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PAULO JORGE FERREIRA
University of Aveiro

A WORD FROM THE RECTOR

Achieving a more inclusive, innovative, and sustainable society, and thus a more balanced, just, and prosperous one, is a challenge that requires the participation of everyone, in all sectors of society.

We are responsible for the future and we are all called upon to participate in the construction of participative models that value diversity, promote equal opportunities, stimulate creativity and the ability to create solutions for the challenges of our time, preserving the environment and using natural resources responsibly.

It is a global commitment, to which higher education institutions can contribute in two ways: through training, research, and innovation, crucial to the sustainable well-being of present and future generations; and by setting themselves up as models of good practice, marking society through example.

And these are, precisely, the commitments of the University of Aveiro.

ARTUR SILVA
University of Aveiro

MESSAGE FROM THE VICE-RECTOR

We have been experiencing decades of fast-paced advancement in knowledge creation, innovation and technological development. This goes hand-in-hand with an unprecedented level of worldwide educational attainment. Yet, the challenges and the existing divides, at the global scale and within societies, have remained large. In fact, in some cases, they have even grown larger.

Climate change, geopolitical tensions, demographics trends and imbalances, income disparities, poverty, famine, forced or induced migrations and displacements, depletion of resources. All these shape, in one way or the other, our current lives.

To those issues, we may have an array of additional concerns, closely bound to research and to what we often call wellbeing: the frontiers on the use of genetics, the increase of energy consumption, the exploration of rare materials, overwhelming plastic and electronic waste, pressing cybersecurity issues, and the unknown impacts of the fast dissemination of artificial intelligence applications.

These are issues hard to overcome. Even more so as societies are profoundly asymmetric: there is a differentiated access to goods and services, including basic ones, often related to purchase power and individual status. These results in exclusion and in novel forms of exclusion, confronting the concept of an evolution towards a more just society.

Research, by itself, does not provide direct and easy solutions to those problems, as their nature goes beyond the scientific and technological arenas. Nevertheless, research across all domains has the power to shed a unique light over our world. It allows us to have a better understanding of the past, and of how the present came to be. It opens up windows into the future, into alternative futures, for us to decide upon, as individuals, as groups, and as societies.

Research enables an understanding across different dimensions, now more important than ever due to the high-level of interconnectedness and interdependence of man-made activities. Across space, from local to regional to global, from our University and neighborhood, to the city and the region, the country, and the world. Across time, from the now to the short thereafter, and into the future, moving beyond the institutional and the political governing cycles, reaching generations to be. Across organizational scales, from the single person, to different groups, to formal or informal organizations, public and private, accommodating for flexible and changing arrangements. Across individuals, understanding their diversity and contexts, and caring for different needs.

Furthermore, through research activities, in all their variety, we have the ability to both go deeper, into each single subject, and to go wider, addressing relations and interconnections, blurring traditional subject boundaries.

This increasing pool of knowledge feeds, in turn, the innovation processes, which involve a much wider range of agents from outside the academia. The services and products resulting from innovation and technological development probably are the most visible impact of research on daily life. However, such impacts are much deeper and long ranging, especially when duly incorporated in education processes.

Furthermore, while collective decision processes pertain to the policy sphere, they should make use of the best knowledge available, and this includes a clear depiction of uncertainties and unknowns, and of widespread participation processes.

The Universidade de Aveiro, a comprehensive research driven university, is especially capable to make a significant contribution within this framework, as it has been demonstrating, once and again, over the almost 50 years of its existence. Its underlying matrix structure was originally designed to allow for customized and adaptable pooling of the best people and resources, to tackle ever-evolving research challenges. This premise is still valid today, and we must collectively make the most of it.

This is why it is so important to continuously nurture internal forums with no strict thematic boundaries, and to promote national and international networking, as all these foster creativity and may lead to novel research pathways.

This year, and within this line of reasoning, we have challenged the community to critically reflect on our contribution to inclusiveness, innovation, and the way forward towards more sustainable societies, through research as well as through action, setting our university as an example. Communities are made by their members, and we all have a role to play when defining the future we aim for.


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RESEARCH UNIVERSE

Interdisciplinary research centres and facilities

The research matrix of the University of Aveiro 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, the 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.

The University of Aveiro hosts 20 research units, all classified as very good or excellent in the last evaluation process promoted by the National Foundation for Science and Technology.

Eight of these research units were labelled or integrate Associated Laboratories.

Research centres

CESAM
Centre for Environmental and Marine Studies

We aim to develop multidisciplinary and transdisciplinary international research of excellence, supporting the private and not-for-profit sectors and contributing to the development of public policy, nationally and internationally.

Unit coordinator: Amadeu Soares

Research areas: we address the challenges posed by global change, with a focus on social, economic and environmental sustainability, and cover the continuum of atmosphere, land, oceans, and aquatic resources, from the catchment to the deep sea. We are caring for the future.

https://www.cesam-la.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 interdisciplinary research unit in the Humanities, with a transdisciplinary orientation.

Unit coordinator: Anthony David Barker

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

https://www.ua.pt/en/cllc

CICECO
Aveiro Institute of Materials

Its mission is to create and disseminate scientific and technological knowledge to develop, process and apply materials that will anticipate and address the challenges of a global society.

Unit coordinator: João A.P. Coutinho

Research areas: Porous Materials and Nanosystems; Photonic, Electronic and Magnetic Materials; Electrochemical Materials, Interfaces and Coatings; Renewable Materials and Circular Economy; Biomimetic, Biological and Living Materials; Virtual Materials and Artificial Intelligence.

https://www.ciceco.ua.pt

CIDMA
Centre for Research and Development in Mathematics and Applications

CIDMA is a R&D unit hosted at DMat--UAveiro 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.

https://cidma.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: Maria 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/en/cidtff

CINTESIS
Centre for Health Technology and Services Research

It's a multidisciplinary research unit that includes researchers from the Department of Education and Psychology and from the Health School.

Pole coordinator: Óscar Ribeiro

Research areas: social and behavioral gerontology, clinical gerontology and geriatrics, mental health, chronic disease management, and health care provision.

https://cintesis.eu/en/home

CIPES
Centre 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: The growth of the Centre and its activities has led to the identification of three main Research Groups: system level policies, institutional and organisational analysis, and relationship between higher education and the environment.

https://www.ua.pt/en/cipes

DigiMedia
Digital Media and Interaction

Interdisciplinary research centre focused on media innovation and interaction design, working in three lines: Digital Studies, Digital Experience and Digital Contents.

Unit coordinator: Nelson Zagalo

Research areas: Media Technology, Media Arts and Communication.

https://digimedia.web.ua.pt/

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.

https://www.ua.pt/en/geo/page/17534

GOVCOPP
Governance, Competitiveness and Public Policies

GOVCOPP's research focusses on place-based policy and governance, producing knowledge that responds to the particular needs, perspectives, challenges and resources of specific contexts.

Unit coordinator: Varqá Carlos Jalali

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

https://www.ua.pt/en/govcopp

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: Bruno Jesus

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

https://www.ua.pt/en/ibimed

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.

Pole coordinator: Vasco Branco

Research areas: Design, Art, Media and Culture.

https://idmais.org

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: José Luís Oliveira

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

https://www.ieeta.pt

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

INET-md carries out transdisciplinary research on music and dance, using current perspectives from a broadening spectrum of musical, sound, and dance disciplinary fields, as tools both for fundamental research and for developing actions of social responsibility.

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/index.php/en

I3N – Institute for Nanostructures, Nanomodelling and Nanofabrication

I3N/ Aveiro focus on micro and nanofabrication, green and clean energy, nanomaterials and functional interfaces, biomedical devices and systems and theoretical and computational studies.

Pole coordinator: Florinda Costa

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

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 Carlos Pedro

Research areas: Wireless Technologies; Optics and Photonics; Networks and Services; Information and Data Sciences; and Basic Sciences and Enabling Technologies.

https://www.it.pt

LAQV-REQUIMTE – Associated Laboratory for Green Chemistry

The vision of LAQV is for a world in which Sustainable Chemistry is used as a powerful and dynamic tool to tackle the societal, economic, and environmental challenges of modern life, contributing to a World Sustainable Development.

Pole coordinator: Francisco Amado

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

https://laqv.requimte.pt

RISCO
Risks and Sustainability in Construction

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

Unit Coordinator: Romeu da Silva Vicente

Research areas: Assessment and mitigation of risks in the built environment, Sustainable and resilient solutions for the built environment, Built heritage safeguarding, conservation, renovation and retrofit.

https://www.ua.pt/en/risco

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

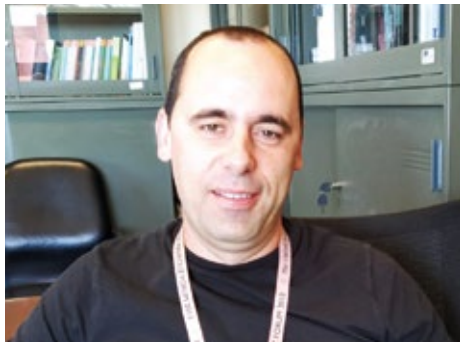
Research areas: Advanced Mechanical Engineering and Fracture Mechanics, Applied Energy, Biomechanics, Nanoengineering, Transportation Technology and Simulation Software Research and Development.

https://www.ua.pt/en/tema

WJRC
William James Research Centre

The core mission of the WJCR is to advance research and training in psychology with a broad interdisciplinary approach, including neurosciences, social and cognitive psychology, psychobiology, psychometrics, and statistical modeling.

Pole coordinator: Marco Vasconcelos



Research areas: Cognition, social cognition and body odors, health, and social development.

https://williamjamescr.org

Strategic projects

RESTORE4Cs – Modelling Restoration of wetlands for Carbon pathways, Climate Change mitigation and adaptation, ecosystem services, and biodiversity, Co-benefits

36 months; €6,6 M (UAveiro: €747 K)

Funded by the European Commission through the Horizon Europe, the project RESTORE4Cs is a Research and Innovation Action led by the University of Aveiro, under the scientific coordination of Ana Lillebø, Vice-Rector of the University and Principal Researcher of DBIO/CESAM, in a consortium of 15 European partners from 9 countries.

