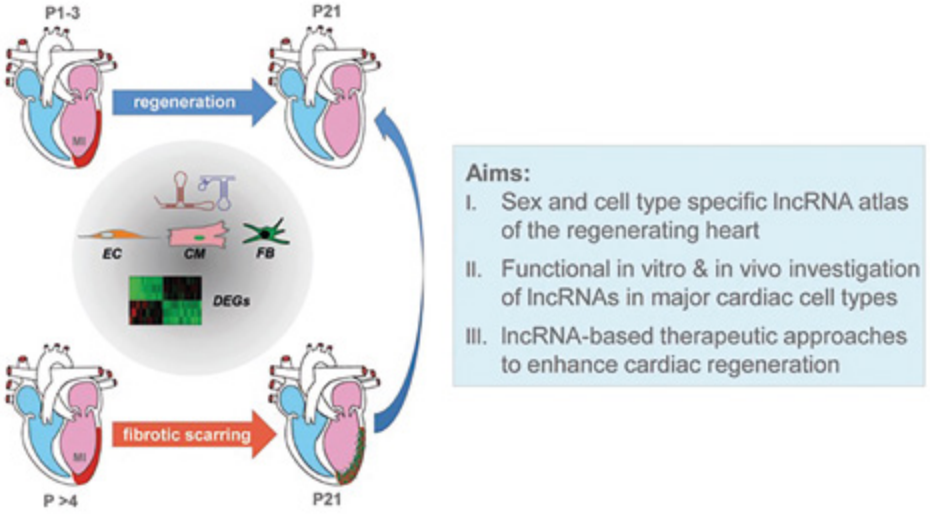

The interplay between viruses and the host translation machinery – a novel antiviral therapeutic target

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The development of novel speci□c or broad-spectrum antiviral therapeutics depends on a deep understanding of the interplay between viruses and their host cells.

Viruses rely on the host-cell translation machinery to synthesize their own proteins. As RNA viruses do not encode tRNAs, they depend on host tRNAs for translation. However, as viral RNAs and host cell mRNAs may diverge significantly in terms of nucleotide composition (host cell genome is biased towards C/G-ending codons while the RNAs of many viruses are skewed towards A/U-ending codons), some viruses manipulate the host tRNA pool to decode viral skewed codons and optimize viral protein translation. Figure 1 depicts some of the strategies used by di□erent viruses to manipulate the host tRNAs. We have recently published a manuscript discussing the importance of tRNA biology for viral infections (https://doi.org/10.1016/j.tibs.2020.05.007).

Our preliminary data indicates that the in□uenza A virus induces the speci□c deregulation of some of the host tRNA modifying enzymes (tRNAME) and consequently host tRNA modi□cations, in order to more e□ciently translate its own viral proteins. Our research furthermore suggests that perturbing the host tRNA epitranscriptome machinery may unravel novel targets for single or broad-spectrum antiviral strategies. Our recently awarded H2020 Twinning grant will allow us to collaborate with world-renowned virologists from the Leiden University Medical Centre and Analytical Chemists from the Ludwig-Maximilians University in Munich and have the ideal setting to understand gene regulation during viral infection while identifying regulators of viral protein translation. We will not only unravel how the host tRNA epitranscriptome is regulated upon viral infection but, importantly, how it can be manipulated for antiviral targeting.

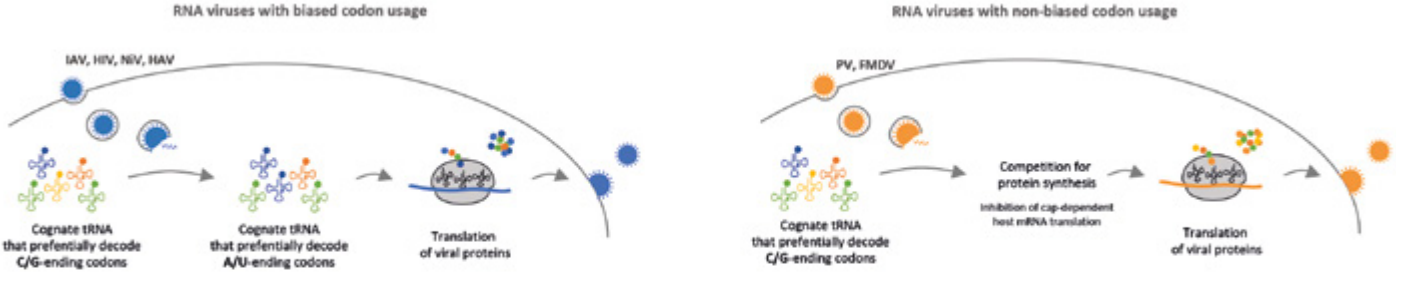

FIGURE 1
Manipulation of the host cell tRNA pool and codon usage adaptation upon viral infection. Viruses with biased codon usage, such as in□uenza A virus (IAV), HIV, Nipah virus (NiV), and hepatitis A virus (HAV), are able to exploit and manipulate the tRNA pool of the host to better match their codon usage and, therefore, favor the translation of their own proteins. On the other hand, viruses with nonbiased codon usage, such as poliovirus (PV) and foot-and-mouth disease virus (FMDV), compete for tRNAs for protein synthesis and inhibit host protein translation.

Internal strain and temperature discrimination with optical fiber hybrid sensors in Li-ion batteries

Micael Nascimento[1], Susana Novais[1], Markus S. Ding[2], Marta S. Ferreira[1], Stephan Koch[2], Stefano Passerini[2], João L. Pinto[1]

According with Paris and Madrid agreements (COP21 and COP25), as well as EU 2030 targets, there is a need for signi□cant reductions in CO_2 and greenhouse gas emissions in a short time span. Li-ion batteries (LIBs) are currently seen as important technological enablers to drive the transition towards a decarbonised society. They have recently achieved considerable improvements in terms of their technical performance (such as energy and power density, thermal stability, and durability) and economic a□ordability, making them as major contributors to successful introduction of electric vehicles and stationary energy storage systems. However, for a successful mass introduction of electri□ed mobility, renewable, and clean energy systems with market competitive performances, fast charging capability and substantial improvements of electric battery technologies are required.

The sensing of characteristic parameters in LIBs, such as temperature and strain changes are fundamental issues to ensure that they operate in optimal conditions, improving their safety and long-term cycling stability. High local current densities can result in a massive heat release, decomposition of the electrolyte, gas evolution and even explosion of the battery, known as thermal runaway. However, the corrosive chemical environment in the batteries is a challenge to monitor strain and temperature. Optical □ber sensors, due to their high chemical stability and small diameter, can be embedded within the LIBs, thus becoming a quasi-non-invasive solution, for operando and in situ measurements. In this work, an optical □ber hybrid sensing network constituted by □ber Bragg gratings and Fabry-Perot cavities was developed and embedded in LIBs, and galvanostatic cycling at di□erent C-rates was applied, correlating the variations in temperature and strain with LIB processes. To the best of our knowledge, this is the □rst time that this innovative methodology is proposed for this type of application.

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2 — Helmholtz Institute Ulm (HIU), Germany and Karlsruhe Institute of Technology (KIT)

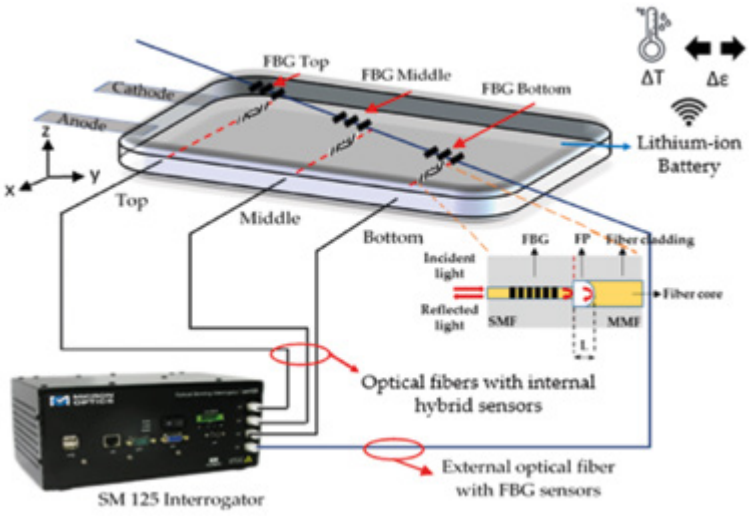

FIGURE 1
Illustrative diagram of the internal and external optical sensors network used to temperature and strain monitoring of the Li-ion battery.

ZnO decorated laser-induced graphene produced by direct laser scribing

Joana Rodrigues[1], Julia Zanoni[1], Guilherme Gaspar[1], António J. S. Fernandes[1], Alexandre F. Carvalho[1], Nuno F. Santos[1], Teresa Monteiro[1], Florinda M. Costa[1]

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Zinc oxide/laser-induced graphene (ZnO/LIG) composites were successfully produced, for the first time, by a simple, fast and cost-effective single-step approach [1]. In order to overcome the usual elaborated and time-consuming preparation techniques, a direct laser scribing (DLS) methodology was employed by irradiating a metallic zinc/ZnO-covered polyimide with a CO2 laser under ambient conditions. In this way, ZnO decorated LIG structures are produced. Since the formation of LIG and ZnO takes place simultaneously, a stronger link and interaction between the two materials is expected when compared with other approaches. The produced samples exhibited the presence of both wurtzite-ZnO and sp2 carbon, as well as the typical ZnO-related photoluminescence properties, whose features can be tuned depending on the laser processing conditions and the nature of precursors used, highlighting their influence on the composites' optical defect distribution. The sample produced from the ZnO-based precursor evidenced the highest luminescence signal, with a dominant UV recombination. Electrochemical measurements point to the existence of charge transfer processes between LIG and the ZnO particles. Additionally, this method allows to perform a patterned design by using a computer-assisted laser-scribing system, also prone to easy scalability. As the processing conditions can be chosen to keep a thin polymer sheet as mechanical substrate, flexible samples can be produced, which makes these composites attractive for many applications. For instance, they present interesting properties to be applied as transducer platforms for optical and electrochemical sensing devices for detection of biological analytes.

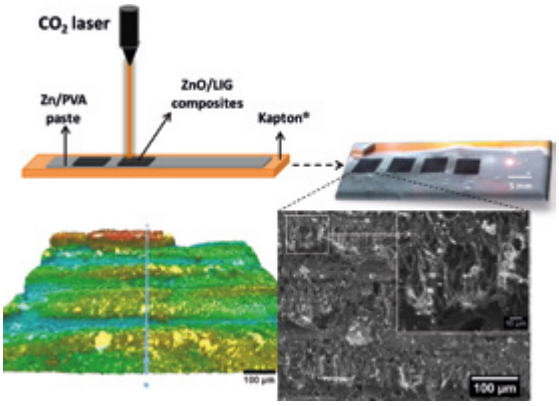

FIGURE 1
Schematic illustration of the laser-scribing process with a representative topographical profile and a scanning electron microscopy image of the ZnO decorated LIG [1]

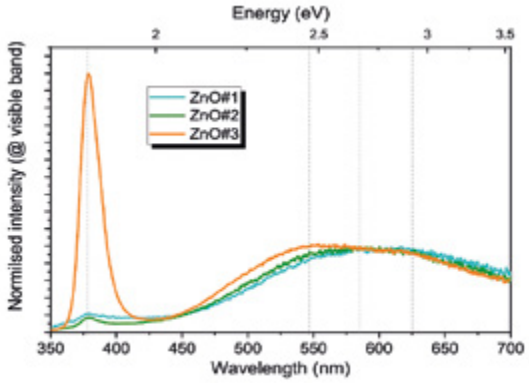

FIGURE 2
Photoluminescence spectra obtained by exciting the samples with the 325 nm laser line for samples processed in different experimental conditions [1].

[1] J. Rodrigues, J. Zanoni, G. Gaspar, A.J.S. Fernandes, A.F. Carvalho, N.F. Santos, T. Monteiro, F.M. Costa, Nanoscale Adv. 1 (2019) 3252–3268. doi:10.1039/C8NA00391B.

One dimensional topological insulators with noncentered inversion symmetry axis

A. M. Marques[1], R. G. Dias[1]

Topological insulators (TIs) are materials with an electronic insulating bulk and conductive edge states, which are protected by the presence of certain symmetries in the model, meaning that they are robust against perturbations that respect these symmetries. This makes TIs very attractive for uses in quantum computation technologies, as evidenced by the large sums spent by the likes of Intel, Bell Labs or Microsoft in their research and development.

In one-dimensional (1D) TIs with inversion (I) symmetry, the eigenstates generate symmetric charge distribution in relation to the centered I-axis within the unit cell, as in the model of Fig. 1(a). In this paper, we studied a 1D TI [see Fig. 1(b)] belonging to a class of models for which the textbook topological characterization required some modi□cations, due to the fact that a noncentered I-axis within the unit cells originates a non-quantized topological invariant, which is problematic since it is from the quantized values of this invariant, directly correlated with the number of edge states, that one classi□es the topology of any given model. As such, we derived a generalized version of this invariant that returns quantized values regardless of the position of the I-axis, enabling one to recover an unambiguous topological characterization of any 1D model with I-symmetry.

As for the model in Fig. 1(b), we further showed that the symmetry protecting the edge states is not the usual chiral symmetry $\hat{C}_1$, but rather an underlying "chiral-like" symmetry $\hat{C}_{1/2}$, depicted in Fig. 1(c), which provided protection against a more restricted set of perturbations. Finally, the noncentered I-axis in the unit cell was seen to imply a displacement of the inversion center of the bulk charge distribution with relation to the center of the chain, generating a shift in the polarization quantization, as shown in Fig. 2. A generalization of these results to 2D models with noncentered rotation axes is currently being considered.

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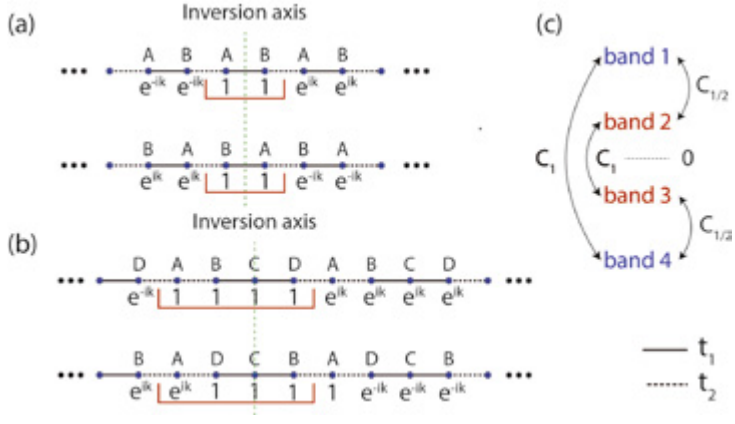
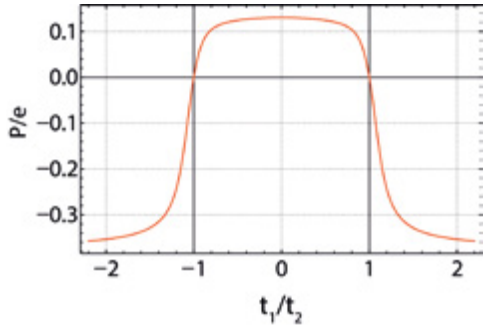
FIGURE 1
Examples of 1D models with (a) centered and (b) noncentered Inversion-symmetry axes within the unit cell, indicated in red. (c) Depiction of the action of the operators $\hat{C}_1$ and $\hat{C}_{1/2}$, on the band structure of the model shown in (b).