With a focus on coastal wetlands throughout Europe, this project aims to assess the role of restoration action on wetlands capacity for climate change mitigation and a wide range of ecosystem services, using an integrative socio-ecological systems approach.

RESTORE4Cs will deliver standardised methodologies and approaches for the prioritisation of restoration promoting carbon-storage and greenhouse gases (GHG) emissions abatement, while improving the ecological status and the provision of additional ecosystem services such as flood regulation and coastal erosion protection. Aligned with the implementation of Climate and Biodiversity policies, this project plays a vital role in advancing the objectives of the European Green Deal.

To achieve these goals, RESTORE4Cs has identified six case pilots for its activities, encompassing coastal wetland ecosystems with varying preservation statuses (well-preserved vs. altered) and presenting different alterations and existing restoration measures. These case pilot sites provide a good geographical representation within Europe and its biogeographical regions: Mediterranean: (Ebro Delta and Camargue), Atlantic (Ria de Aveiro and Oosterschelde/Grevelingen Delta), Baltic (Curonian Lagoon) and the Black Sea (Danube Delta), providing invaluable insights into wetland restoration in different contexts. The University of Aveiro team will focus on the Ria de Aveiro coastal lagoon case study, exploring the role of seagrass meadows to the promoting of blue carbon-storage and greenhouse gases emissions abatement.

The RESTORE4Cs consortium brings together a multidisciplinary team that possesses the expertise necessary to drive progress in the field of wetland restoration and to bridge the gap between research and policy. By prioritising restoration activities that enhance carbon pathways, mitigate climate change and support biodiversity, this project leads the way to a more sustainable and resilient future.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement N.º 101056782

More information
https://www.restore4cs.eu

A-AAGORA – Blueprint for Atlantic-Arctic Agora on cross-sectoral cooperation for restoration of marine and coastal ecosystems and increased climate resilience through transformative innovation

42 months; €8,4 M (UAveiro: €1,7 M)

The A-AAGORA project is a Horizon Europe Innovation Action of the Mission "Restore our Ocean and Waters by 2023", for the Atlantic & Arctic Basins Lighthouse. The project aims to develop a methodology for a coordinated approach to the co-development of implementable nature-based solutions in coastal areas.

A-AAGORA builds on the successful implementation of nature-based solutions in three demonstrators (Centro Region Portugal, Cork County Ireland and Troms Artic Archipelago Norway), representing different starting points that will serve as pilots of innovative actions, providing important data for global ocean science and direct research in the coastal and marine regions. The three demonstrators will act as platforms for the development and deployment of transformative innovations of all forms – technological, social, business, governance. The project will then identify areas and locations where the tested nature-based solutions can be replicated or scaled-up. The Living Lab concept will foster the exchange synergies at multiple scales between researchers and users, decision-makers and local communities, industry, and SMEs, integrating existing and new knowledge, co-designing and co-implementing with citizens and stakeholders in a deliberative democracy process. This will be the basis for the creation of a community of practice and a digital knowledge system. The project will also co-develop blueprints for the Atlantic-Arctic lighthouse for the restoration, protection and preservation of our ocean, seas, and waters.

A-AAGORA will demonstrate that restoration of aquatic ecosystems is possible at a large scale through reduction of pressures, Ecosystem based Management, and effective nature-based solutions including blue reforestation to boost coastal resilience to climate change impacts.

Led by Ana Lillebø, Vice-Rector of the University of Aveiro and Principal Researcher at DBIO/CESAM, this ambitious project brings together a consortium of 30 partners from 8 different countries, with complementary expertise in policy, governance, ecology, environmental economics, stakeholder engagement, technology development, business and international fora.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement N.º 101093956

More information
https://a-aagora.eu/

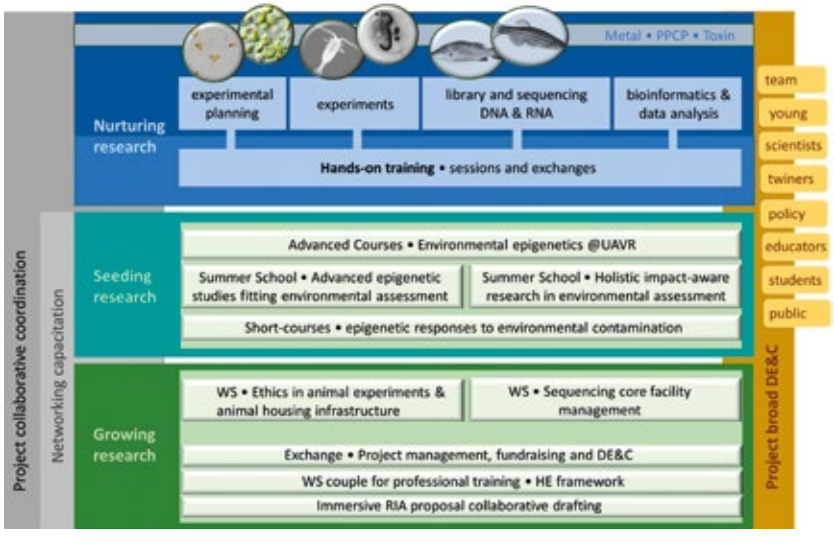
A-A AGORA

EPIBOOST: BOOSting excellence in environmental EPIgenetics

36 months; €1,5 M (UAveiro: €658 K)

EPIBOOST is a Twinning Coordination and Support Action (CSA) of the Horizon Europe programme started on October 1st 2022. Its aims are strongly linked to the capacitation of the Coordinator, the University of Aveiro, UAveiro) towards excellence in research and research support in the field of environmental epigenetics, specifically concerning the integration of this field in the regulatory ecological risk assessment of aquatic ecosystems. The aims and ambition of the project are promoted and deeply supported through a strategic partnership with the University of Ghent (UGent, Belgium) and Consejo Superior de Investigaciones Científicas (CSIC, Spain). The scientific coordination is ensured by Joana Luísa Pereira (CESAM and Department of Biology, UAveiro), then by Jana Asselman (UGent) and Laia Navarro Martin (IDAEA-CSIC). Several UAveiro research units are involved: CESAM, iBiMED, CIDTFF and DigiMedia.

The project aims at leveraging the research profile of UAveiro in the field of environmental epigenetics through capacity building activities that cover 5 specific objectives. The first focuses on the implementation of optimized protocols, through training sessions and exchanges between partners towards the development of the embedded research project that will produce knowledge about the suitability of DNA methylation signatures as informative biomarkers of environmental contamination and effects in aquatic organisms. The second objective is focused on nurturing the human talent that will underpin the European critical mass in the area of environmental epigenetics, by organizing several training events (advanced courses, summer schools and short courses at scientific meetings) targeted at young EU researchers. The third and fourth objectives tackle the absolute need for infrastructure and technical support, as well as of an empowered science management atmosphere, for boosting world-class levelled research in environmental epigenetics. In this context, an immersive training program in key aspects of research (ethics and animal housing; sequencing technologies), exchange of science managers, research management and administration training, and collaborative preparation of funding applications are foreseen. The fifth objective addresses the growth of the network and influential capacity of the consortium through a systematic strategy of involving international experts in capacity building activities and raising awareness among stakeholders.



This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement N.º 101078991

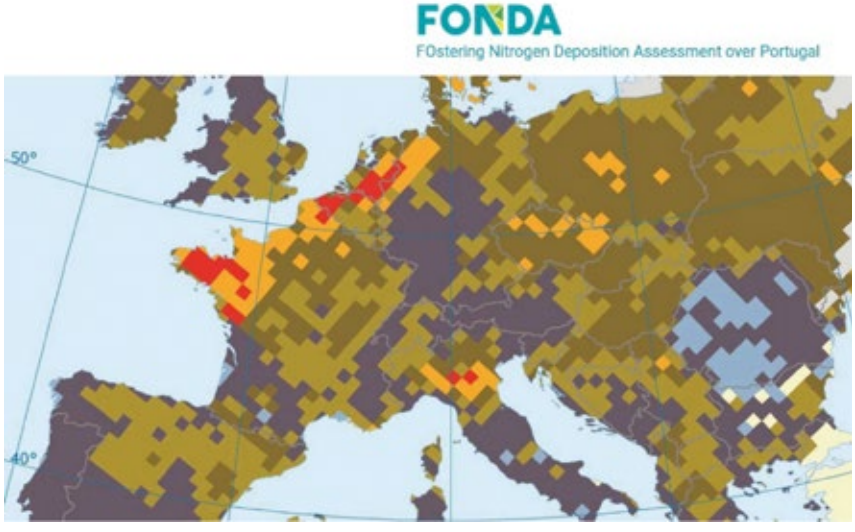
More information
https://epiboost.web.ua.pt

FONDA – FOstering Nitrogen Deposition Assessment over Portugal

36 months; €1,1M (UAveiro €677K)

FONDA is one of the Twinning projects, funded by Horizon Europe, coordinated by UAveiro, with the goal of modeling and mapping of pollutants like nitrogen. As a Twinning project, inside Widening purposes, FONDA aims to promote research excellence through networking, exchange and training. In the area of air quality modeling, the FONDA project, with a funding higher than 1.000 k euros, will allow to foster and capacity building the research group lead by Alexandra Monteiro – the project coordinator – and bring excellence to this scientifical and technological field in UAveiro.

The FONDA – project FOstering Nitrogen Deposition Assessment over Portugal project focuses on the area of modeling and mapping of atmospheric emissions, particularly of ammonia. The project involves the formation of a strategic partnership with the Dutch R&D institution TNO and the University of Berlin (FUB), Germany, and will enable to better understand the impact of this pollutant on our ecosystems (particular critical in terms of nitrogen critical loads) and the interactions between atmospheric chemistry, biodiversity, and climate change. Two summer schools and two international workshops will be organized to better promote the scientific capacity and knowledge transfer in this RD&I among other younger researchers. This Twinning project will also promote the development of technical, administrative and scientific skills of the UAveiro, strengthening its capacity to successfully develop new research and innovation projects in one of the advanced scientific areas of the European Research Area.



This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement N.º 101079482

More information
https://fonda.web.ua.pt/

SupraLife – Unlocking the scientific excellence and innovation capacity of the University of Aveiro in supramolecular multicomponent biomaterials for enabling advanced biomaterials for healthcare

36 months; € 1,5M (UAveiro €1M)

SupraLife is a Twinning project funded by the European Union's Horizon Europe research and innovation programme and coordinated by the University of Aveiro (UAveiro, Portugal), being the activities headed by the COMPASS Research Group, which belongs to the Associate Laboratory CICECO – Aveiro Institute of Materials within the Department of Chemistry. The consortium also encompasses the Eindhoven University of Technology (TU/e, The Netherlands), the University of Bordeaux (UBx, France) and its affiliated entities Polytechnic Institute of Bordeaux (Bordeaux INP, France) and French National Centre for Scientific Research (CNRS, France) as the internationally leading partner organizations.

UAveiro has been actively engaged in a significant number of international collaborations with world-leading research groups and companies in the Chemistry field focusing on the covalent-driven chemical modification of small organic compounds, natural products, and natural-origin macromolecules, as well as on their structural and biological characterization.

In particular, owing to its strategic maritime location, UAveiro has been taking advantage of the biocompatibility, biodegradability and wide availability of marine-origin polysaccharides to develop high added-value sustainable biomaterials for solving challenges in healthcare.

However, the performance of either native or covalent-based biopolymer derivatives is limited to the native properties of natural-origin polymers, showcasing limited bioactivity, stimuli-responsiveness, unsuitable mechanical properties, and non-adaptive behaviour, thus extensively limiting their use for mimicking living systems, and fulfilling healthcare needs.

SupraLife aims to accelerate the pace on the development of life-like supramolecular multifunctional biomaterials, exhibiting dynamic properties and bioinstructive and adaptive behavior, for healthcare by functionalizing biopolymers with self-assembling motifs.

The SupraLife consortium proposes the organisation of joint events, networking activities, short-term on-site trainings and staff exchanges, expert visits, and an exploratory research project for stepping up and stimulating UAveiro´s scientific excellence and innovation capacity in the supramolecular biomaterials' chemistry field for enabling advanced biomaterials for healthcare.

Roadmap for the development of complex supramolecular multi-component biomaterials for healthcare through the establishment of SupraLife's scientific and training network.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No. 101079482

More information
https://cordis.europa.eu/project/id/101079482
https://www.supralife.eu/

Egas Moniz Health Alliance

The Egas Moniz Health Alliance (EMHA), a Clinical Academic Center created in 2021, brings together the Hospital Centers of "Baixo Vouga", "Entre o Douro e Vouga", and "Vila Nova de Gaia/Espinho", the University of Aveiro, and the Regional Health Administrations for the North and Center Regions, in representation of six affiliated primary health centers (ACES). These institutions operate according to the highest standards of excellence, as recognized by external evaluation and accreditation bodies encompassing higher education and training, research, and healthcare activities, and have a longstanding collaboration-record of accomplishment.

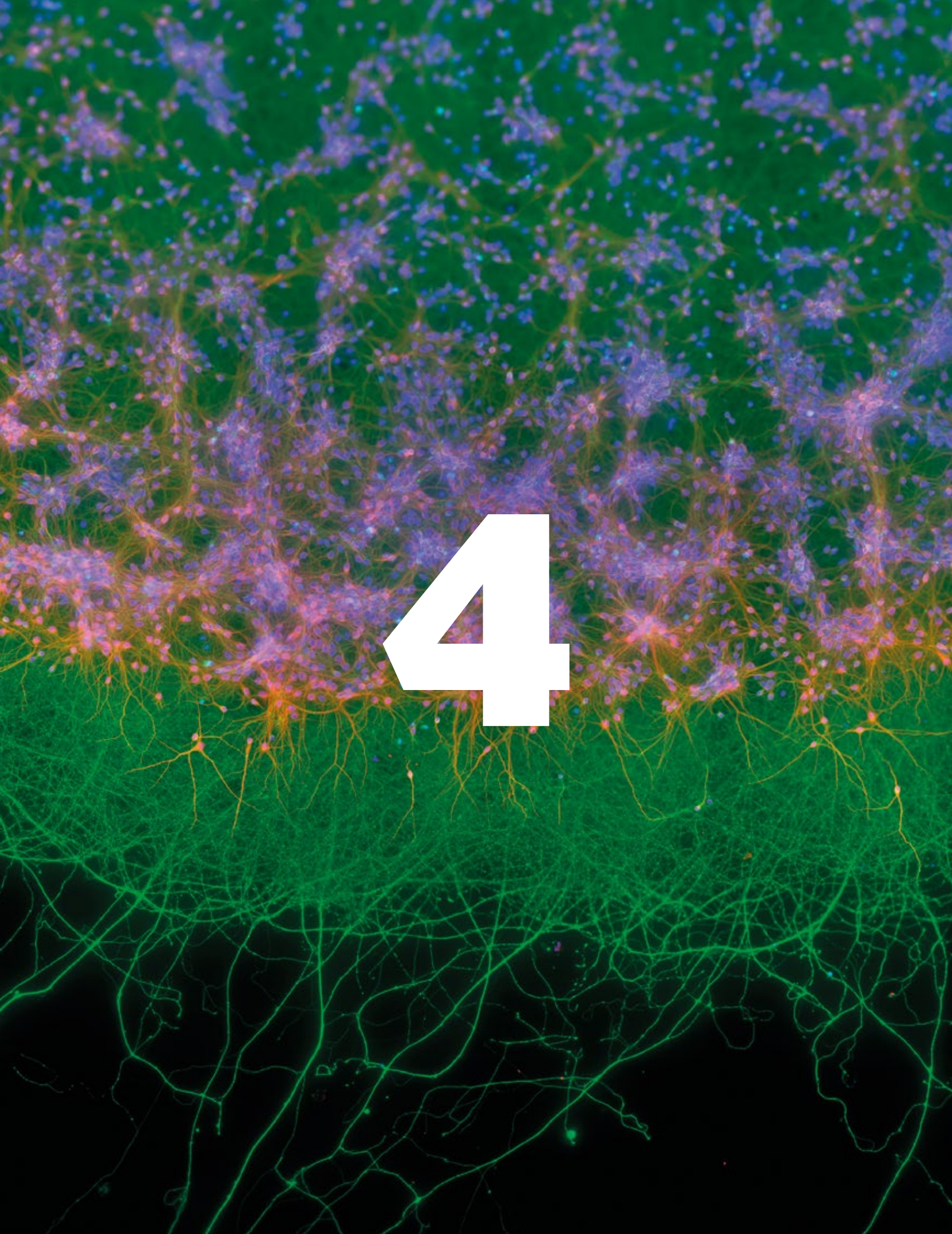
EMHA aims to foster quality and personalized health care provision to the regional community, to create knowledge, and to translate existing and new knowledge for the benefit of the wider population.

Upon mapping the local public health plans in EMHA's region, priorities requiring action from all stakeholders have been identified for the following health problems: ischemic and haemorrhagic stroke; myocardial infarction; diabetes mellitus; colorectal cancer; and lung cancer. Therefore, the proposed main challenges to be tackled by EMHA are: i) cardiovascular, metabolic and respiratory conditions; ii) musculoskeletal and rheumatologic conditions; and iii) infection and resistance.

EMHA proposes to capitalise and further develop the knowledge from genomics, proteomics, pharmacogenomics, metabolomics, epigenomics, and to integrate and boost personomics to identify treatments that are uniquely tailored and meaningful for each individual patient.

To achieve such objectives, a multipronged approach has been developed, combining research, innovation, and education and training of health professionals. This includes, among others, promoting the modernization and qualification of health education, and the development of actions promoting quality health care, supported by the contributions from the basic sciences, the clinical health sciences, and medical and social services of the health care units. Furthermore, collaborative research projects, fostering local, national and international research networks focused on the promotion of quality of life of the society will be developed.

More information
https://www.ua.pt/en/cacemha/egas-moniz-clinical-academic-center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SPOTLIGHT ON RESEARCH DISSEMINATION

Research Summit 2022

Assuming a greater return to academia, the Research Summit 2022 allowed the research community of the University of Aveiro to enhance awareness on the important theme of Open Science, increasing collaboration, advancing the state of the art and, above all, learning from best practices.

It became clear, throughout the 1st day of the event, that Open Science unveils how science and universities shall become more open, accessible, efficient, democratic and transparent. This principle of openness and transparency in the whole research cycle fostered this Open Science revolution, promoting, as well, an increase in public trust and interest in science and the public's participation in research activities.

Several research units showed how efforts are being made towards Open Science, how the principles, policies and practices are being incorporated in areas as music, chemistry, informatics, languages and cultures, mathematics, etc. It was proved that this new culture of openness provoked changes in the way research is conducted: for scientists themselves, through increasing the use of open access scientific publishing and open data, and for the public, through increasing their understanding of and participation in science.

The event benefitted from the participation of Victoria Tsoukala, Policy Officer-Seconded National Expert- Open Access and European Open Science Cloud at European Commission, DG RESEARCH, with a presentation on "Open Science: Enabling the Science of the Future". The perspective of the European Commission is strongly connected to their efforts: a number of collaborative actions at the regional level to increase up-take for the European Open Science Cloud (EOSC) and the launching of Open Research Europe (ORE), an open access publishing platform for the publication of research stemming from Horizon 2020 and Horizon Europe funding across all subject areas, making it easy for beneficiaries to comply with the open access terms of their funding.

Sara Bosshart, Head of Open Access Journals, Royal Society of Chemistry, presented the perspective of a publisher regarding "Shaping the future of Open Access & Open Science; a publishers' perspective". On its turn, Eloy Rodrigues, Director of the University of Minho Libraries gave the audience an overview of the "Challenges and Opportunities of Open Science for Universities".

With a magnificent introduction by Gary King, Harvard University, the DunAs, the University of Aveiro Research Data Repository, was publicly presented as the new service that allows the archiving, publication and access to research data generated and collected under the scope of scientific research activities of the University. This recent effort by the University of Aveiro, through the Library, Document Management and Museology Services and the Information Technology and Communication Services, in collaboration with the Research Support Office, aims to implement an open repository for the archive and publication of research data, promoting its visibility, impact and reproducibility.