FIGURE 2
Polarization per unit length for the model in Fig. 1(b) with six unit cells and open boundaries, as a function of the ratio of the hopping parameters, showing the upward shift in the top and bottom plateaus in relation to P=0 and P=-0.5, respectively.





Towards a Design Observatory: crafting a distributed approach

Nina Costa[1], Vasco Branco[1], Rui Costa[1], António Modesto[2], Catarina Silva[3], Raul Cunca[4], Afonso Borges[5]

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2 — Faculty of Fine Arts & ID+, University of Porto
3 — School of Design & ID+, Polytechnical Institute of Cávado and Ave
4 — Faculty of Fine Arts & CIEBA, University of Lisbon
5 — Faculty of Arts and Letters, University of Beira Interior

The DesignOBS project aims to collect, map and interpret data about the Portuguese Design Ecosystem, providing more robust and reliable information that may support the creation of strategies and policies for its promotion and evolution. To operationalize the project, a three-step Design research iterative process was put in place:

(1) Development of a preliminary observation process based in particular on the analysis and comparison of Design ecosystem models in use at the European level; interviews and in-loco visits with leaders of key international Design centers and the application of the re□ection-action process proposed by Schön to re□ne the observation approach;

(2) test the observation approach through its application on a preliminary and manageable case about design doctorates to create a "□rst portray" of the status quo of national scholarly Design research. Results showed important disparities in the number of Design theses concluded (variations of about 25% registered in di□erent databases), and dubious quality of information. The lack of curation of the information presented in institutional databases makes it di□cult to create a reliable map about Design. These results led to the development of guidelines and calls for action which were presented and discussed within the REDE community (national Design schools meeting) in late October 2019. These results and methodology, already published in an international outlet, were evolved to understand some foundational aspects of doctoral research in Design and also the reproducibility of Portuguese research in this □eld of knowledge.

(3) Re□nement of the iterative re□exive and distributed observation approach based on the results obtained in stage 1 and 2.

This process is now being used to approach other research topics such as the characterization of Design companies in Portugal using databases such as SABI that can provide some information to facilitate the creation of preliminary representations.

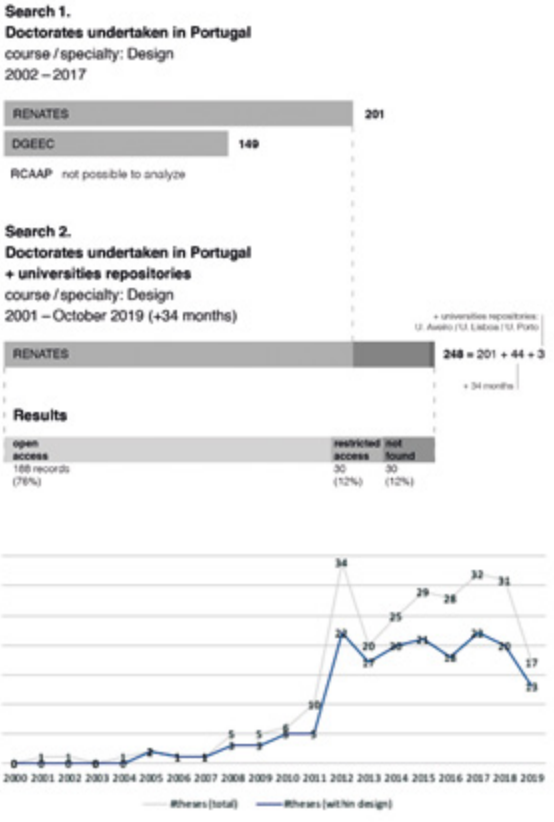

FIGURE 1
Application of the search criteria and results obtained per database.

FIGURE 2
Di□erences between the original and the curated results.

System for Automated Gait Analysis Using an RGB-D Camera

Ana Patrícia Rocha[1], Hugo Miguel Pereira Choupina[2], Maria do Carmo Vilas-Boas[2], José Maria Fernandes[1], João Paulo da Silva Cunha[2]

Nowadays it is still common in clinical practice to assess the gait (or way of walking) of a person using a subjective approach (visual observation and/or use of rating scales). However, there are currently sensors, including RGB-D cameras (e.g., Microsoft Kinect), that can be used to obtain quantitative information that allows performing gait analysis more objectively. The results of quantitative gait analysis can be very useful for example to support the clinical assessment of patients with diseases that can a□ect gait, such as Parkinson's disease.

In this context, we developed a portable system for automated quantitative gait analysis in a quick, inexpensive and minimally invasive way, using a single RGB-D camera (Kinect v1 or v2). The system relies on 3-D body data to automatically select data corresponding to walking, detect the performed gait cycles and extract several gait parameters. Moreover, the gait parameters are used together with anthropometric measures to automatically identify the subject being assessed.

The gait data selection relies on machine learning techniques to recognize three di□erent activities (walking, standing, and marching), as well as two di□erent positions of the subject in relation to the camera (facing the camera and facing away from it). For gait cycle detection, we developed an algorithm that estimates the instants corresponding to speci□c gait events. Subject identi□cation based on gait is enabled by a solution also implemented relying on machine learning.

Our system was found to be a viable alternative to gold standard systems for obtaining several spatiotemporal and some kinematic gait parameters. Furthermore, the system is suitable for both clinical and ambulatory scenarios, since it relies on a single markerless RGB-D camera that is less expensive, more portable, less intrusive and easier to set up, when compared with the gold standard systems (multiple cameras and several markers attached to the subject's body).

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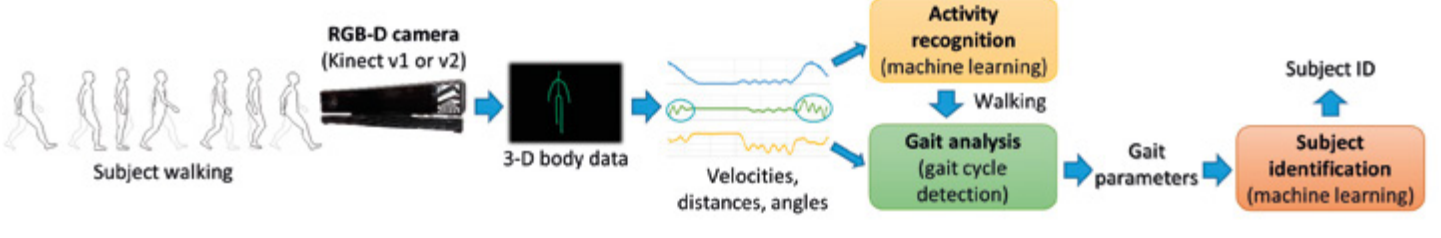
2 — FEUP & INESC TEC, University of Porto

FIGURE 1
System for automated gait analysis using an RGB-D Camera, including the acquisition of 3-D body data provided by the camera from a given subject, computation of di□erent types of measures, selection of gait data relying on activity recognition, gait analysis and identi□cation of the subject based on their gait.



Local-LDA: Open-Ended Learning of Latent Topics for 3D Object Recognition in Robotics

S. Hamidreza Kasaei[1,3], Luís Seabra Lopes[1,2], Ana Maria Tomé[1,2]

1 — Department of Electronics, Telecommunications and Informatics & IEETA, University of Aveiro
2 — Department of Electronics, Telecommunications and Informatics, University of Aveiro
3 — Currently at the University of Groningen, The Netherlands

Object recognition is still a challenging problem because of ill-de□nition of objects, large variations in object appearance and concept drift in dynamic environments. Moreover, since in open-ended domains the set of categories to be learned is not known in advance, autonomous robots must have the ability to continuously execute learning and recognition in a concurrent and interleaved fashion. The training instances are extracted from on-line experiences of the robot and become gradually available over time, rather than being completely available at the beginning of the learning process.

We developed an open-ended 3D object recognition system capable of concurrently learning the object categories as well as the features used to encode them. A multi-layered object representation approach is used to enhance open-ended learning (Fig. 1). Each object view is hierarchically described as a random mixture over a set of Latent Dirichlet Allocation (LDA) topics, where each topic is discrete distribution over visual words. Topic modelling is suitable for open-ended learning because it provides short object descriptions and enables e□cient processing of large collections. Given the open-ended setting, we propose an extension of LDA to learn topics for each category independently (Local-LDA). These local topics are discovered in an unsupervised fashion and updated incrementally using new object views. In the lowest layer, the spin-image descriptor is used to represent the local shapes of the objects in di□erent key points; in a bag-of-words layer, the given object view is described by a histogram of local shape features; in the topic layer, we use the visual words to compute a set of LDA topics for the given object. Since the views of an object can vary signi□cantly depending on the perspective, and the categories themselves are often heterogeneous, the category layer stores distinctive views of di□erent objects in each object category.

An extensive set of experiments was carried out to assess the performance of Local-LDA and compare it with other state-of-art approaches. Local-LDA outperformed the other approaches, achieving appropriate descriptiveness and scalability with respect to increasing number of categories (Fig. 2).

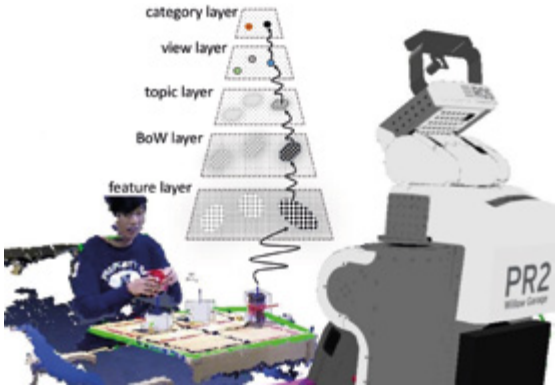


FIGURE 1
Layered approach.

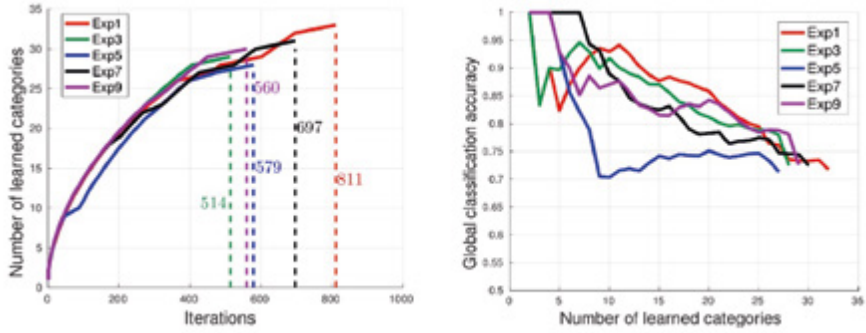


FIGURE 2
Experimental results for Local-LDA

Communities of musical practice; transformative contexts for intercultural communication

Maria Westfall[1], Pedro Aragão[2]

This article discusses the potentials of communities of musical practice as vital contexts for intercultural communication in a variety of ways. The focus is on two speci□c musical communities, one in the city of Rio de Janeiro, Brazil and the other in Örebro, Sweden. The two communities are so called extension projects with one foot in the academic context and the other in the vibrant life of the cities. *Escola Portátil de Música* is a project based on choro, a musical genre that was born in the XIXth century and it is still very popular in Brazil. *Spelrum* is a Swedish art project based on ethnic diversity and social inclusion. Both projects have an inclusive approach, where musical and social interaction serve as a means for musical development. The article discusses the concept of communities of practice as the organizational basis for collective musical activities and also the process of musicking as a way of describing the actual "doing" of music in the communities. Finally, intercultural experiences are considered when the article concludes with a discussion on transformative aspects of musical practices.

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FIGURE 1
Escola Portátil de Música, extension program developed by University of Rio de Janeiro. The project attracts hundreds of students that are interested in learning *choro*, a popular Brazilian musical genre.

FIGURE 2
Spelrum, art project developed by University of Orebro, Sweden, based on ethnic diversity and social inclusion.

Social sustainability and collective participation: cyclical dynamics of the multipart singing in the village of Manhouce

Maria do Rosário Pestana[1]

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

FIGURE 1, 2
Cantos e Encantos na Semana Cultural de Manhouce. 2017

Throughout the 20th Century, and even more forcibly in the 21st Century, the village of Manhouce underwent great transformations as a result of the impact of modernity in agrarian societies, i.e. successive economic crises, migratory movements of its inhabitants, digital communications, and, more recently, the consequences of climate change in the local forests. These setbacks threaten the locality, obliging residents to reimagine their social life and their sense of community. As this paper discusses, local activists, political agents, and other residents of Manhouce create cyclical cooperative networks to fight for the sustainability of their society and social life, and for their local public spaces. Participatory performances of traditional songs related with the lost and imagined communitarian agrarian society are at the core of their repertoire. With the aim to understand such stewardships of traditional musical practices, I conducted field work and a long-term research in Manhouce, one of 14 parishes in the county of São Pedro do Sul in Portugal.

In Manhouce, singing traditional songs in three parallel voices has been a cyclical tie, uniting the population regularly. In 1938, the village sang and danced to be elected a symbol of the policies and values of the Estado Novo autocratic regime; in the 1980s, to access the recognition of the music industries and media; in the 21st Century, to conquer UNESCO's Intangible Cultural Heritage recognition and to resist oblivion and social disconnection. Each new cycle brings about a (i) conversion of discourses around values of "authenticity", "antiquity" and "uniqueness" and a (ii) diversion of performative practices that are reformulated and actualised, e.g. by adding or removing musical instruments, by integrating different generations, migrant family members, foreign accents or speakers of other languages.

Long-Term Memory Effects in GaN Devices: From Modeling to Compensation?