The program included a roundtable, moderated by the Vice-Rector Artur Silva, discussing the research challenges in open science, gathering contributions from Sara Bosshart, Cristina Cortês, Director of the Library, Document Management and Museology Services, and João Coutinho, José Luís Oliveira, Nelson Zagalo, and Susana Sardo, Coordinators of the Research Centres CICECO, IEETA, DIGIMEDIA and INET-MD, respectively.

Following the plenary session, days 2 and 3 were highly attended, with over 840 intervenients, along the 9 to 10 simultaneous rooms each day, with 49 doctoral programs, more than 590 PhD students and 168 professors and researchers involved in the jury, as all pitches were evaluated by a jury.

Under the scope of PIIC@UA (Scientific Research Incentive Program) around 50 students pitched the activities developed under this initiative to promote their enrolment in science during the 1st and 2nd cycle of training.

The expected outcomes of this Research Summit shall be reflected on the institutional engagement with Open Science, reinforcing the need to work together to deliver a set of goals in a complex and evolving mix of themes and priorities in Open Science, to which all members should commit. Such changes are expected to enable greater transparency, collaboration and research integrity in the short term and improve scientific quality in the long term.

Academia de Verão

SUMMER ACADEMY

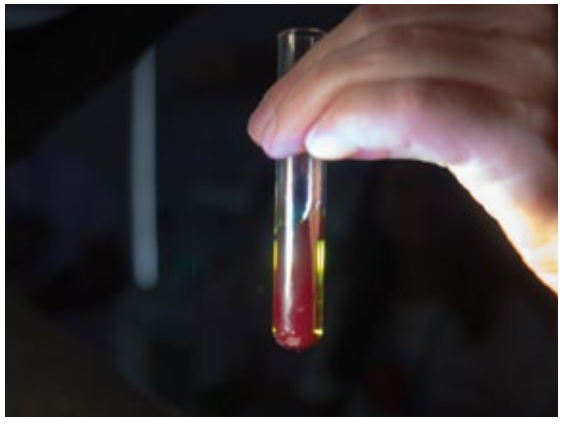
The Summer Academy is an initiative of the University of Aveiro (UAveiro) that every year provides a first contact with academic life and a diverse set of scientific, sports and leisure activities, especially for students from the 5th to 12th grades. In 2022, the event held its 16th edition, and counted on the participation of 439 students.

The scientific activities are organized by both the organic and research units of UAveiro – in a total of 16 departments, 3 polytechnic schools and 20 research units, each proposing activity programs for each Summer Academy edition.

UAveiro organizational culture has always been committed to the promotion of the public acknowledgment of science, the concern in communicating the scientific advances at UAveiro and the development of "science for all" initiatives. Since its foundation, UAveiro promoted an Open Day, later transforming it into an Open Week, and recently creating the Summer Academy, which is 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 UAveiro, in the mid-1990s, and the Fábrica – Live Science Centre, in 2004, were very innovative and pioneer initiatives in the context of Portuguese universities. Nowadays, these structures develop permanent activities and are devoted to the global university community.

UAveiro 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 laid in the Summer Academy objectives.

Children and young students are welcome and challenged to join scientific and cultural activities proposed by the UAveiro, especially during the summer period, and also other initiatives during the academic year.

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RESEARCH HIGHLIGHTS

Methods Harmonization for Nanomaterial Testing

Susana Loureiro[1], Patrícia V Silva[2], Zahra Khodaparast[2], Fábio Campos[1], Fábio Chen[1], Ana Lopes[2] and Amadeu Soares[1]

1 – Department of Biology & CESAM, University of Aveiro.
2 – Department of Materials and Ceramic Engineering & CICECO, University of Aveiro.

The nanotechnology's success in applying nanomaterials (NMs) in several products may lead to their release into the environment. Consequently, there is an increasing need to evaluate their potential environmental and human risks. However, the wide variety and distinct physicochemical properties of NMs make their environmental risk assessment very challenging. The existing guidelines do not account for all the nano-specificities, leading to insecurities and uncertainties regarding NM's hazard. Several problems have been reported when using aquatic ecotoxicity Test Guidelines (TG) to nanomaterials (NMs) required in REACH, CLP and other regulations leading to the need to adapt the protocols of the TG 201 Freshwater Alga, Growth Inhibition Test; TG 202 Daphnia sp. Acute Immobilization test; TG 203 Fish, Acute Toxicity Test.

FIGURE 1
Daphnia magna exposed to TiO2 (NM 101,104) (TG 202), with details on the full gut and NMs' attachment to antenna.

Therefore an overarching aim has been set to harmonize experimental methods to enlarge the scientific basis for the eco-toxicological testing of NMs and generate technical recommendations. This will also support the development of guidance included as annexes to the "Guidance Document on aquatic and sediment toxicological testing of nanomaterials" (OECD Guidance Document N.° 317) and in the work programme of the OECD. For that, the identification and collation of data, protocols, and SOPs, and improvements to the TGs for NMs testing have been carried out in different laboratories to check appropriateness, in close collaboration with a working group at OECD, using several JRC NM references: TiO_2 (NM 101, 104), ZnO (NM 110, 111), SiO_2 (NM200), MWC nanotubes (NM400, 401), $BaSO_4$ (NM220) and Bentonite (NM600). This approach includes the exposure characterization and the close relation with the induced effects. For the Daphnia TG 202, NMs stability and behaviour during exposure are tested and advised to adapt accordingly. The feed contamination characterization of the fish TG 203 is being assessed to ensure stability during exposure.

This study was supported by the NanoHarmony project (EC Horizon 2020, grant agreement 885931)

FIGURE 2
Effective dispersion and contamination procedure of fish feed for the TG 203 toxicity test with fish. Procedure involves accurate sonication, dispersion and stabilization of NMs in fish feed.

Electronic tongue multisensor systems for marine toxins' detection

Mariana Raposo[1], Maria J Botelho[2], Catarina Moreirinha[1], Marta Veríssimo[1], Sara Costa[2], Maria T Gomes[1], Alisa Rudnitskaya[1]

Most of coastal countries are affected by out-of-control proliferation of microalgae – harmful algal blooms (HABs). Some of these microalgae species biosynthesize toxins that can be accumulated in the tissues of filter-feeding bivalves leading to the shellfish poisoning in humans upon consumption. Due to the unpredictability of the occurrence of HABs, routine surveillance of toxins in commercial bivalves is necessary.

Among marine toxins included in the monitoring program, our work focuses on detection of paralytic shellfish toxins (PSTs), which, through occurring infrequently, have hazardous effects on humans. This research is of particular relevance to the Aveiro region, which is one of most problematic areas with respect to the marine toxin contamination, though toxicity episodes related to PSTs were detected along all the Portuguese coast.

Our team is working on the development of such fast screening tools for the PST detection – electronic tongue based on potentiometric chemical sensors and biosensors and impedance assays. Our approach's novelty lies in the use of plasticized polymeric materials and enzymes as sensing elements, which affords low cost, robust and easily scalable sensors and biosensors. Use of electronic tongue approach – combination of partially selective sensors in the arrays and application of chemometrics to data processing, allows simultaneous quantification of several toxins with similar structure. The developed electronic tongue targets several of PSTs simultaneously comprising ones typical for the Portuguese coast and other world regions for which no alternative rapid tests are available.

Successful implementation of the proposed sensing tool will contribute to the more efficient management of bivalve harvest particularly at the start or end of a toxicity episodes with expected high economic, social, and environmental impacts.

1 – Department of Chemistry & CESAM, University of Aveiro.
2 – IPMA, Portuguese Institute for the Sea and Atmosphere, Lisbon & CIIMAR – Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Porto.

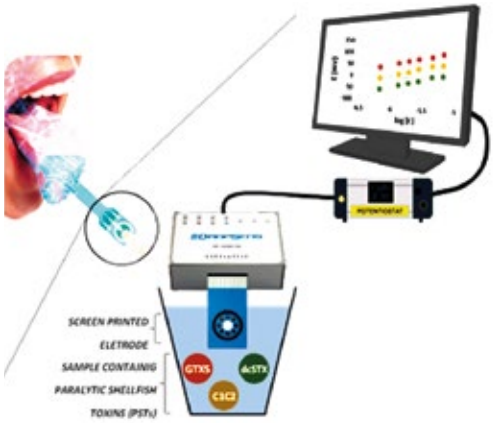


FIGURE 1
Concept of the electronic tongue: an array of partially selective (bio)sensors, chemometrics for data processing, simultaneous quantification of several PSTs.

FIGURE 2
Concept of the project: the project aims to replace the tedious laboratory analysis by portable microfluidic sensing platform, an enabling technology for rapid screening of toxins closer to the field.

In situ formation of LDH-based nanocontainers on the surface of AZ91 magnesium alloy and detailed investigation of their crystal structure

Tatsiana Shulha[1], Maria Serdechnova[1], Mariia H Iuzviuk[2], Igor A Zobkalo[2], Polina Karlova[1], Nico Scharnagl[1], Dietmar CF Wieland[3], Sviatlana V Lamaka[1], Aleksey A Yaremchenko[4], Cartsen Blawert[1], Mikhail L Zheludkevich[1, 5]

1 – Helmholtz-Zentrum Hereon, Institute of Surface Science, Germany.
2 – Condensed Matter Department, Petersburg Nuclear Physics Institute, Russia.
3 – Helmholtz-Zentrum Hereon, Institute of Metallic Biomaterials, Germany.
4 – Department of Materials and Ceramic Engineering & CICECO, University of Aveiro.
5 – Faculty of Engineering, University of Kiel, Germany.

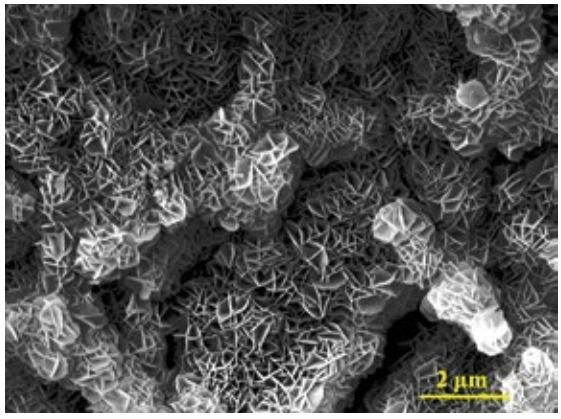


FIGURE 1
Surface morphology of AZ91 obtained as a result of the hydrothermal LDH synthesis in the presence of a DTPA chelating agent.

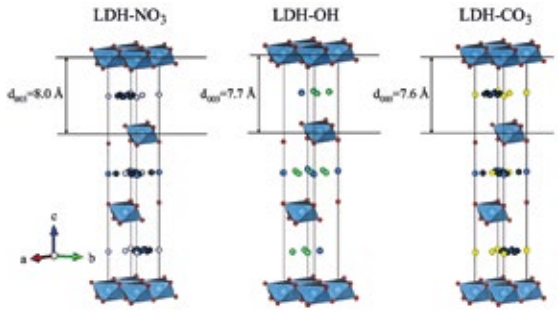


FIGURE 2
Schematic representation of the unit cells of LDH-NO_3, LDH-OH and LDH-CO_3.

Magnesium alloys constitute one of the most important groups of engineering materials and are highly used for biomedical, transportation, and 3C industries. However, their application is limited due to high reactivity, which requires adequate corrosion protection. The present work explored the possibility of direct synthesis of LDH (layered double hydroxide) as corrosion protection coating on the surface of AZ91 magnesium alloy in the presence of a chelating agent (DTPA -diethylenetriaminepentaacetic acid). The conversion layer of LDH nanocontainers was formed under ambient pressure without the addition of carbonate in the electrolyte. The samples of AZ91 magnesium alloy were immersed in the prepared treatment baths (aqueous solutions containing DTPA pentasodium salt, $Al(NO_3)_3$ and $NaNO_3$) preheated to different temperatures under continuous stirring. As the optimal conditions of LDH formation, the following parameters were identified: DTPA concentration equal to 0.1 M, temperature of 95°C, and pH of the solution equal to 10. The optimal duration of LDH growth was defined as 6h. For further industrial application, the synthesis can be additionally optimized to obtain LDH under milder conditions (e.g., 0.01 M DTPA concentration, 80°C and 3h). The obtained LDH was characterized by the combination of experimental (SEM-EDS, XRD, TGA, XPS, Raman spectroscopy) and computational methods (thermodynamic calculation, modeling of possible LDH crystal structures). A comparison of three possible LDHs (LDH-OH, -NO_3 and -CO_3) was performed. Based on the experimental results and crystal simulation approach, it was confirmed that an LDH-based mixture with the general formula Mg-Al LDH-OH/CO_3 is grown on the surface under applied synthesis conditions in the presence of DTPA pentasodium salt.

Reference
Journal of Magnesium and Alloys, 2022, Vol.10, N.º 5, pp.1268-1285. https://doi.org/10.1016/j.jma.2021.10.006

Less is more: dimensionality reduction as a general strategy for more precise luminescence thermometry

Erving Ximendes[1,2], Riccardo Marin[1], Luís D Carlos[3], Daniel Jaque[1,2]

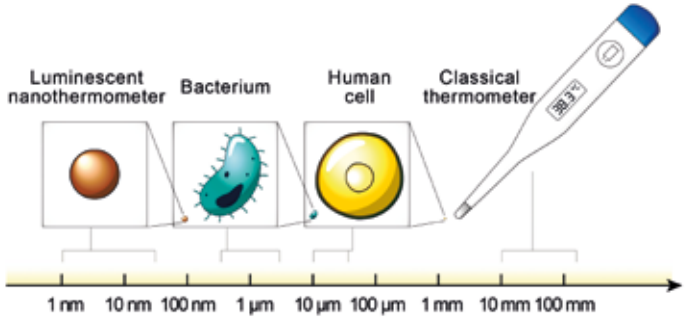
Temperature and heat exchange are at the base of biological processes throughout the realm of Nature. Several of these biological processes are associated with temperature changes in the order of few degrees or even below 0.1 degrees Celsius. To reliably monitor these processes, approaches that minimally perturb the studies system and with thermometric precision below 0.1 degrees Celsius are needed.

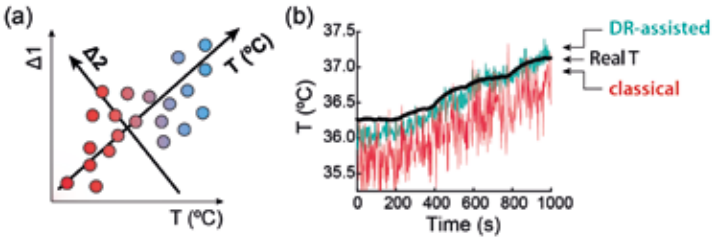
To this end a team of scientists from Spain and Portugal has cracked the code for an increased precision in the thermal readout using luminescent nanothermometers. These are nanomaterials whose optical properties are sensitive to temperature changes, and they can be inserted in biological (micro)environments to act as temperature nanoprobes down to the single-cell level. With their reduced size (Figure 1) they comply with the prerequisite of minimal perturbation of the probed system. However, when operating in aqueous environments, the precision in the readout of the temperature is generally above 0.1 degrees Celsius.

To calibrate a luminescent nanothermometer, changes in the optical properties of the nanomaterial are quantitatively correlated with variations in the temperature of the surrounding environment. This calibration passes through the selection of a suitable thermometric parameter and the acquisition of a calibration dataset, meaning that the photoluminescence (photon absorption followed by photon emission) of the nanothermometer is recorded as a function of a set of temperatures. Through the use of large-data analysis approaches collectively referred to as dimensionality reduction (Figure 2), the researchers have demonstrated that it is possible to automatize the selection of the thermometric parameter that maximizes the precision of the thermometric approach.

Reference

See the article: DOI 10.1038/s41377-022-00932-3





1 – NanoBIG, Departamento de Física de Materiales, Facultad de Ciencias, Universidad Autónoma de Madrid, Spain.
2 – NanoBIG, Instituto Ramón y Cajal de Investigación Sanitaria (IRYCIS), Madrid, Spain.
3 – Department of Physics & CICECO, University of Aveiro.

FIGURE 1

Size comparison of thermometers. Luminescent nanothermometers have a size that is much smaller than bacteria and human cells, making the measurement of temperatures in such small organisms possible.

FIGURE 2

Dimensionality reduction in luminescence nanothermometry. (a) The application of a dimensionality reduction approach (in this case a linear transformation such as Principal Component Analysis) results in the definition of a new space of coordinates wherein a temperature change is more easily quantifiable. (b) An example of the increased precision of luminescence nanothermometry achieved applying dimensionality reduction (DR) approaches (*teal line*) compared to a classical trial-and-error approach (*magenta line*) to define the thermometric parameter. The *black line* is the real temperature of the medium in which the luminescent nanothermometers are embedded.

Observing the formation of 2D Dynamic Covalent Polymers in Real Time

Gaolei Zhan[1], Zhen-Feng Cai[1], Karol Strutyński[2], Lihua Yu[1], Niklas Herrmann[1], Marta Martínez-Abadía[3], Manuel Melle-Franco[2], Aurelio Mateo-Alonso[3, 4], Steven Feyter[1]

1 – Department of Chemistry, Division of Molecular Imaging and Photonics, KU Leuven, Leuven, Belgium.
2 – Department of Chemistry & CICECO, University of Aveiro.
3 – POLYMAT, University of the Basque Country UPV/EHU, Donostia-San Sebastian, Spain.
4 – Ikerbasque, Basque Foundation for Science, Bilbao, Spain.

Synthetic 2D, atom-thin, porous polymers are a fast growing field with a potential interest in many areas from heterogeneous catalysis to electronics. Yet, to this date, how these polymers grow has been only hypothesised. We have now been able to directly observe all the events leading to the formation of these polymers with the help of electronic, scanning tunnelling, microscopy [1]. This technique is able to yield one image per minute of the growing polymer, which matches the growing rate of 2D boroxine on graphite, thus yielding a sequential movie of the polymerization process, from the starting monomers until a full 2D boroxine polymer is obtained, Figure 1.

The microscope images unveil a highly dynamic process which was thought to happen from indirect observations. First, isolated monomers of pyrene-2,7-diboronic acid were observed on the surface. Later, dimers and oligomers appear, and are observed in successive images to shrink and enlarge until a certain size is reached jumpstarting the final polymerization process which ends up covering the surface. From these observations, we perform computer simulations to understand the thermodynamics of the different mechanisms at play to rationalise the observations, Figure 2.

This research was the fruit of a multidisciplinary collaboration led by KU Leuven (Belgium), that performed the microscopy, with POLYMAT (Spain) that tuned the chemical synthesis, and the University of Aveiro where the modelling took place.

These polymers are the basic building blocks of covalent organic frameworks which rely on error-correction and self-healing mechanisms which had not been directly observed before. The novel and detailed understanding of the process will pave the way towards improved, less defective, materials and may yield new methods to provide novel layered heteromaterials with large potential in several areas from electronics to catalysis.

Reference

[1] Nature 603, 7903, 835, 2022

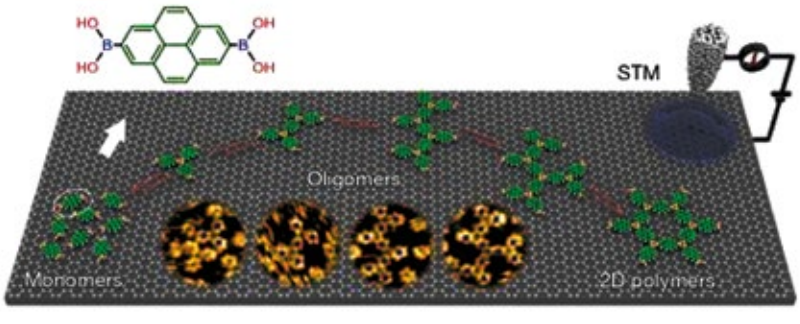


FIGURE 1
Scheme of the experiment.