Pedro Mirassol Tomé[1], João Lucas Gomes[1], Cristiano Gonçalves[1], Filipe Miguel Barradas[1], Luís Cótimos Nunes[1], Telmo Reis Cunha[1], and José Carlos Pedro[1]

Gallium-nitride (GaN) transistors have highly attractive performance for power ampli□ers used in GHz telecommunications, mostly due to their low power density characteristic. However GaN devices present slowly varying distortion e□ects (usually referred to as long-term memory e□ects), which impede the veri□cation of the telecommunications' speci□cations for radar applications and cellular communications (unless a highly complex digital compensation unit is added, running sophisticate algorithms).

The phenomena originating such long-term distortion – electron trapping/detrapping within the transistor– has been a topic to which the Wireless Circuits – Av group has been analyzing in the last years. In this sense, research work has been conducted to characterize these phenomena at the device physics-level, using innovative laboratory setups dedicated to the observation of e□ects induce by electron trapping/detrapping in GaN devices.

The knowledge developed from this study has made it possible to understand the implication of long-term memory e□ects at the system-level behavior of power ampli□ers. This led to the design of an innovative analog compensation circuit which, integrated into the ampli□er circuitry, produces an overall conventional behavior, without apparent long-term distortion, while still taking pro□t from the bene□ts of GaN transistors. This is highly important especially for the upcoming transmitter architectures foreseen for 5G communications, consisting of arrays of low power ampli□ers, whose distortion compensation will not be possible to achieve through advanced digital processors, but whose linearity level will still have to meet the strict speci□cations.

In 2019, this work led to three publications in the Q1 journal IEEE Transactions on Microwave Theory and Techniques (the most relevant journal in this topic) and one presentation at the IEEE International Microwave Symposium (the most important conference in this □eld).

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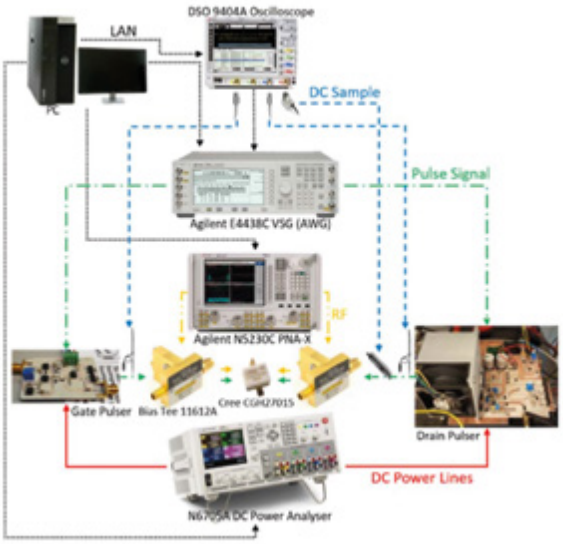

FIGURE 1
Laboratory setup for characterizing the e□ects of electron trapping/detrapping in GaN-based ampli□ers.

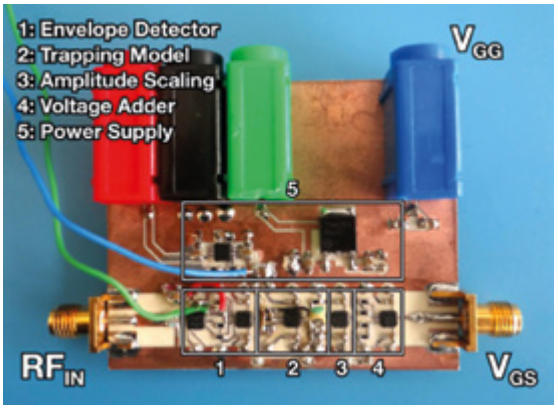

FIGURE 2
Analog compensator designed for compensating the long-term memory e□ects on GaN-based ampli□er circuits.

Intensity based POF sensors for water quality assessment

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2 — Department of Physics & CESAM, University of Aveiro
3 — Department of Chemistry & CESAM, University of Aveiro
4 — Department of Engineering, University of Campania Luigi Vanvitelli, Italy
5 — Department of Chemistry & UCIBIO, Faculty of Sciences and Technology, Nova University of Lisbon

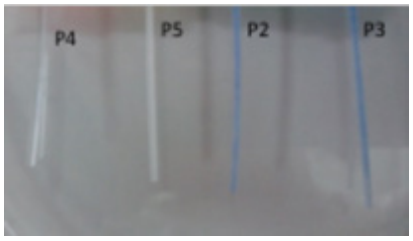
Low-cost and user-friendly solutions for water quality assessment are needful nowadays, which can allow for remote, in-site and real-time monitoring of water contaminants. Sensing technologies using Polymeric Optical Fibres (POFs) combined with specially developed sensitive layers for chemical detection may o□er these possibilities, with proper interrogation systems.

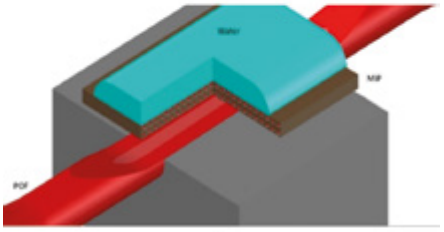
POF sensing platforms based on low-cost procedures were developed and characterized using aqueous solutions of di□erent refractive indices (RI). The POF RI sensors were optimized by varying the length and/or roughness of the sensing region and resolutions of 10-4 RIU were obtained. A portable optical setup was used, which allows real time monitoring through Bluetooth technology, enabling in-site and remote monitoring. The intensity based detection system incorporated a reference POF allowing for a self-referenced signal, avoiding small source □uctuations. The stability of the transmitted signal was veri□ed, as well as the reproducibility on the sensor's responses and signal recovery with washing procedures with distilled water.

The suitability of these sensing platforms for chemical detection was evaluated through the coating with sensitive layers, namely Molecularly Imprinted Polymers (MIPs) using different deposition techniques. A D-shaped POF chemical sensor was successfully developed using a sensitive MIP layer, allowing the detection of perfluorooctanoate (POFA/PFO-) in aqueous media with a limit of detection of 0.20 – 0.28 ppb.

The dependency of proteins immobilization on the POF's sensing region was evaluated for straight POF's con□guration, aiming future developments in chemical detection using POF biosensors. The protein's immobilization was con□rmed using a binding-speci□c dye.
Obtained results show a promising future for the development of low-cost POF chemical sensors and biosensors, as di□erent layers can be coated on POF's surface allowing for the detection of di□erent analytes/contaminants.

(a)





(b)

FIGURE 1
Sensing platforms: (a) photograph of D-shape POFs; (b) schematic representation of a D-shape POF-MIP covered with water. [1]

FIGURE 2
Protein immobilization on POF's surface is easily seen at naked using a binding-speci□c dye. [2]

[1] N. Cennamo *et al.*, "A simple and low-cost optical □ber intensity-based con□guration for per□uorinated compounds in water solution," *Sensors (Switzerland)*, vol. 18, no. 9, 2018.
[2] F. Sequeira, R. Nogueira, L. Bilro, and T. Santos-Silva, "Coating of modi□ed plastic optical □bers with proteins for chemical sensing and biosensing: preliminary studies," in *Proc. SPIE 11028, Optical Sensors 2019*, 2019, no. 110282O.

Ultra high-capacity wireless communications enabled by free-space optics

Fernando P. Guiomar[1], Abel Lorences-Riesgo[1], Akeem Mufutau[1], Marco A. Fernandes[1], Bruno T. Brandão[1], Artur N. Sousa[1], António L. Teixeira[1], Nelson J. Muga[1] and Paulo P. Monteiro[1]

The recent standardization of 5G has opened new opportunities for the exploitation of high-frequency communications, such as millimeter-wave (above 30 GHz). Nevertheless, in order to face the ever-increasing bandwidth requirements and the scarcity of spectrum, the current research e□orts for beyond 5G communications are now being shifted towards the development of THz-wave transmission (above 300 GHz). However, the utilization of such high-frequency communications is strongly limited by the tremendous technical challenges, complexity and cost of the required components. In contrast, the use of free-space optics (FSO) in the near-infrared region provides a much simpler and cost-e□ective implementation, owing to the use of o□-the-shelf lasers and photodetectors inherited from □ber-optic communications. In addition, FSO provides an unprecedented potential for ultra-wide bandwidth wireless communications over an unregulated spectrum.

Exploiting the imminent advantages of FSO communications, we have recently demonstrated the seamless transmission of 5G-compatible wireless signals over an outdoor 50 m link, while guaranteeing its retro-compatibility with full-□edged legacy 4G networks. Targeting ultra-high capacity applications, such as dense mobile backhaul or inter-datacenter links, we have also experimentally demonstrated a phase-coherent 200 Gbps FSO transmission using a single photodiode detector enabled by the Kramers-Kronig transform. The results were presented at the most prestigious international conference on optical communications, being ranked as a top-scored paper. Even more recently, we have demonstrated 400G+ transmission under adverse weather conditions enabled by the exploitation of digital coherent transceivers together with adaptive probabilistic constellation shaping.

Overall, the obtained results clearly demonstrate the potential of FSO for cost-e□ective ultra-high-capacity wireless transmission for beyond 5G communications.

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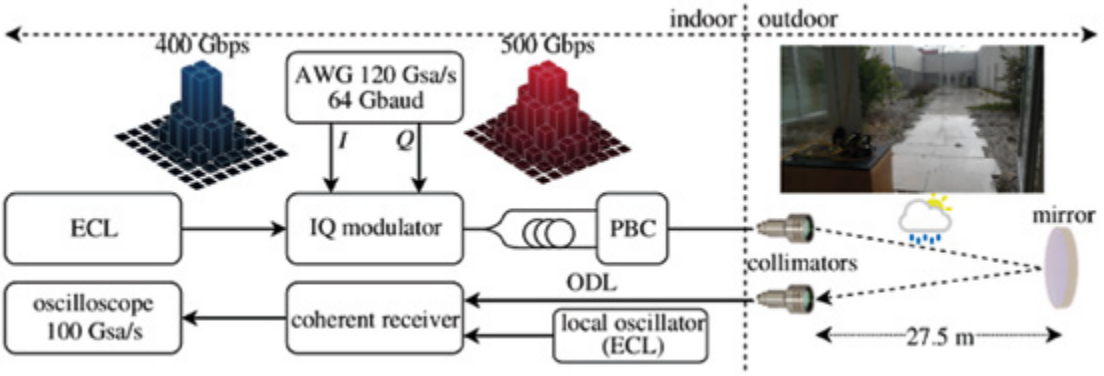

FIGURE 1
Experimental setup implemented in the optical communications laboratory of Instituto de Telecomunicações, enabling the demonstration of 400G+ optical signal transmission and detection with a 55-m free-space optics link.

Biological imaging enabled by organic fluorophore's supramolecular interactions

Raquel Nunes da Silva[1,2], Francisco Cardona[1], Catarina C. Costa[1], Maria J. G. Santos[1], Mariana Q. Alves[2], Susana S. Braga[1], Sandra I. Vieira[2], João Rocha[3], Artur M. S. Silva[1], Samuel Guieu[1,3]

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Most organic dyes are only luminescent in dilute solutions and see their emission intensity dramatically quenched when their molecules interact with each other. But certain fluorophores present a different behavior: they are almost non-emissive in solution, and their emission intensity increases upon crystallization or when they form supramolecular complexes. This behavior results from the stiffening of the fluorophore backbone upon aggregation or complexation, which in turn blocks internal conversions enabling the dye's emission.

In the course of our investigation [1], a family of emissive dyes has been developed, based on a hydrogen-bonded azine backbone [2]. Excited with UV light, such dyes are non-emissive in dilute solution but very bright in the crystalline form. Moreover, varying the substituents on the aromatic rings changes the emission color from blue to orange (Figure 1).

Protein misfolding and aggregation occur under several stress conditions, and can be associated with aging and age-related diseases, such as Alzheimer's, Huntington, Parkinson's or prion disease. Fluorescence-based techniques are useful to study such protein aggregates, but developing more selective and brighter fluorescent probes for protein aggregation is still a challenge.

The introduction of cationic groups on the fluorophore's backbone turns them soluble in water, allowing their application in biological imaging [2]. One fluorophore is non-toxic to cells, and has been applied to the staining of protein aggregates. The fluorophore enters the cells upon incubation, and accumulates selectively inside the protein aggregates present, probably in between the beta-sheets, forming a supramolecular complex. In these conditions, the molecular motions of the probe are restricted, and the fluorophore changes from non-emissive in solution to highly luminescent in the aggregate, selectively lighting-up the protein aggregates.

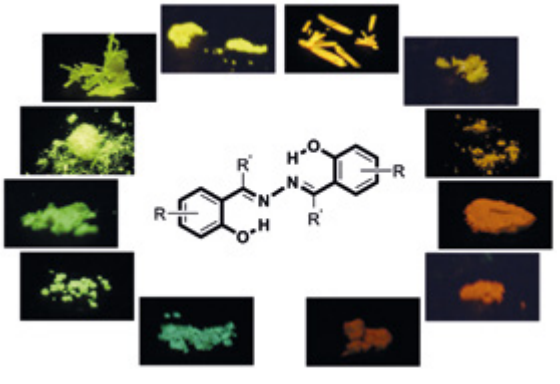

FIGURE 1
General structure of the family of fluorescent dyes, and photographs of their crystals or amorphous powders under UV light.

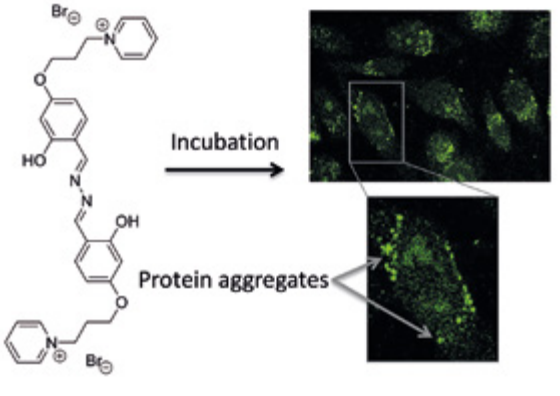

FIGURE 2
Structure of the fluorescent molecular probe used to detect protein aggregates, and fluorescence microscopy images of cells after incubation with the probe. The green dots are the protein aggregates.

[1] *"pAGE – Protein aggregation across the lifespan"*, Reference CENTRO-01-0145-FEDER-000003.
[2] *Tunable Color of Aggregation Induced Emission Enhancement in a Family of Hydrogen-Bonded Azines and Schiff Bases*, S. Guieu, F. Cardona, J. Rocha, A. M. S. Silva, Chem. Eur. J. 2018, 24, 17262-17267.
[3] *Fluorescent light-up probe for the detection of protein aggregates*, R. Nunes da Silva, C. C. Costa, M. J. G. Santos, M. Q. Alves, S. S. Braga, S. I. Vieira, J. Rocha, A. M. S. Silva, S. Guieu, Chem. Asian J. 2019, 14, 859-863.

Exercise training attenuates the variation of the phospholipidome of mitochondria from skeletal muscle induced by the urothelial carcinoma

Javier-Fernando Montero-Bullon[1], Tânia Melo[1,4], Rita Ferreira[1], Ana Isabel Padrão[1,2], Paula A. Oliveira[3], M. Rosário M. Domingues[1,4], Pedro Domingues[1]

Cancer cachexia is a wasting paraneoplastic syndrome characterized by physical disability, reduced tolerance to cancer therapy and reduced survival of cancer patients. There is no cure for cancer cachexia and the pathophysiological process involved is largely unknown. Physical exercise is currently recommended for the clinical management of this syndrome.

In this study we used a lipidomic approach based on liquid chromatography coupled with high resolution mass spectrometry to study the e□ect of exercise in modulating the phospholipid composition of mitochondria isolated from the *gastrocnemius muscle*. We used a preclinical Wistar rat model of urothelial carcinoma-induced cachexia (BBN). The exercised BBN and control rats were submitted to 13 weeks of exercise on a treadmill. BBN sedentary rats and controls were also included in this study.

PCA multivariate analysis showed a cluster that included the BBN exercise group and the two control groups (sedentary control and exercise control), while the sedentary BBN group was clustered away (Figure 2). The main signi□cant di□erences occurred in phosphatidylserine (PS) and cardiolipin (CL). PS with shorter fatty acyl chains were upregulated in the sedentary group BBN, while the other PS species with longer FA and a higher degree of unsaturation were downregulated. The BBN exercise group showed only small di□erences from the control groups.

The remodeling of the phospholipid pro□le of mitochondria from skeletal muscle of rats with urothelial carcinoma con□rmed the importance of lipid metabolism in mitochondrial dysfunction and muscle wasting. Exercise training prevented the changes induced by cancer of the polar lipid pro□le and had a positive impact on the ability of mitochondria to produce ATP, restoring the healthy pro□le of phospholipids. These results support the current perspective that exercise is an adequate therapeutic approach for the management of muscle wasting linked to cancer.

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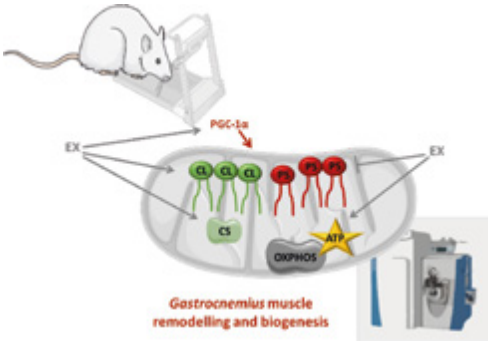

FIGURE 1
Graphical abstract

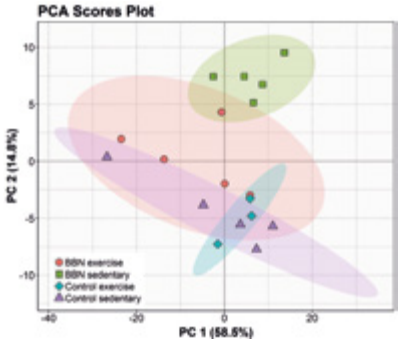

FIGURE 2
PCA of the phospholipid data set from preclinical Wistar rat model of urothelial cachexia acquired by LC-MS. Groups: Control sedentary, Control with exercise, urothelial cancer (BBN sedentary) and urothelial cancer submitted to exercise (BBN exercise).

Why revisiting the chemistry of apple pomace?

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Apple juice extraction follows an enzymatic digestion and pressing steps. Such process yields an insoluble material composed by the pulp, skin, seeds, and stalks of the fruit. This material is called apple pomace and is the most relevant byproduct of apple juice industries.

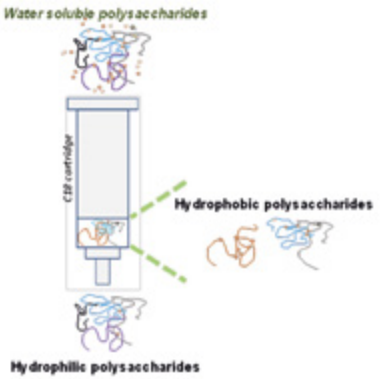
Apple pomace also represents one of the raw materials to produce fruit jams due to the presence of pectic polysaccharides components of apple pulp. This outcomes from the fact that pectic polysaccharides are widely viewed as hydrophilic structures, due to their capability to retain water and form gels when in solution. However, the retention of apple pomace pectic polysaccharides in hydrophobic C18 cartridges demonstrated that some polysaccharides behave hydrophobically.

While some *polysaccharides were shown to be hydrophobically retained* at neutral pH, others were shown to only behave hydrophobically in acidic conditions. These observations highlight the e□ect of pectic polysaccharide charge. However, the most relevant factor contributing to polysaccharides hydrophobic behavior was noted to result of polyphenols covalent bonding to the pectic polysaccharide arabinans.

As covalently attached polyphenols are not reported to be found in apple tissues, these linkages were noticed to be formed by means of polyphenol oxidation reactions occurring during the juice extraction process. This observation *reshapes the dogma of polysaccharides as hydrophilic compounds* and opens the opportunity for novel polysaccharide-based applications in food, environmental and biomedical □elds by taking advantage of their pH tailored hydrophobicity. Ultimately, it will boost the mitigation of apple pomace as an industrial disposable and allows to de□ne strategies for other agro-food wastes mitigation.

FIGURE 1
Schematic representation of apple juice □ow chart.

FIGURE 2
Scheme of hydrophobic pectic polysaccharides isolation from apple pomace.



Nanotechnology applied to construction: Experimental and Numerical Study of Building Solutions with Phase change materials

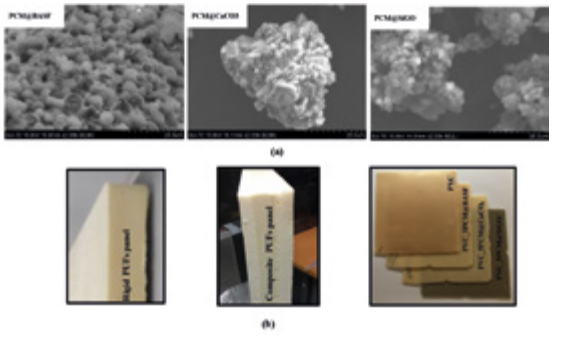
Cláudia Amaral[1], Romeu Vicente[1], Paula Maques[2], Ana Barros-Timmons[3]

The incorporation of phase change materials (PCM) into building solutions and components is a growing trend that has proven, in many applications, to enhance thermal comfort in buildings and energy e□ciency for new and existing building. This is because PCM can storage more energy, in latent form, than the typical sensible energy stored by common construction materials. However, the low thermal conductivity of PCM is an acknowledged drawback that constrains the use of their full potential since it slows down the heat transfer response associated to the charging and discharging processes.

The work developed addressed this drawback, and solutions incorporating two types of shape stabilized PCM, one based on para□n and calcium carbonate (PCM@CaCO3) and other on para□n, silica and graphene oxide (PCM@SiGO) to enhance their thermal conductivity were developed (see Figure 1a). The results achieved for the two types of shape stabilized PCM in comparison to those obtained using commercially available PCM (PCM@BASF) and their incorporation method in di□erent polymeric matrices brought forward potential latent heat thermal energy storage (LHTES) applications (see Figure 1b). The PCM@CaCO3 was integrated in di□erent polyurethane foams (PUFs) assembled in rigid PUFs panel and in composite PUFs panels (rigid /soft/rigid) and fully characterized. The thermal performance was evaluated using the Hotbox setup (see Figure 2), Hotplate and Hotdisk methods. Complementary, these PCM@CaCO3 and the PCM@SiGO were also incorporated in a poly(vinyl chloride) (PVC) structural layer.

The results obtained for three rigid PUFs panels, one without PCM (RPU) and the other two containing 5 wt% of each PCM (RPU_5PCM@CaCO3 and RPU_5PCM@BASF) are shown in Figure 2. These results reveal the thermal regulation e□ect of incorporating PCM, which could improve thermal comfort, reducing the temperature swing of the indoor spaces as well as the associated energy consumption to keep the temperature within the comfort range.

Additionally, a numerical model was developed and calibrated resourcing to experimental data to then carry out a parametric study to further assess the thermal performance, varying di□erent parameters such as loading content of PCM and latent heat capacity



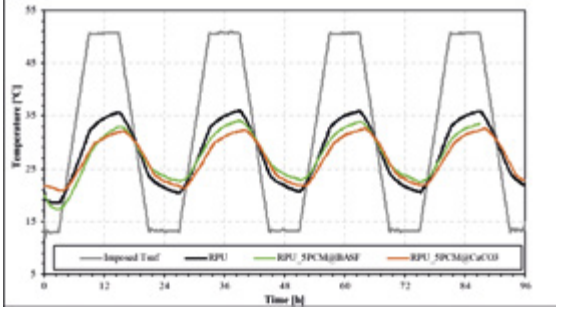


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FIGURE 1
Incorporation of PCM into support polymeric matrices: (a) SEM images of di□erent types of PCM (b) PUF panels and PVC □lms

FIGURE 2
Temperature pro□les of rigid PUFs panels (RPU) for a 4 day cycle

Life Cycle Cost Estimation for the Support of Maintenance and Refurbishment of Buildings

Paulo Ribeirinho Soares[1], Fernanda Rodrigues[1], Hugo Rodrigues[1]

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Construction life cycle management is currently a concern of the construction sector, especially in refurbishment and maintenance interventions. Maintenance actions are strategic to assure the buildings' performance within the users and standards requirements. The building design phase and the decisions taken during the rehabilitation of the existent buildings play a crucial role in the determination of the building's life cycle performance in terms of life cycle costs (LCC). For maintenance planning, it is necessary to know the service life of the construction elements and its building LCC. With this goal, the eCOSTLY - evaluate COnstructions Service Life for You (Fig. 1) web-based tool was developed, to support the automatic calculation of the estimated service life (ESL) of materials and constructive elements using the factorial method (ISO 15686-1: 2000) based on the design, construction parameters, the environmental conditions and the implemented maintenance type (Fig. 2). Is also able to appraisal maintenance costs over the building life cycle. The main aim of the tool is to support the AECO (architecture, engineering, construction, and operators) sector to take the best option in the moment of the construction of a new building or the rehabilitation of an existent one, based not only in the initial costs but in the annual costs during the building life cycle, including the maintenance and the replacement of the elements, according to its reference service life (RSL). Direct connection with the construction industry will allow to develop and optimize the eCOStly products database with real and current information, providing construction technicians with a more complete tool. Finally, the tool is being connected with Building Information Modelling software through an application programming interface to automatically perform the ESL and generating maintenance plans. It was concluded that eCOStly is a useful and innovative tool for buildings' stakeholders.

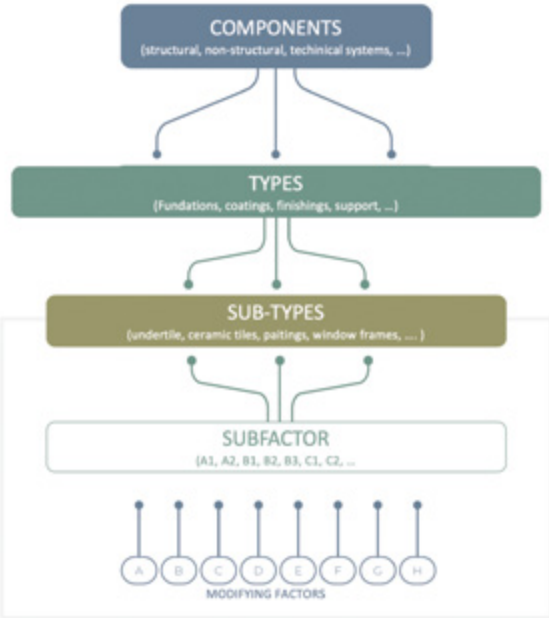

FIGURE 1
eCOStly methodology framework

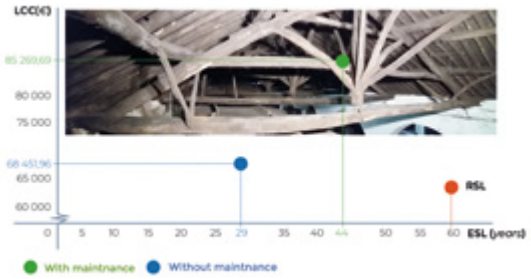

FIGURE 2
Application example for an old timber truss

Integrating road traffic externalities through a sustainability indicator

Paulo Fernandes[1], Mariana Vilaça[1], Eloísa Macedo[1], Eloísa Macedo[1], Behnam Bahmankhah[1], Jorge Bandeira[1], Claudio Guarnaccia[2], Sandra Rafael[3], Ana Fernandes[3], Hélder Relvas[3], Carlos Borrego[3], Margarida Coelho[1]

Road tra□c poses negative externalities on society and represents a key challenge in sustainable transportation. However, the existing literature about the assessment of tra□c externalities drawn on a common measure is scarce.

This paper develops a sustainability indicator that integrates tra□c-related externalities as means of tra□c congestion, noise, greenhouse gases (GHG) and nitrogen oxides (NOx) emissions, health impacts and road crash related costs, and adjusted to local contexts of vulnerability. Tra□c, road crashes, acoustic and vehicle dynamic data were collected from one real-world intercity corridor pair comprising three alternative routes: i) partly rural/urban; ii) low-tra□c-volume highway with electronic pay tolls; iii) high-tra□c-volume highway with both conventional and electronic pay tolls. The site-speci□c operations were characterized using a modeling platform of tra□c, emissions, noise and air quality. A speci□c methodology is applied for each road tra□c externality and translated in a single factor – external cost.

Low-tra□c-volume highway yielded lower external costs than other routes. Road crash costs presented the largest share along the partly rural/urban route while GHG costs were relevant in routes with highway trip sections. For the road-level analysis, some di□erences in the distribution of external costs can be stressed. The share of noise and NOx in external costs were only signi□cant in urban roads, mostly due to higher potentially exposed population in those areas.

This paper o□ers a line of research that produced a method for decision-makers with a reliable and □exible cost analysis aimed at reducing the negative impacts of road tra□c. It also encourages the design of eco-tra□c management policies considering the perspective of drivers, commuters and population, and the support of future road pricing schemes that include a given cost value related to road tra□c externalities.