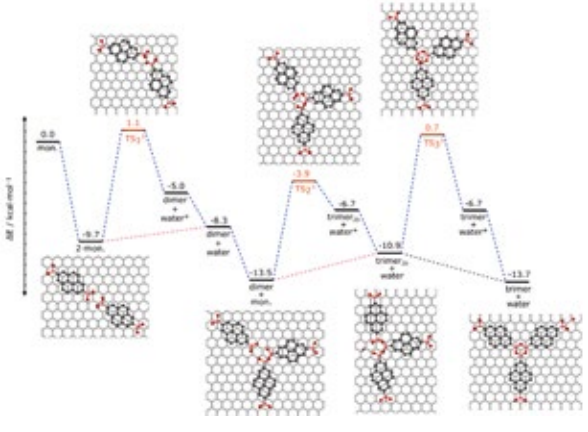


FIGURE 2
Computer models of the fundamental polymerization steps with relative energies in kcal/mol.

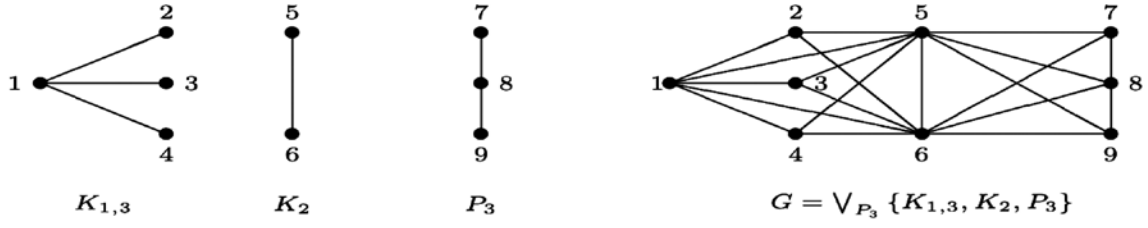
The spectrum of the *H*-join of arbitrary graphs – the walk matrix approach

Domingos M Cardoso[1], Sofia J Pinheiro[1], Helena Gomes[2]

The results obtained in [D.M. Cardoso, H. Gomes, S.J. Pinheiro, The *H*-join of arbitrary families of graphs – the universal adjacency spectrum, Linear Algebra Appl. 648 (2022): 160-180] resolve the nearly five decades problem raised by a remark in [A. J. Schwenk, Computing the characteristic polynomial of a graph, Graphs and Combinatorics (Lecture notes in Mathematics 406, eds. R. Bary and F. Harary), Springer-Verlag, Berlin, (1974): 153-172]. Indeed, since 1974 the expressions for the determination of the characteristic polynomial as well as the entire spectrum of the adjacency matrix of the *H*-join of a family of graphs $G = \{G_1, ..., G_p\}$ also called generalized composition $H\{G_1, ..., G_p\}$, where *H* is an arbitrary graph with *p* vertices (see an example in Figure), in terms of the characteristic polynomial (respectively the spectra) of adjacency matrices of its components, that is, graphs in *G*, and an associated matrix, were limited to families *G* of regular graphs. In his 1974 article, Schwenk wrote the following remark: in general, it does not appear likely that the characteristic polynomial of the adjacency matrix of the generalized composition $H\{G_1, ..., G_p\}$ can always be expressed in terms of the characteristic polynomials of adjacency matrices of the graphs $G_1, ..., G_p$. In the 2022 above article, considering an arbitrary graph *H* with *p* vertices and a family of arbitrary graphs $G = \{G_1, ..., G_p\}$, based on a walk matrix approach, the authors obtained an expression for the determination, in an effective way, of the characteristic polynomial as well as the entire spectrum of the universal adjacency matrix of the generalized composition $H\{G_1, ..., G_p\}$, in terms of the characteristic polynomials (respectively the spectra) of the universal adjacency matrices of the components and an associated matrix. Note that the universal adjacency matrix of a graph *G* is $U(G) = \alpha A(G) + \beta I + \Upsilon J + \delta D(G)$, where $\alpha \neq 0$ and when $\alpha = 1$ and $\beta = \Upsilon = \delta = 0$, $U(G)$ coincides with the adjacency matrix $A(G)$.

1 – Department of Mathematics & CIDMA, University of Aveiro.
2 – Escola Superior de Educacao & CIDMA, Instituto Politecnico de Viseu.

FIGURE 1
$P_3 [K_{1,3}, K_2, P_3]$



Automatic differentiation as an effective tool in Electrical Impedance Tomography

Ivan Pombo[1, 2], Luis Sarmento[2]

1 – Department of Mathematics & CIDMA, University of Aveiro.
2 – Inductiva Research Labs.

Electrical Impedance Tomography (EIT) is a non-invasive imaging method that produces images by determining the electrical conductivity inside a subject using only electrical measurements obtained at its surface. More specifically, sinusoidal currents are applied to the subject through electrodes placed in certain locations at the surface of the object. The resulting voltages are then measured, making it possible to infer internal properties of the objects. EIT is a low-cost method and harmless for human beings, since it only applies low amplitude currents. A particularly relevant application of EIT is in the early determination of breast cancer, specifically for young women where the risk of the ionizing X-rays of mammographies outweigh the benefits of regular check-ups. The goal is to locate a potential region affected by cancer from measurements on the breast surface.

We start by formulating the EIT problem for the screening of breast cancer in an optimization framework. To solve this problem we used derivative-based methods, like gradient descent. For this we need a method to simulate the propagation of electrical current given an electrical conductivity, which we designate by differentiable simulator, and a way to compute its derivatives. Currently, the latter computations are done manually and can be fairly cumbersome and expensive to program efficiently. In this work, we explore automatic differentiation methods for the computation of the derivatives of the differentiable simulators. We validate that the latter method solves the optimization problem as efficiently as the manual methods. Moreover, we verified that automatic differentiation is as computationally and time efficient as programmatically computing the manual formulation of the derivatives. Hence, this methodology permits a faster implementation of novel algorithms for the solution of the EIT problem and lets us focus on the important aspect of implementing efficient differentiable simulators.

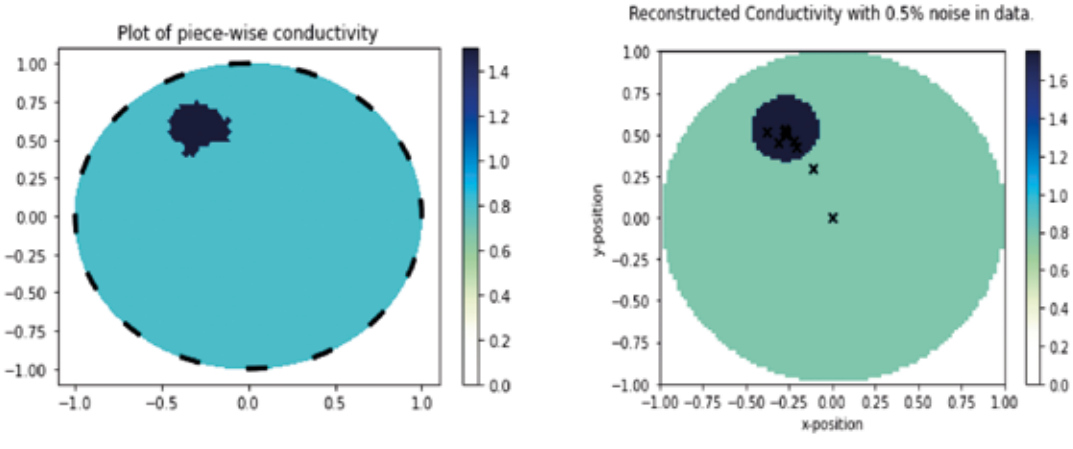


FIGURE 1
Slice of conductivity profile representing breast cancer on the left and the reconstruction obtained with automatic differentiation on the right. The color represents the conductivities in each region.

CoMMiTTEd – A pedagogical observatory of Fake News

Sílvia Melo-Pfeifer[2], Maria HA Sá[1], Susana Ambrósio[1], Manuela Gonçalves[1], Margarida Lucas[1], Filomena Martins[1], Lucas Oliveira[1], Ana R Simões[1], Madalena Teixeira[1], Ricardo Torres[1]

Fake News (FN) is not a recent phenomenon, nor a phenomenon to which only people with lower levels of formal education are more susceptible. The rapid online circulation of FN and the reach that the internet affords it have made FN a recurring phenomenon today. The pandemic caused by COVID-19 was the trigger for the CoMMiTTEd project: "Covid, Migrants and Minorities in Teacher Education: A FN Observatory to promote Critical Thinking and Digital Literacy in Times of Crisis" (https://committedobservatory.eu/en/home/). The project team (with scholars from Germany, the Netherlands, Portugal, and Spain) uncovered a problematic issue, circulating in the press and social media, that linked the origins and spread of the virus to migrants and minorities. This phenomenon was not country-specific, but rather fitted into the more or less biased narratives that were already in circulation in each country.

The CoMMiTTEd project engaged with the professional needs of teachers in this domain, by developing resources to help them deal with FN. This involved delving into the insidious world of FN, designing in-depth case studies, conducting research with students and teachers in the four partner countries, and deconstructing the verbal and non-verbal means used in FN. The team created an observatory of FN, including the in-depth multimodal analysis of five cases per country, classifying them as malinformation, disinformation, or misinformation, according to their level of maleficence and intention to create harm (Figure 1). This observatory is companied by suggestions for pedagogical use across the curriculum and a glossary. Based on the data collected at schools and universities, with students and teachers, the consortium conceptualised, implemented, and assessed two e-modules for teacher education programs, to address professional needs, such as the deconstruction of othering mechanisms present in FN involving migrants and minorities, in the classroom. Finally, as a sort of metaresource of the project, the team compiled the suggestions for using the observatory and the modules in a document conceived as an E-handbook for teachers and teacher educators. This metaresource includes a theoretical background, which overviews the different literacies involved in debunking FN (Figure 2), as well as a pedagogical reflection on the need to develop them, both in specific school subjects and across the curriculum. The overall lesson of the project is that school has an important role in the development of resilience against FN.