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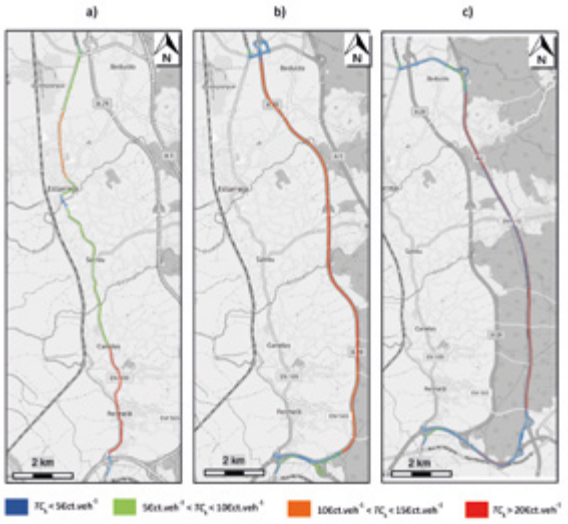
FIGURE 1
(upper) Sustainability Indicator (congestion, noise, GHG, NOX, health impacts and road crash) in €/veh

FIGURE 2
(bottom) Distribution of external costs by route: a) R1; b) R2; and c) R3.



Capacitive technologies for highly controlled and personalized electrical stimulation by implantable biomedical systems

Marco P. Soares dos Santos[1,2], J. Coutinho[1], Ana Marote[3], Bárbara sousa[3], A. Ramos[1], Jorge A. F. Ferreira[1], Rodrigo Bernardo[1], André Rodrigues[1], A. Torres Marques[2,4], Odete A. B. da Cruz e Silva[3], Edward P. Furlani[5], José A. O. Simões[1], Sandra I. Vieira[3]

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Cosurface electrode architectures are able to deliver personalized electric stimuli to target tissues. As such, this technology holds potential for a variety of innovative biomedical devices. However, to date, no detailed analyses have been conducted to evaluate the impact of stimulator architecture and geometry on stimuli features. This work characterizes, for the □rst time, the electric stimuli delivered to bone cellular tissues during in vitro experiments, when using three capacitive architectures: striped, interdigitated and circular patterns. Computational models are presented that predict the in□uence of cell con□uence, cosurface architecture, electrodes geometry, gap size between electrodes and power excitation on the stimuli delivered to cellular layers.

The results demonstrate that these stimulators are able to deliver osteoconductive stimuli. Signi□cant di□erences in stimuli distributions were observed for di□erent stimulator designs and di□erent external excitations. The thickness speci□cation was found to be of utmost importance. Frequency-dependent and region-dependent electric □eld stimuli are delivered to osteoblastic cells (Fig. 1). Maximum electric stimuli of 0.3 V/mm and 0.7 V/mm was delivered to the cellular tissues using electrodes with 100 µm thick for 14 Hz and 60 kHz, respectively, and 10 V voltage excitation. In vitro experiments using an osteoblastic cell line highlight that cosurface stimulation at a low frequency can enhance osteoconductive responses, with some electrode-speci□c di□erences being found (Fig. 2). A major feature of this type of work is that it enables future detailed analyses of stimuli distribution throughout more complex biological structures, such as tissues and organs, towards sophisticated biodevice personalization.

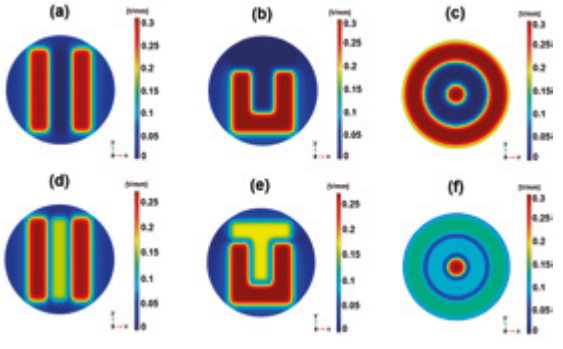

FIGURE 1
Electric □eld stimuli delivered to MC3T3 osteoblasts for low frequency (a–c) and high frequency (d–f) excitations delivered by: (a,d) a striped pattern; (b,e) a interdigitated pattern; (c,f) a circular pattern.

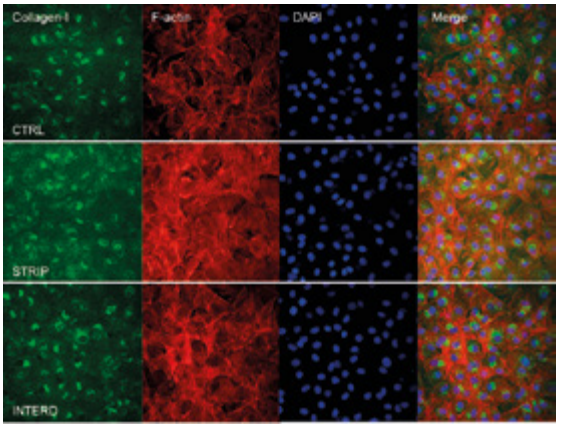

FIGURE 2
Confocal microscopy analysis of MC3T3 osteoblasts cultured for 28 DIV in the absence of stimulus (CTRL) or upon daily stimulation with two electrode patterns (striped [STRIP] and interdigitated [INTERD]). Cells were probed for type-I collagen (green □uorescence), DAPI (blue nuclear staining), and □lamentous actin (F-actin, probed with red-labeled phalloidin). The scale bar is 50 µm.

The evaluation of laser weldability of the third-generation Advanced High Strength Steel

António B. Pereira[1], Rafael O. Santos [1,2,3], Bruno S. Carvalho[1], Marilena C. Butuc[1], Gabriela Vincze[1], Luciano P. Moreira[3]

The automotive industry is increasingly using advanced high strength steels (AHSS) in the production of the components to meet the demands of vehicular safety and greenhouse gas emission reduction. With the newly developed third generation of AHSS, it is essential to study their behavior towards manufacturing processes used in the automotive industry. The third generation of AHSS has a cost slightly higher than the □rst generation and provides mechanical properties between the □rst and second generation due to its multiphase microstructure with a signi□cant amount of retained austenite. Laser-welding has gained popularity in the metal-joining industry due to its ease of automation and □exibility. Also, the laser-welding has no electrode cap wear as the resistance spot-welding process, not requires access to both sides of the join to support the material as the self-piercing riveting and can also be used to welding dissimilar materials. For this purpose, the welding capability of Gen3 980T steel with 1.58 mm thickness was investigated using the Nd:YAG laser-welding with di□erent parameter conditions. Figure (a) shows the best set of parameters among the analyzed ones for the butt joint welding condition. The analysis was made by uniaxial tensile tests, micro-hardness, Scanning Electron Microscopy, and X-Ray Di□raction. The criteria used to evaluate the quality of the weld were the distance between the fracture and the weld bead and the surface □nish. Figure (b) shows the welded specimen of uniaxial tensile test with fracture far from the weld bead and a comparison of its mechanical behavior with the sample without weld. The energy density correspondent to the best set of parameters was equal to 139 J/mm2. It was observed a relationship between the quality of the weld and the energy density. Below the optimal value, partial penetrations were detected. Above the optimal energy density, a high number of spatters and irregularities were perceived in the weld bead.

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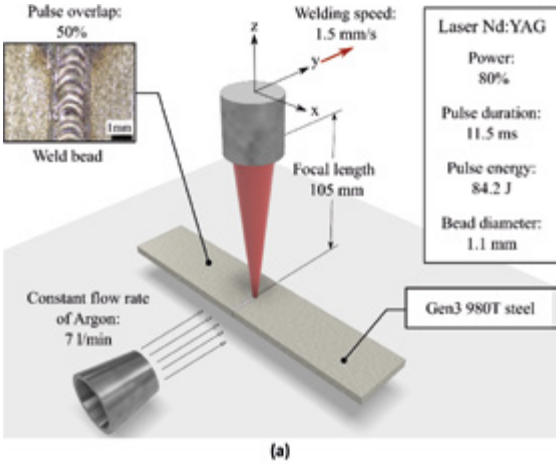
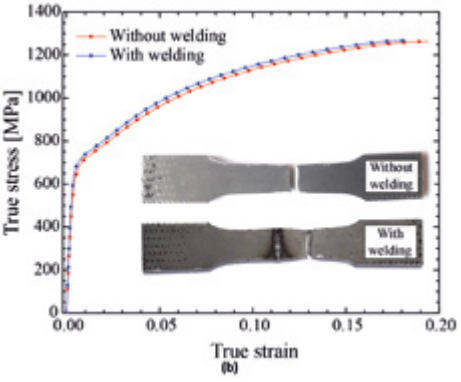


(a)



(b)

FIGURE 1
The best set of parameters of Nd:YAG laser welding for the Gen3 980T steel

FIGURE 2
True stress vs. strain curve for Gen3 980T steel, with and without weld.

Adaptive Memory: Longevity and Learning Intentionality of the Animacy Effect

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

2 — Department of Psychological Sciences, Purdue University, USA

Everything that surrounds us can be classi□ed according to its animacy status: animate (living things) or inanimate (nonliving). Natural selection likely favored cognitive systems that prioritize the processing of animates because during evolution animates were (and remain) important stimuli; animates can be, for example, predators, prey, kin or sexual mates. Accordingly, many aspects of human cognition are sensitive to this dimension, including language, reasoning, attention and perception. It has recently been reported that memory is also included in this list: people tend to remember animates better than inanimates, which is known as the animacy e□ect (Fig. 1). Given the adaptive value of this e□ect, we hypothesized it would occur independently of intention to memorize information, and both at short and long retention intervals. In our study, participants were presented a list of words that corresponded to animates and inanimates. Roughly half of the participants were instructed to memorize the words for a later memory test (intentional learning); the other half was asked simply to rate the pleasantness of the words and no mention was made of the later memory test (incidental learning). In both groups, some participants were asked to remember the words shortly after the words were presented (immediate condition) whereas others were asked to do so only two days later (delayed condition). As predicted, animates were remembered signi□cantly better than inanimates. Our data also revealed that the animacy e□ect holds after longer retention intervals and that it is sometimes stronger when learning is incidental than when it is intentional (Fig. 2). Our results add to the growing body of research on the animacy e□ect and on the adaptive functions of memory. During the development of this study we also created a Portuguese animacy norming database of words, an important resource made available for researchers interested in studying animacy-related phenomena.

FIGURE 1

Everything that surrounds us can be classi□ed according to its animacy status, ranging from being clearly inanimate (nonliving) to animate (living) (see Félix, Pandeirada & Nairne, in press; available at http://evo.psych.purdue.edu/publications/). Adaptively, animates are particularly relevant and impact memory as revealed in our study. ern.

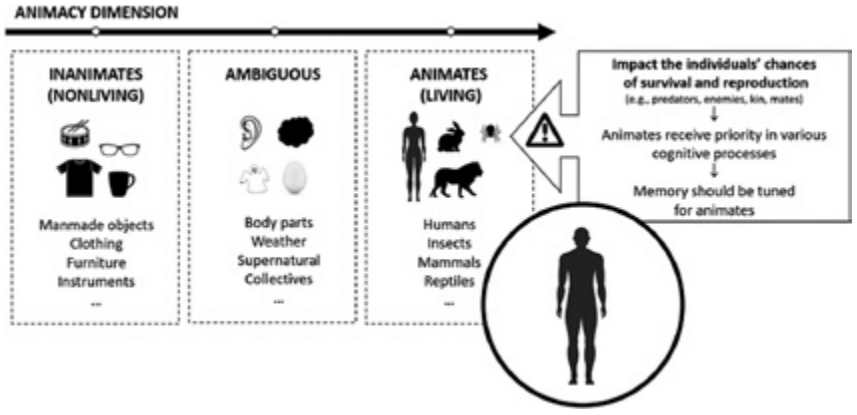
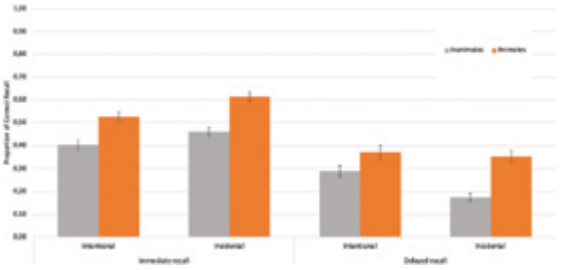


FIGURE 2

Mean proportion of correct recall of animate and inanimate words, in all conditions under study (from Félix, Pandeirada & Nairne, 2019; doi: 10.1080/20445911.2019.1586716). Error bars represent SEM.



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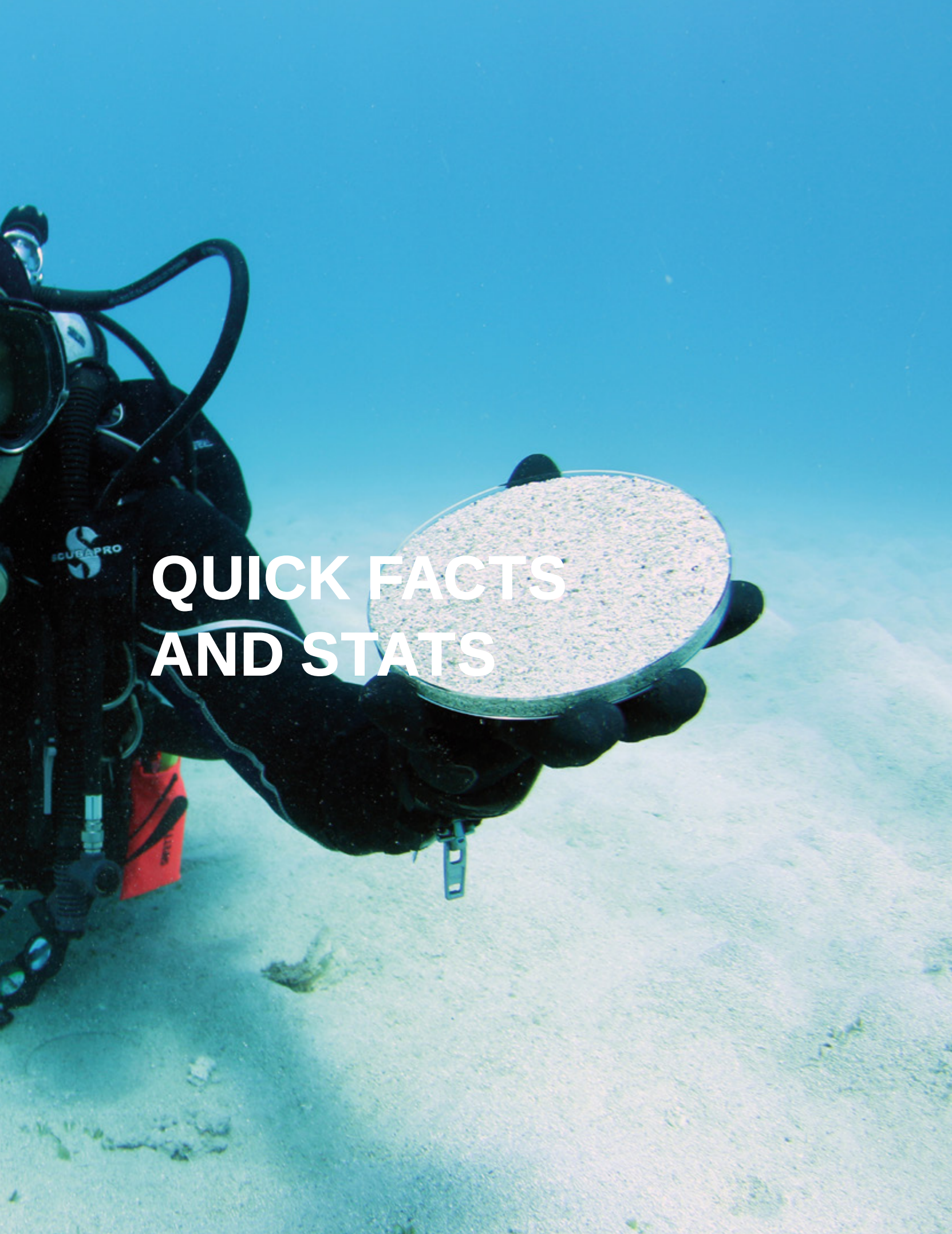


QUICK FACTS AND STATS

People

FACULTY BY DEPARTMENT

	FACULTY (FTE)			
	TOTAL	TOTAL	PERCENTAGE OF WOMEN	PERCENTAGE OF FOREIGNERS
UNIVERSITY	**2018**	**2019**		
Department of Biology	34,90	32,50	37%	
Department of Chemistry	44,30	44,30	53%	2%
Department of Civil Engineering	15,45	16,45	26%	
Department of Communication and Art	75,30	74,60	32%	4%
Department of Economics, Management, Industrial Engineering and Tourism	53,40	53,05	63%	4%
Department of Education and Psychology	40,60	38,95	66%	3%
Department of Electronics, Telecommunications and Informatics	77,00	77,00	8%	
Department of Environment and Planning	16,00	13,00	62%	
Department of Geosciences	14,30	14,30	42%	
Department of Languages and Cultures	43,30	44,30	64%	21%
Department of Materials Engineering and Ceramics	16,00	15,00	40%	
Department of Mathematics	56,70	56,30	47%	9%
Department of Mechanical Engineering	26,20	29,60	12%	3%
Department of Medical Sciences	23,90	22,50	61%	6%
Department of Physics	43,30	46,00	20%	7%
Department of Social Sciences, Policy and Planning	19,70	19,00	27%	
POLYTECHNIC SCHOOLS				
Águeda School of Technology and Management	58,30	60,65	44%	
Aveiro Institute of Accounting and Administration	68,60	70,70	51%	
School of Design, Management and Production Technologies of Aveiro North	30,85	32,10	33%	
School of Health Sciences	49,30	54,15	63%	
TOTAL	**807,40**	**814,45**	**42%**	**3%**

RESEARCHERS BY DEPARTMENT

	RESEARCHERS (FTE)			
	TOTAL	TOTAL	PERCENTAGE OF WOMEN	PERCENTAGE OF FOREIGNERS
UNIVERSITY	**2018**	**2019**		
Department of Biology	97	116	67%	14%
Department of Chemistry	134	145	66%	15%
Department of Civil Engineering	2	7	29%	14%
Department of Communication and Art	16	17	59%	18%
Department of Economics, Management, Industrial Engineering and Tourism	2	3	100%	33%
Department of Education and Psychology	13	18	89%	
Department of Electronics, Telecommunications and Informatics	23	21	52%	24%
Department of Environment and Planning	37	49	61%	29%
Department of Geosciences	5	10	70%	20%
Department of Languages and Cultures		1	100%	
Department of Health Sciences	12	21	76%	5%
Department of Materials Engineering and Ceramics	38	41	34%	37%
Department of Mathematics	6	9	33%	22%
Department of Mechanical Engineering	28	30	40%	43%
Department of Physics	72	74	32%	38%
Department of Social Sciences, Policy and Planning	17	21	67%	14%
POLYTECHNIC SCHOOLS				
Aveiro Institute of Accounting and Administration		1	100%	
School of Design, Management and Production Technologies of Aveiro North	1			
School of Health Sciences		2	100%	
TOTAL	**503**	**586**	**58%**	**22%**

STAFF BY CATEGORY

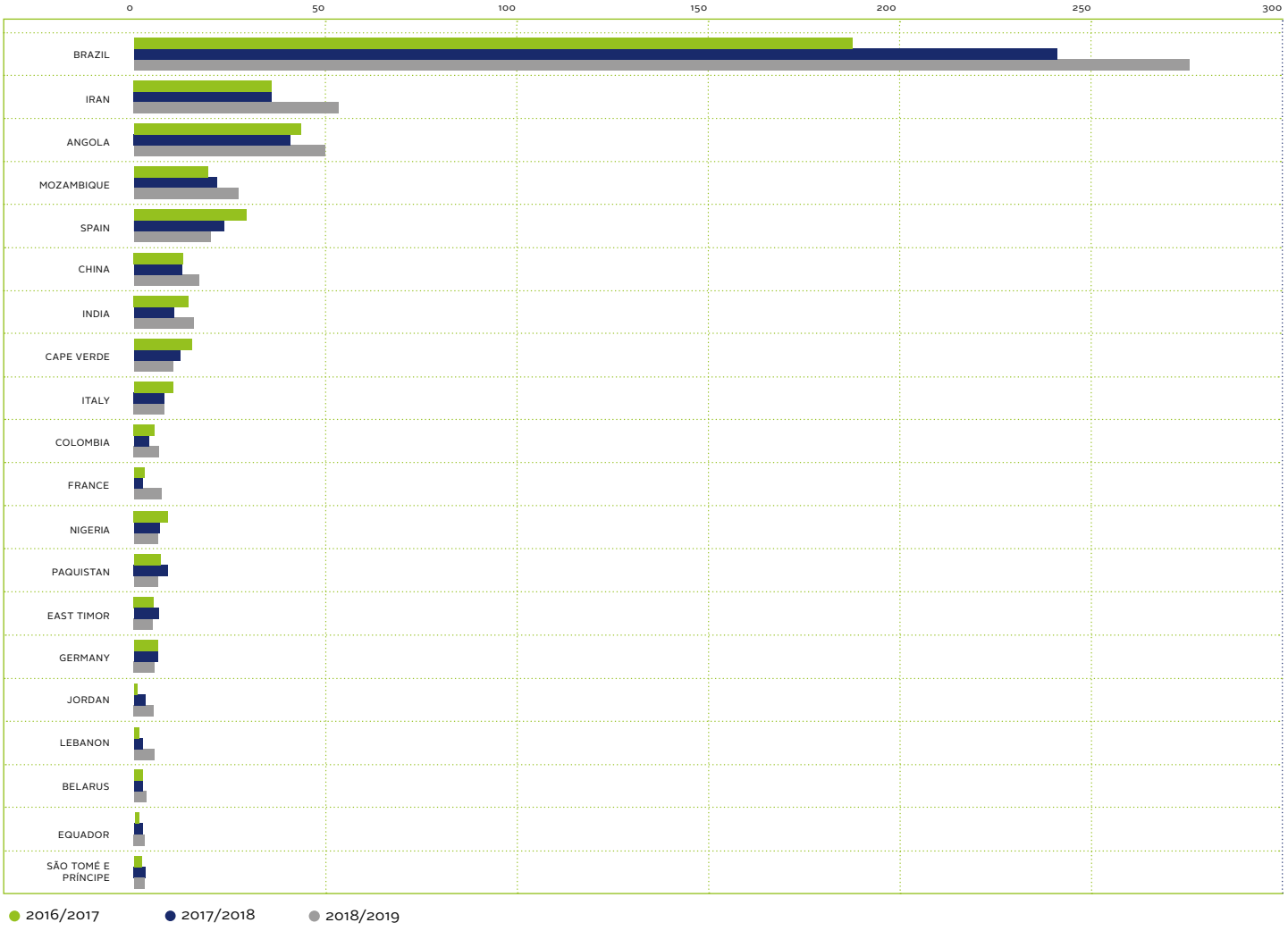
	FTE			
	TOTAL	TOTAL	PERCENTAGE OF WOMEN	PERCENTAGE OF FOREIGNERS
UNIVERSITY	**2018**	**2019**		
Full Professors	59,60	56,10	12%	4%
Assotiated Professors	124,00	123,60	36%	3%
Assistant Professors	381,70	380,80	44%	4%
Lecturer	17,75	19,25	18%	
Other Teaching Sta	17,30	17,10	77%	37%
Researchers	152,00	428,00	60%	17%
Post-Doctoral Students	351,00	158,00	53%	35%
POLYTECHNIC SCHOOLS				
Coordinator Professors	14,90	18,90	48%	
Adjunt Professors	140,05	145,25	49%	
Lecturer	52,10	53,45	51%	1%
TOTAL	**1.310,40**	**1.400,45**	**49%**	**11%**

PHD STUDENTS BY DEPARTMENT

	PHD STUDENTS				
	TOTAL	TOTAL	PERCENTAGE OF WOMEN	PERCENTAGE OF FOREIGNERS	PERCENTAGE OF NEW STUDENTS
DEPARTMENT	**2017/2018**	**2018/2019**			
Department of Biology	161	139	63%	30%	17%
Department of Chemistry	122	225	68%	15%	39%
Department of Civil Engineering	64	57	21%	53%	46%
Department of Communication and Art	229	244	50%	51%	29%
Department of Economics, Management, Industrial Engineering and Tourism	230	251	46%	47%	39%
Department of Education and Psychology	243	257	73%	39%	28%
Department of Electronics, Telecommunications and Informatics	101	119	21%	30%	28%
Department of Environment and Planning	71	73	45%	42%	30%
Department of Geosciences	12	11	64%	45%	18%
Department of Languages and Cultures	60	59	59%	46%	69%
Department of Materials Engineering and Ceramics	78	81	42%	36%	32%
Department of Mathematics	23	30	57%	33%	53%
Department of Mechanical Engineering	59	67	40%	27%	49%
Department of Medical Sciences	64	60	72%	5%	38%
Department of Physics	76	93	44%	18%	32%
Department of Social Sciences, Policy and Planning	78	85	33%	58%	40%
TOTAL*	**1.443**	**1.621**	**53%**	**36%**	**33%**

* 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



Top 20

FOREIGN PHD STUDENTS BY CONTINENT

- Africa (20%)
- Asia (20%)
- America (50%)
- Europe (10%)

MSC THESES

- Arts and Humanities (16%)
- Health Sciences (7%)
- Engineering and Technology (40%)
- Life Sciences (17%)
- Social Sciences (18%)
- Exact Sciences (2%)

PHD THESES

- Arts and Humanities (9%)
- Health Sciences (6%)
- Engineering and Technology (34%)
- Life Sciences (14%)
- Social Sciences (21%)
- Exact Sciences (16%)

SCI Papers

TOP 10 SUBJECT AREAS FOR PAPERS PUBLISHED IN 2019	RECORD COUNT	% OF 2.460
Environmental Sciences	320	13.008 %
Materials Science Multidisciplinary	238	9.675 %
Chemistry Multidisciplinary	182	7.398 %
Chemistry Physical	131	5.325 %
Engineering Electrical Electronic	125	5.081 %
Physics Applied	120	4.878 %
Biochemistry Molecular Biology	119	4.837 %
Green Sustainable Science Technology	82	3.333 %
Energy Fuels	70	2.846 %
Computer Science Information Systems	68	2.764 %

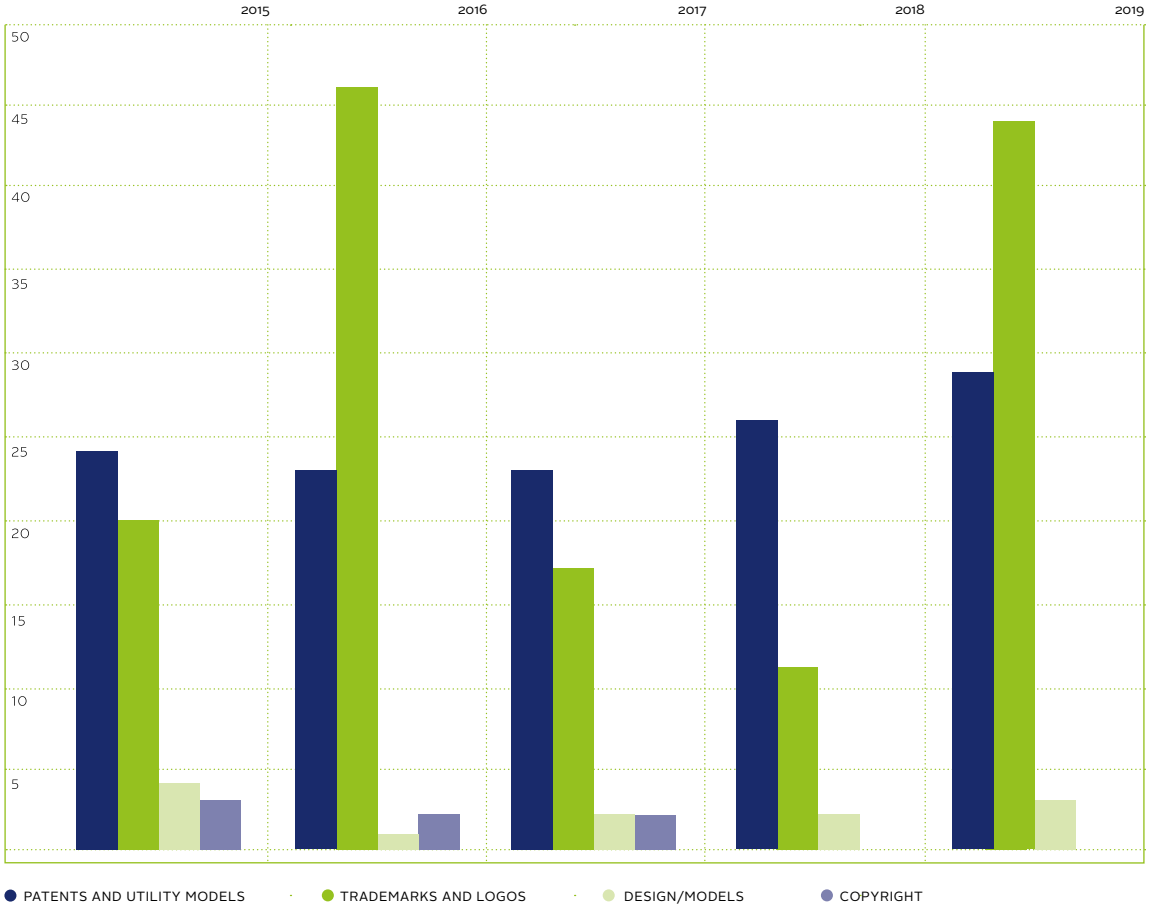
* Data retrieved from ISI Web of Knowledge SM (Thomson Reuters) on 18th June 2020.