1 – Department of Education and Psychology & CIDTFF, University of Aveiro.
2 – Fakultät für Erziehungswissenschaft & CIDTFF, Universität Hamburg, Deutschland.

FIGURE 1
Structuration of the Observatory of FN.

FIGURE 2
Principles underlying the pedagogical work with FN at school.

HiLives – networking for full participation, inclusion and independent lives in Higher Education

Paula C Santos[1], Ágústa R Björnsdóttir[5], Aida Rebelo[6], Ana F Ferreira[2], Ana I Saraiva[6], Ana L Saraiva[6], Ana M Almeida[2], Ana Melo[6], António N Mendes[1], Catarina Martins[7], Cátia Cartaxo[8], Emiliano D Villoria[3], Eulália Albuquerque[7], Evelien de Maesschalck[4], Francisco B Veja[3], Gabriela Duarte[8], Gabriela Portugal[1], Geert van Hove[4], Gracinda Martins[1], Helena A Sá[1], Helena Gunnarsdóttir[5], Inés van Velze[9], Irene B Alonso[3], Jane Machado[1], Joana Camacho[6], Joana Glória[9], Joana Gonçalves[6], Kristín Harðardóttir[5], Manuel Rodrigues[1], Manuela Gonçalves[1], María V Cilleros[3], Mariana Dantas[1], Mário Pereira[5], Marisa Machado[1], Natália Gamboa[8], Oksana Tymoshchuk[2], Patricia N Macho[3], Raul Rocha[9], Tânia Figueiredo[6], Virgínia Chalegre[2]

1 – Department of Education and Psychology, & CIDTFF, University of Aveiro.
2 – Department of Communication and Art, & DigiMedia, University of Aveiro.
3 – INICO, University of Salamanca, Spain.
4 – University of Ghent, Belgium.
5 – University of Iceland, Iceland.
6 – ASSOL, Portugal.
7 – AVisPT21, Portugal.
8 – Pais-em-Rede, Portugal.
9 – FORMEM, Portugal.

HiLives Project [ERASMUS+, 2019-1-PT01-KA203-061312] aimed at creating a new scenario in the field of Higher Education (HE) and transition to Employment, creating opportunities for people with Intellectual and Developmental Disabilities (IDD) to participate, belong and learn in HE, within an inclusive and collaborative model.

The consortium, involving 4 universities and 4 ONGs in Portugal, Spain, Belgium and Iceland, focused in developing 3 outputs:

i) A transnational/European framework for the development of an inclusive, flexible and student-centered HE curriculum, accessible to adults with IDD, based in: (i) the normative and political framework for inclusion in HE and Employment; (ii) the stakeholders' point of view [people with IDD, families, HEIs, and employers]; and (iii) the evidence-based/international literature.

ii) A prototype of a digital tool to connect and network opportunities, tackling gaps and mismatches between the expectations, skills and needs of young adults with IDD, and both the HE offer and the employment opportunities. Departing from a benchmarking exercise, the team designed and developed the model, implemented and validated it (convoking the perspectives of people with IDD, HEI and Companies, in the 4 countries of the consortium).

iii) A Transnational/European good practices guide for HEIs, Secondary Schools, and Employers, aiming at helping adults with IDD to access HE and to start an independent life. Focusing on 11 domains, the team analyzed weaknesses and threats, strengths and opportunities to its implementation, with recommendations for each domain. The guide includes a detailed presentation of the programs developed by the 4 *HiLivian* universities, and a brief review of other programs identified as examples of good practices.

Intertwined with HiLives, the innovative *Programa Individual de Estudos Multidisciplinares* opened inclusive Portuguese HE to students with IDD at UA, October 2021. The 2nd edition will start at September 2023.

FIGURE 1
The HiLives logo, first creation within HiLives Project, developed by a team composed by students of the Design Course of the Universituy of Aveiro, and two students with IDD.

FIGURE 2
Inclusive rhetoric versus reality (O'Brien et al., 2019).

Element	Operationalizing an "Inclusive Human Right"	Keeping people in "Their Right Place"
Model	Full inclusion	Locational inclusion on the university campus
Funding	Guaranteed and sustained government funding to support inclusive initiatives	One off funding grants from government, philanthropies or corporates
Admission policy	Open to enrolling students with intellectual disability (ID) into courses without them having to have university entrance exam scores or being a mature aged student	Auditing courses only owing to lack of entry grades; visitor/ affiliate status arising from participating in a special program
Accreditation rules and regulations	University supports development of new course that includes students with ID into life of university	Students attend classes, but do not receive written university recognition of competencies
Support services	All university support services, inclusive of medical counselling, disability tutoring services	Official support only available if the student is officially enrolled
Inclusive pedagogy	Academics design their courses and instruction according to the principles of Universal Design for Learning to meet the diverse needs of all learners	Academics design their courses and instruction to meet the needs of the "average" student.
Graduation policy	Graduate from the university with full recognition of course completed on official transcripts	Presentation/internal award evenings with certificate of Attendance only
Disability policy	Inclusion of people with ID strategically included in the policy and practice of the university	People with intellectual disability not included as students within the university's rules and regulations

Source: O'Brien, P., Bonati, M., Gadow, F., Slee, R. (2019). Moving from Rhetoric to Reality: Inclusive Tertiary Education for Adults with Intellectual Disability. In Patricia OBrien, Michelle L. Bonati, Friederike Gadow, Roger Slee (Eds.), *People with Intellectual Disability Experiencing University Life: Theoretical Underpinnings, Evidence and Lived Experience*, (pp. 277-287). Leiden: Koninklijke Brill NV.

"Feeling foggy after cancer diagnosis and treatment?" – Assessing self-reported cancer-related cognitive impairment and associated factors in Portuguese cancer survivors

Ana F Oliveira[1], Ana Torres[1,2], Linda M Ercoli[3], Isabel M Santos[4]

Cancer-related cognitive impairment (CRCI) is a common and potentially debilitating symptom experienced by non-central nervous system (CNS) cancer survivors (CSs) throughout the disease trajectory. Considering its consequences and high prevalence, it is essential to identify individuals with CRCI to guarantee adequate supportive care to those who need it. In this context, members of the Psycho-Oncology Research Group of the Department of Education and Psychology of the University of Aveiro, within the project "CanCOG – Cognitive Rehabilitation in Cancer®"[1] (Figure 1), conducted studies to explore self-reported CRCI in Portuguese CSs. The Functional Assessment of Cancer Therapy-Cognitive Function-Version 3 (FACT-Cog-v3) is the most extensively used instrument to evaluate cognitive complaints in CSs. A sample of 281 adult non-CNS CSs participated in a study to evaluate the psychometric properties of its Portuguese version[2]. The findings of this study confirmed that the scale can be considered a reliable and valid measure to assess perceived cognitive functioning (PCF) in Portuguese non-CNS CSs. Another study used this instrument to evaluate PCF in Portuguese breast cancer (BC) survivors and to explore associated psychological adjustment[3]. This cross-sectional study included 146 women (73 with BC and 73 with no cancer history) and verified that, compared to healthy women, women with BC showed more cognitive complaints. Furthermore, higher levels of anxiety and depression were associated with cognitive complaints. The results of these studies highlight the need for healthcare professionals to recognize subjective cognitive complaints as a legitimate side effect of cancer and its treatments in non-CNS CSs. Moreover, the present findings highlight the importance of tackling this problem with specifically designed clinical interventions that target both the cognitive impairments and the psychological adjustment of patients.

1 – Department of Education and Psychology & CINTESIS@RISE, University of Aveiro.
2 – Department of Psychology and Education, Faculty of Human and Social Sciences, University of Beira Interior.
3 – Department of Psychiatry & Biobehavioral Sciences, Jane & Terry Semel Institute for Neuroscience & Human Behavior, University of California Los Angeles.
4 – Department of Education and Psychology & WJCR, University of Aveiro.

FIGURE 1
CanCOG's logo.

Reference

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The Effects of the Pragmatic Intervention Programme (PICP) in Preschool-Age Children

Tatiana Pereira[1], Marisa Lousada[2], Margarida Ramalho[3]

1 – Department of Languages and Cultures & CINTESIS.UA@RISE, University of Aveiro; CLUL, University of Lisbon.
2 – School of Health Sciences & CINTESIS.UA@RISE, University of Aveiro.
3 – CLUL, University of Lisbon.

Using language for social purposes can be a real challenge for children with Autism Spectrum Disorder (ASD) and children with Developmental Language Disorder (DLD) with pragmatic difficulties. Therefore, early, effective, and evidence-based interventions are crucial to minimise the long-term impacts of pragmatic language impairments. Despite the challenges, studying the effects of intervention programmes in heterogeneous populations such as ASD and DLD is essential.

In Portugal, the Pragmatic Intervention Programme (PICP) is the only intervention programme that was developed and content-validated for preschool-age children with pragmatic impairments. It includes 11 skills and advocates that these skills should be worked on with different communicative partners (e.g., peers, teachers) and in multiple contexts (e.g., home, kindergarten) to promote skills generalization. The effects of this programme are being studied through a non-randomized controlled trial with preschool-age children with ASD and DLD.

In this study, each child attends 24 PICP-based intervention sessions provided by a Speech and Language Therapist, bi-weekly, in kindergarten, where the active participation from several communicative partners is a premise. Outcome measures include a Goal Attainment Scale, rated by parents and kindergarten teachers; parent/teacher-reported communication skills (Escala de Avaliação de Competências Comunicativas – EACC) and an assessment of the child's general language ability (Teste de Linguagem – Avaliação da Linguagem Pré-Escolar – TL-ALPE). Data from 20 children with ASD and DLD (experimental group, n = 11; control group, n = 9) shows that the PICP contributes to a significant language improvement in preschool-age children with ASD and DLD with pragmatic difficulties. However, further research is needed to analyse the effectiveness of the PICP for each neurodevelopmental disorder individually, to contribute to future research and evidence-based practice.

FIGURE 1
Speech and language therapist and children with ASD, during a PICP-based intervention session.