TOP 10 CITED PAPERS	TOTAL Nº CITATIONS (2014 – 2019)
Klionsky, DJ; Abdelmohsen, K; Abe, A; Abedin, MJ; Abeliovich, H; Arozena, AA; et al (2016). Guidelines for the use and interpretation of assays for monitoring autophagy (3rd edition). AUTOPHAGY, 12: 1-222	2.244
Berti, E; Barausse, E; Cardoso, V; Gualtieri, L; Pani, P; Sperhake, U; et al (2015). Testing general relativity with present and future astrophysical observations. CLASSICAL AND QUANTUM GRAVITY, 32, Article Number: 243001	446
Silva, P; Vilela, SMF; Tome, JPC; Paz, FAA (2015). Multifunctional metal-organic frameworks: from academia to industrial applications. CHEMICAL SOCIETY REVIEWS, 44: 6774-6803	357
Herdeiro, CAR; Radu, E (2015). Asymptotically □at black holes with scalar hair: A review. INTERNATIONAL JOURNAL OF MODERN PHYSICS, 24 Article Number: 1542014	223
Khan, M; Iqbal, R; Fatma, M; Per, TS; et al (2015). Salicylic acid-induced abiotic stress tolerance and underlying mechanisms in plants. FRONTIERS IN PLANT SCIENCE, 6 Article Number: 462	216
Bennett, EM; Cramer, W; Begossi, A; et al (2015). Linking biodiversity, ecosystem services, and human well-being: three challenges for designing research for sustainability. CURRENT OPINION IN ENVIRONMENTAL SUSTAINABILITY, 14: 76-85	212
Ferreira, SS; Passos, CP; Madureira, P; et al (2015). Structure function relationships of immunostimulatory polysaccharides: A review. CARBOHYDRATE POLYMERS, 132: 378-396	208
Sousa, AF; Vilela, C; Fonseca, AC; et al. (2015). Biobased polyesters and other polymers from 2,5-furandicarboxylic acid: a tribute to furan excellency. POLYMER CHEMISTRY, 6: 5961-5983	204
Sims, R; van der Lee, SJ.; Naj, AC.; Bras, J; Guerreiro, R; et al (2017). Rare coding variants in PLCG2, ABI3, and TREM2 implicate microglial-mediated innate immunity in Alzheimer's disease. NATURE GENETICS, 49	194
Ventura, SPM; Silva, FA; Quental, MV; et al (2017). Ionic-Liquid-Mediated Extraction and Separation Processes for Bioactive Compounds: Past, Present, and Future Trends CHEMICAL REVIEWS,117 P: 6984-7052	171

Intellectual Property

INTELLECTUAL PROPERTY RIGHTS REGISTRATION

	2015	2016	2017	2018	2019
Patents and Utility Models	24	23	23	26	29
Trademarks and Logos	20	46	17	11	44
Design/Models	4	1	2	2	3
Copyright	3	2	2	0	0



International Projects

EU-FUNDED PROJECTS STARTED IN 2019

HORIZON 2020 – PROJECTS COORDINATED BY UA	ACRONYM	PROJECT COORDINATOR
A Step Forward to Spinal Cord Injury Repair Using Innovative Stimulated Nanoengineered Sca□olds	NeuroStimSpinal	PAULA MARQUES

HORIZON 2020	ACRONYM	LOCAL COORDINATOR
Development and design of novel multiFUNctional PEO COATings	FUNCOAT	MÁRIO FERREIRA
Integrating Environment and Health Research: a Vision for the EU	HERA	ANA ISABEL MIRANDA
FUNctional GLASS	FUNGLASS	LUÍS CARLOS
Establishing a Nanotechnology Risk Governance Framework	NANORIGO	MÓNICA AMORIM
Development and Implementation of a Sustainable Modelling Platform for NanoInformatics	NanoInformaTIX	MÓNICA AMORIM
Green chemicals and technologies for the wood-to-textile value chain	GRETE	JOÃO COUTINHO
the strong interaction at the frontier of knowledge: fundamental research and applications	STRONG-2020	JOÃO VELOSO
Past, present and future of turbid reefs in the Coral Triangle	4D_REEF	NEWTON GOMES
Integrated on-farm Aquaponics systems for co-production of □sh, halophyte vege	AQUACOMBINE	MÁRIO PACHECO
Smart and Healthy Ageing through People Engaging in Supportive Systems	SHAPES	ANABELA SILVA

ERASMUS + - PROJECTS COORDINATED BY UA	ACRONYM	PROJECT COORDINATOR
Including and Connecting in Higher Education: Networking opportunities for independent lives	HiLives	PAULA SANTOS
Teacher education for sustainability Schools educating for sustainability: proposals for and from in-service teacher education	TEDS	ANA ISABEL ANDRADE
Collaborative Platform for Teaching Innovation in Higher Education	ColLab	SANDRA SOARES
Knowledge Exchange in sustainable Fisheries management and Aquaculture in the Mediterranean region	FishAqu	ANTÓNIO NOGUEIRA

ERASMUS + EUROPEAN UNIVERSITIES	ACRONYM	LOCAL COORDINATOR
ECIU University		ARTUR SILVA

ERASMUS +	ACRONYM	LOCAL COORDINATOR
Post-Crisis Journalism in Post-Crisis Libya: A Bottom-up Approach to the Development of a Cross- Media Journalism Master Program	PAGE	VANIA BALDI
LoCALL: LOcal Linguistic Landscapes for global language education in the school context	LoCALL	MÓNICA LOURENÇO
Transdisciplinary methodology for Integrated Design in higher education	HIGH5	ELISABETH ROCHA
Kamilala: un projet créatif d'inclusion sociale par l'ouverture aux langues et aux cultures	Kamilala	ROSA FANECA
Augmented RealiTy fOr Management SkIlls Development with real-based Cases	ATOMIC	ELISABETH ROCHA
Doctoral Education for Technology-Enhanced Learning	DE-TEL	LUÍS PEDRO
Enhancing Universities' Sustainability Teaching and Practices through Ecological Footprint	EUSTEPs	SARA PIRES
A step forward in the internationalisation of Higher Education Institutions in Nepal and India	InterNepInd	SANDRA SOARES
Learning and Teaching Space in Higher Education	LTSHE	M JOÃO PIRES DA ROSA

LIFE +	ACRONYM	LOCAL COORDINATOR
Decreasing socio-ecological barriers to connectivity for wolves south of the Douro river	WOLFLUX	CARLOS FONSECA

INTERREG EUROPE – PROJECTS COORDINATED BY UA	ACRONYM	PROJECT COORDINATOR
Prioritizing low carbon mobility services for improving accessibility of citizens	PriMaaS	JORGE BANDEIRA

INTERREG ATLANTIC AREA	ACRONYM	LOCAL COORDINATOR
Water-Energy-Seafood Nexus: Eco-Innovation and Circular Economy Strategies in the Atlantic Area	NEPTUNUS	ANA CLÁUDIA DIAS

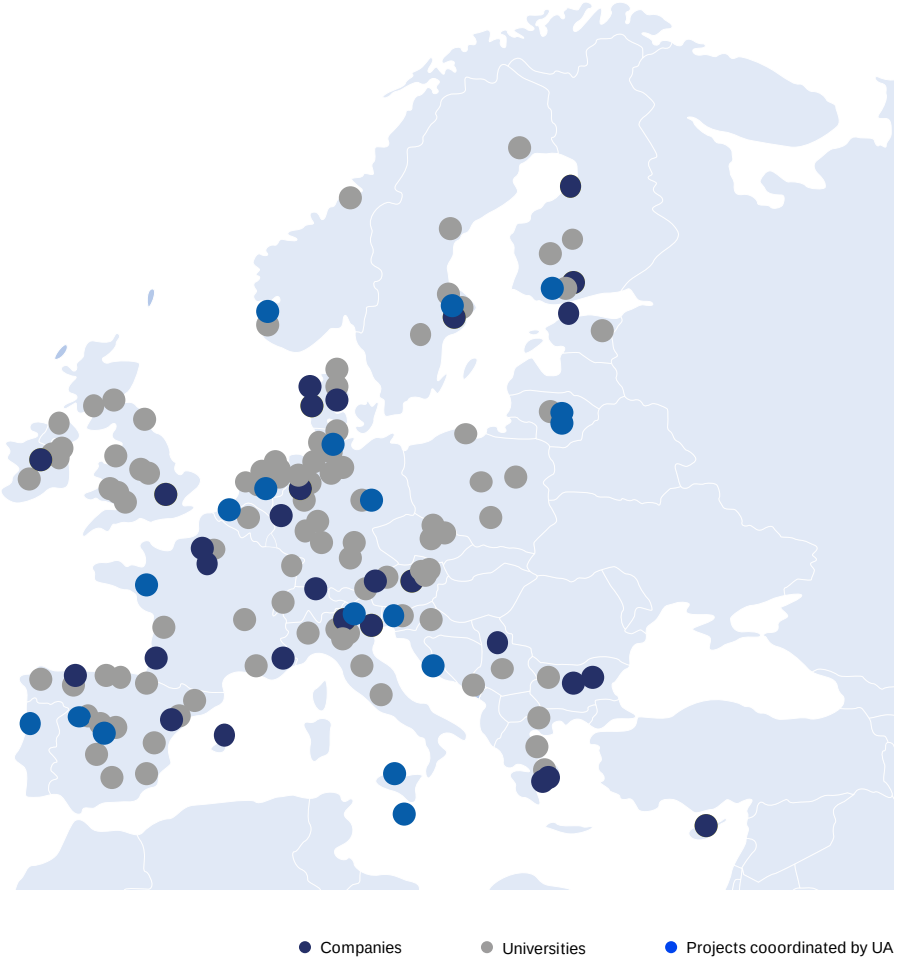
POCTEP	ACRONYM	LOCAL COORDINATOR
Desarrollo de una estrategia transfronteriza para la valorización ecosostenible de biomasas residuales del sector vinícola y vitivinícola en biorre□nerías Integrales para la producción de biocombustibles y bioproductos	BIOVINO	ARMANDO SILVESTRE
Innhospital: Hacia un nuevo modelo de hospital basado en la innovación y la transferencia del conocimiento	INNHOSPITAL	DANIEL POLÓNIA

EUROPEAN MARITIME AND FISHERIES FUND	ACRONYM	LOCAL COORDINATOR
Supporting Implementation of Maritime Spatial Planning in the Atlantic region	SIMATLANTIC	FÁTIMA ALVES
Tagging □shing gears and enhancing on board best-practices to promote waste free □sheries	NET TAG	CRISTINA PITA

COST ACTION – PROJECTS COORDINATED BY UA	ACRONYM	PROJECT COORDINATOR
European network of FURan based chemicals and materials FOR a Sustainable development	FUR4Sustain	ANDREIA SOUSA

NETWORK OF EUROPEAN UNIVERSITIES AND COMPANIES WORKING WITH UA IN EU PROJECTS STARTED IN 2019

AUSTRIA (INNOVATION, LTSHE, PRIDES, HERA, NANORIGO, GRETE, 4D_REEF)
BELGIUM (HILIVES, STRONG-2020, AQUACOMBINE)
BULGARIA (HIGH5, NANOINFORMATIX)
CROACIA (FISHAQU, STRONG-2020)
CYPRUS (SHAPES)
CZECH REPUBLIC (HERA, SHAPES)
DENMARK (ECIU UNIVERSITY, NANORIGO, NANOINFORMATIX, AQUACOMBINE)
ESTONIA (ATOMIC, FUNCOAT)
FINLAND (TEDS, ECIU UNIVERSITY, PRIDES, NANOINFORMATIX, GRETE, STRONG-2020)
FRANCE (TEDS, LOCALL, KAMILALA, FAME+, HERA, FUNGLASS, NANOINFORMATIX, GRETE, SHAPES, NEPTUNUS)
GERMANY (INNOVATION, LOCALL, COLLAB, ECIU UNIVERSITY, FUNCOAT, FUNGLASS, NANORIGO, NANOINFORMATIX, STRONG-2020, 4D_REEF, AQUACOMBINE, PRIMAAS)
GREECE (HIGH5, KAMILALA, EUSTEPS, NANORIGO, NANOINFORMATIX, SHAPES)
IRLAND (ECIU UNIVERSITY, SIMATLANTIC, NANOINFORMATIX, SHAPES, NEPTUNUS)
ITALY (PAGE, COLLAB, EUSTEPS, FISHAQU, LTSHE, NANOINFORMATIX, GRETE, STRONG-2020)
KOSOVO (LTSHE)
LITHUANIA (TEDS, COLLAB, ECIU UNIVERSITY)
MALTA (TEDS)
NETHERLANDS (INNOVATION, LOCALL, ECIU UNIVERSITY, PRIDES, NEUROSTIMSPINAL, NANOINFORMATIX, STRONG-2020)
MONTENEGRO (STRONG-2020)
NORWAY (COLLAB, DE-TEL, ECIU UNIVERSITY)
POLAND (HIGH5, ATOMIC, LTSHE, NANOINFORMATIX, STRONG-2020)
PORTUGAL (PROJECTS COORDINATED BY UA – HILIVES, TEDS, COLLAB, FISHAQU, NEUROSTIMSPINAL, PRIMAAS)
SERBIA (FUNCOAT)
SLOVENIA (FISHAQU, NANORIGO)
SPAIN (HILIVES, LOCALL, INTERNEPIND, ECIU UNIVERSITY, LTSHE, NET TAG, NEUROSTIMSPINAL, NANOINFORMATIX, STRONG-2020, 4D_REEF, SHAPES, BIOVINO, NEPTUNUS)
SWEDEN (ECIU UNIVERSITY, PRIDES, HERA, STRONG-2020, AQUACOMBINE, SHAPES, PRIMAAS)
SWITZERLAND (HERA, NURORIGO, NANOINFORMATIX)
UNITED KINGDOM (LTSHE, NET TAG, SIMATLANTIC, NANOINFORMATIX, STRONG-2020, 4D_REEF, SHAPES, NEPTUNUS)



Budget

TOTAL BUDGET OF THE PROJECTS STARTED IN 2019 BY RESEARCH CENTRE AND FUNDING AGENCY*

RESEARCH CENTRE	EUROPEAN UNION	FOUNDATION FOR SCIENCE AND TECHNOLOGY	INNOVATION AGENCY	OTHERS INTERNATIONAL	OTHERS NATIONAL	2018	2019
CESAM	1.655.015	450.465		125.751	372.879	13.108.455	2.604.109
CIC.DIGITAL	104.514	194.758			19.969	690.759	319.241
CICECO	976.604		1.342.648	293.892	278.003	12.219.150	2.891.147
CIDMA						773.586	
CIDTFF	351.525					83.671	351.525
CINTESIS	723.750					422.460	723.750
CIPES	38.737					463.332	38.737
GEOBIOTEC						50.024	
GOVCOPP	251.085		150.286			2.051.209	401.371
I3N	34.000		379.087			1.191.667	413.087
IBIMED		333.428		136.178	20.000	3.351.050	489.606
ID+						314.920	
IEETA			366.250			1.629.166	366.250
INET-MD				6.651		969.561	6.651
IT	1.337.556	1.466.690	1.828.725			7.408.510	4.632.971
Not Integrated**	483.009	165.371	1.457.252		311.495	5.777.289	2.417.128
QOPNA		80.388	147.837			2.603.274	228.225
RISCO			133.150			615.795	133.150
TEMA	1.421.929					3.725.060	1.421.929
TOTAL	**7.377.724**	**2.691.100**	**5.805.235**	**562.472**	**1.002.345**	**57.448.939**	**17.438.877**

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

** Projects not integrated in research centres

in euros

APPROVED BUDGET UNDER EU-FUNDED PROJECTS*

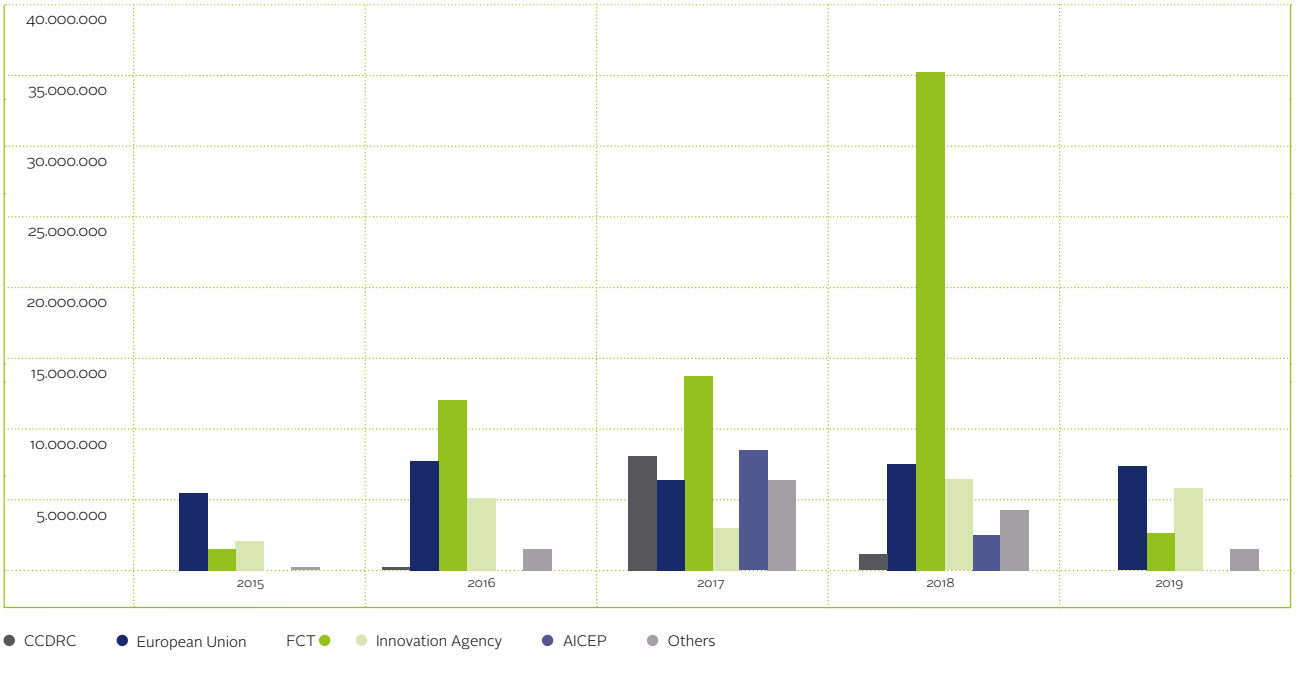
EUROPEAN PROGRAMMES	2018	2019
H2020 – ERC PoC	150.000	
H2020 -FETOPEN	508.060	1.114.705
H2020 – ITN-ETN		777.224
H2020 – RISE	167.900	437.000
H2020 – IF	297.271	
H2020 – NMBP	449.971	323.375
H2020 – ICT	1.439.375	504.000
H2020 – ECSEL		240.000
H2020 – SC6	198.751	
H2020 – SC1		780.605
H2020 – RUR		299.014
H2020 – INFRAIA		34.000
H2020 – CIRC	418.414	
H2020 – SAWFS	246.000	
H2020 – JTI – IMI	626.250	
H2020 – BBI-JTI		299.925
COST ACTION		186.346
ERASMUS +	387.849	1.335.116
LIFE+	301.182	268.020
INTERREG SUDOE	520.036	
INTERREG ATLANTIC AREA		170.128
INTERREG EUROPE		307.224
INTERREG ESPAÑA-PORTUGAL		110.000
Urban Innovative Actions	1.920.460	
EMFF		191.043
TOTAL	**7.631.519**	**7.377.724**

* in euros

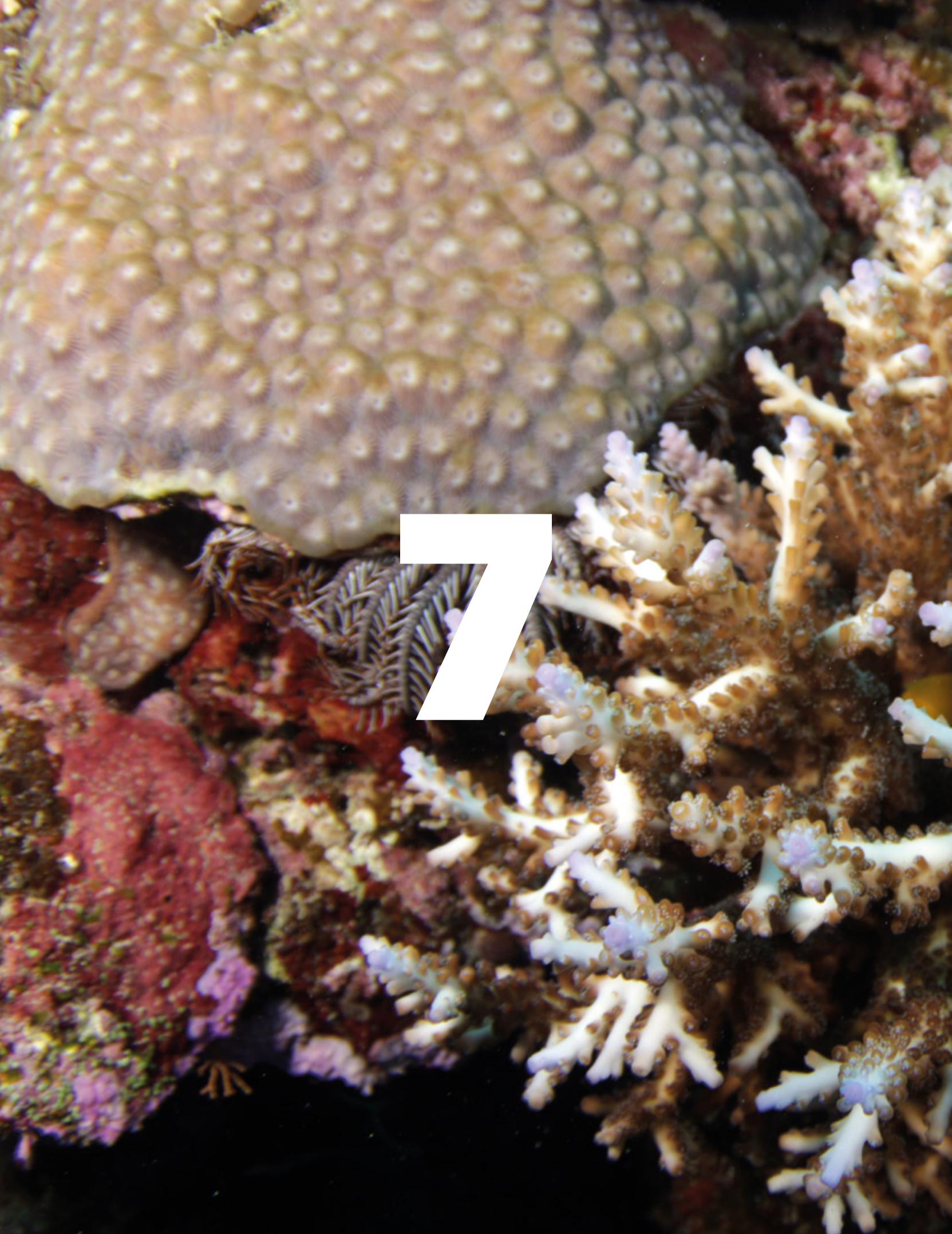
DISTRIBUTION OF RECEIVED FUNDS BY FUNDING AGENCY*

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

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



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



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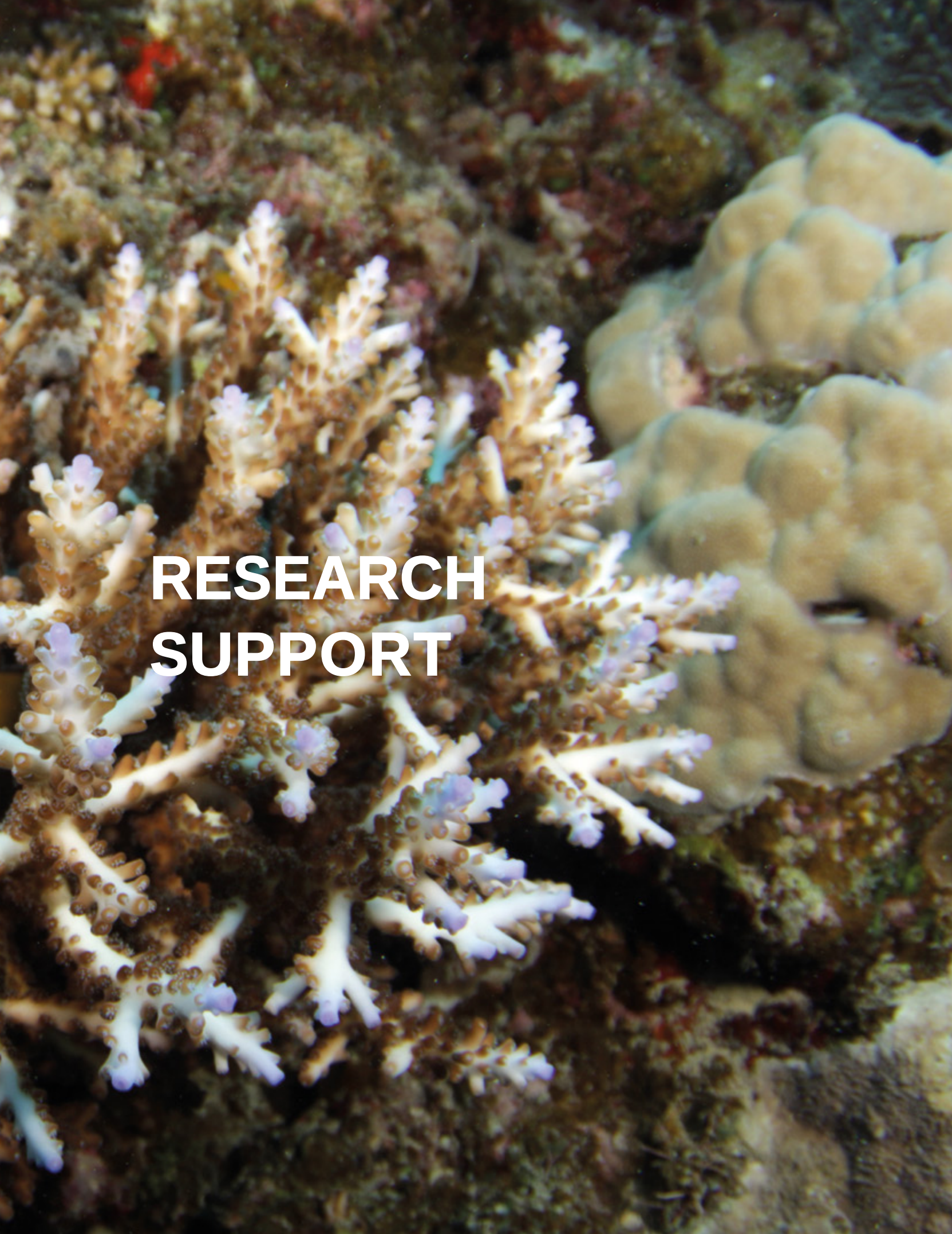

RESEARCH SUPPORT

Support for researchers

The Research Support Office works as the main contact point and interface unit for Research Units and Associated Laboratories, researchers, funding agencies and other relevant stakeholders in the research and innovation ecosystem.

During 2019, 628 research and technology transfer projects have been active in UAVR. From these 134 had or have international collaborations, of which 40 funded by ERASMUS+ and 48 by Horizon 2020. Among these projects are three ongoing ERC Grants and three more were approved for funding. The projects are developed in the scope of the 20 research centres hosted by UAVR which act in many different scientific areas. 95% of these research centres have been classified as very good or excellent in the last evaluation process promoted by the National Foundation for Science and Technology.

To achieve these numbers, the work done by the Research Support Office of the University of Aveiro has been fundamental. The office provides high quality advisory, administrative, technical, contracting and financial services to researchers of all disciplines at the University, assisting the research community in its efforts to secure external funding (national, regional, international; grants, awards and prizes).

Formed by skilled officers with mixed backgrounds, the main action lines of the office are 1) Research development; 2) Strategy support and implementation and 3) Research grants and contracts. The office thus covers most of the life-cycle of the projects, working closely with faculty and researchers in order to identify funding opportunities and bring together interdisciplinary groups of researchers with common interests; disseminating funding information, partnership opportunities, as well as training events; supporting and co-ordinating strategic activities/ projects ; providing advice on costing and submission of grant applications as well as University's authorization for submission; supporting negotiations of contract terms with funders and collaboration agreements with other HEIs and public sector collaborators and formalizing of contracts and agreements.

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