Learning analytics and data ethics in performance data management: a benchlearning exercise involving six European universities

Maria J Rosa[1], James Williams[2], Joke Claeys[3], David Kane[2], Sofia Bruckmann[4], Daniela Costa[5], José A Rafael[6]

Learning analytics (LA) has been defined as "the measurement, collection, analysis and reporting of data about the progress of learners and the contexts in which learning takes place" (Sclater et al., 2016, 4). In recent years it has attracted a great deal of attention as a way of informing the development of learning and teaching practice in higher education, contributing to improve students' learning. Moreover, LA may play an important role in supporting quality enhancement, as a source of the accurate, up-to-date data that is essential to set up sound quality management systems. However, this collection of students' data for gaining insights about their future performance entails ethical and legal issues that need to be seriously taken into account.

This study explores how learning analytics is implemented at a set of six European universities in the context of their performance data management models, including its multiple functions and ethical issues. It further identifies possible good practice and policy recommendations at decision-making level. The data was collected as part of the Erasmus+ Strategic Partnership Sustainable Quality Enhancement in Higher Education Learning and Teaching (SQELT) project.

Results show that LA is present to a certain extent in all six institutions, although mostly based on traditional data and still lacking predictive capacity concerning students' performance. LA is viewed as useful in providing more accurate personal data on students' learning, contributing to the establishment of more sophisticated quality management systems. Overall, and as reflected in the abstracted SWOT analysis (Figure 1), LA entails both opportunities and threats. The possibilities of a LA approach deserve further attention within universities and quality assurance agencies.

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1 – Department of Economics, Management, Industrial Engineering and Tourism & CIPES, University of Aveiro.
2 – Social Research and Evaluation Unit (SREU), Birmingham City University, England.
3 – Department of Educational Policy, Ghent University, Belgium
4 – CIPES, University of Aveiro.
5 – University of Aveiro.
6 – Department of Electronics, Telecommunications and Informatics, University of Aveiro.

FIGURE 1
Abstracted SWOT analysis of learning analytics developed from the six individual SWOT analyses. It intends to subsume the main strengths, weaknesses, opportunities and threats encountered in the SQELT case-study universities.

Old Tools and New Challenges in Higher Education

Frans Kaiser[1], Ana I Melo[2], Angela YC Hou[3]

1 – Center for Higher Education Policy Studies (CHEPS), University of Twente, The Netherlands.
2 – School of Technology and Management & CIPES, University of Aveiro.
3 – College of Education, National Chengchi University, Taipei, Taiwan.

In the last years, "new" policy issues, such as sustainability, have emerged, and old ones, such as social inclusion or study success, have resurfaced on the political and public agendas, being higher education institutions (HEIs) expected to respond to these "new" challenges. One of the biggest developments driving these challenges was the rise of the Sustainable Development Goals (SDGs). But how are HE systems and institutions, namely in Europe and Asia, looking at these 'new' policy issues and assessing them? The article delves into this issue, exploring the use of two of the most well-known tools or mechanisms for measuring performance in both the European and Asian settings: quality assurance systems (QAS) and rankings.

A tentative assessment of coverage of "new" policy issues by these information tools can be seen in Figure 1. QAS was subdivided into external and internal – EQA and IQA. Four rankings were looked at: Times Higher Education – THE, Shanghai Academic Rankings of World Universities – ARWU, QS World University Ranking – QS, and U-Multirank – UMR.

This article concludes that the role of the "new" policy issues in the assessment of institutional performance and quality is still very limited. Both in Asia and Europe, the development of valid, reliable, and feasible metrics to capture those "new" missions, is still at an early stage, which makes it unlikely that "new" missions will be introduced in the QA standards. The need for contextualization makes it even more unlikely. That context refers not only to regional, national, and cultural differences, but also to the mission profile chosen by each HEI.

Developing indicators that may be used for accountability purposes or improvement purposes is a major challenge that lies ahead. Facilitating the exchange of ideas, experiences, and knowledge on how to measure performance on the "new" policy issues and on how to use that information in any of the rationale settings seems to be a promising way forward to get the "new" policy issues embedded in these tools.

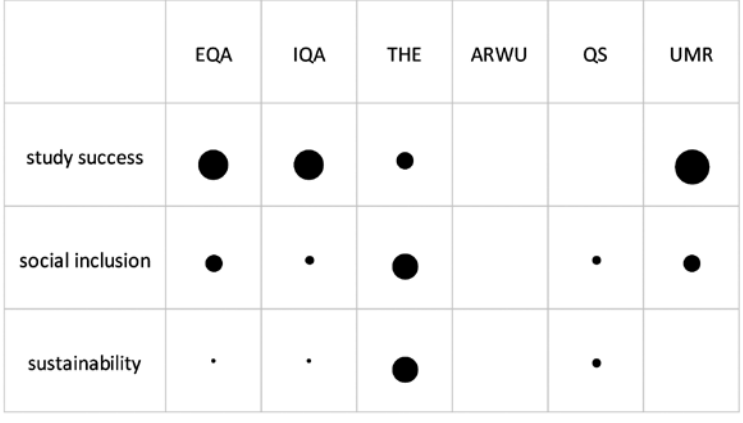


FIGURE 1
Tentative assessment of coverage of "new" policy issues in information tools.
Note: size of the circle indicates relative coverage.

VR experiences as tools for building empathy and awareness towards universal design challenges

Rui Raposo[1], Mário Vairinhos[1], Elisabeth Pereira[2]

Empathy has become a central component of design, manifesting itself loudly in frameworks such as universal design, inclusive design, and human-centred design. Designers and engineers are among the many stakeholders who require an expansion of their "emphatic horizon." The advancement of immersive technologies such as virtual or augmented reality may aid in the development of empathy. Extended Reality (XR) combines virtual reality and reality. As a result, XR technologies enable us to simulate a variety of physical states, health issues, and human body limitations. The work was carried out as part of an Erasmus+ project (Erasmus+ Strategic Partnership Higher Education Sector) aimed to increase competencies in universal design of future engineers, educators and designers by providing them with a set of practical educational tools based on extended reality to understand the different accessibility needs. This study created five independent XR scenarios that put potential users in the shoes of people with special needs. Elaborated tasks address vision impairments (Figure 1), autism spectrum disorder, mobility impairments, pregnancy status, and some elderly problems. All exercises take place in a well-known supermarket setting, as shopping is a common daily activity for most people.

The XR experience reflects the everyday problems of people with various disabilities and was developed using information gathered through interviews, questionnaires, and emphatic research. XR provides a high level of immersion in the situation, allowing the user to not only learn about potential accessibility issues but also experience them first-hand. In the developed XR scenario, participants move through a modern supermarket, making purchases based on a shopping list.

The VR application is designed for the Oculus Quest 2 platform and is supplemented in some cases with tangible equipment (geriatric suit, pregnancy belly simulator, wheelchair) (Figure 2). Experts validated the proposed simulations by evaluating the quality of the proposed tasks as well as the possibility of simulating selected limitations or issues in XR. The XR application's ongoing development and testing will provide more in-depth perspectives on its usefulness, acceptance, and impact in increasing empathy for the challenges faced by the personas portrayed.

1 – Department of Communication and Art & DigiMedia, University of Aveiro.
2 – Department of Economics, Management, Industrial Engineering and Tourism & GOVCOPP, University of Aveiro.

FIGURE 1
Simulated visual impairments in the virtual supermarket. A: Without visual impairments. B: Simulation of visual acuity deterioration. C: Simulation of tunnel vision. D: Simulation of colour perception disorders.

FIGURE 2
External equipment used in VR applications. On the left: pregnancy belly. On the right: geriatric suit.

Digital Travel for Senior Citizens: 360º Virtual Tourism

Ana I Veloso[1], Cláudia Ortet[1], Francisco Regalado[1], Tânia Ribeiro[1]

1 – Department of Communication and Art & DigiMedia, University of Aveiro.

FIGURE 1
360º VR cyclotourism experience (while one participant was testing, the others observed).

FIGURE 2
Researchers of Digital Travel for Senior Citizens: 360º Virtual Tourism (from left to right: Francisco Regalado, Tânia Ribeiro, Ana Veloso and Cláudia Ortet).

Digital travel is currently a reality in the tourism sector exacerbated by the emergence of COVID-19. Not only this sector was deeply affected by the pandemic, but also senior citizens suffered from social distancing and isolation measures, causing health decline. Thus, digital travel can be a solution for tourism and senior citizens as it allows to virtually visit places. It does not replace reality, instead, it can be a resource that democratizes tourism in critical situations.

This research, developed under IC SeniorX project, analyzed the influence of 360º virtual reality (VR) on the sense of Immersion and Presence in tourism. A total of 76 participants, between 50 and 97 years old, were involved in the experiment. Data was collected from a technology acceptance questionnaire, image and sound recordings, and field notes.

Specifically, the VR trip was divided into: (i) – Visit to the Eiffel Tower; (ii) – Bike ride in the suburbs of Paris; and (iii) – Experience evaluation and feedback. The purpose of sharing the experience was to encourage active participation, as while one individual (at a time) performed the activity, the rest watched on TV (Figure 1). Regarding the setting, it contained: (a) a head-mounted display; (b) a computer; (c) a Smart TV; (d) video cameras; (e) chairs for participants; (f) an armchair for the testing subject; (g) an elliptical bicycle; and (h) a fan.

Findings suggest that 360º VR can positively influence Immersion and Presence while promoting active and healthy ageing, sociability behaviors and wellbeing. It can be a safe alternative for the tourism industry and aged populations. Additionally, unexpected results were observed, such as the creating of game strategies to navigate in the 'virtual' world and the absence of motion sickness.

Moreover, this activity was submitted to the Good Practices Award for Active and Healthy Ageing in the Central Region of Portugal (2022), at the Knowledge+ category, winning an honorable mention (Figure 2).

Dimensions of (post-)viral tourism revival: actions and strategies from the perspectives of policymakers in Portugal

Faruk Seyitoğlu[1], Carlos Costa[1], Ana Malta[1]

This study explores the dimensions of (post-)viral tourism revival from the perspectives of policymakers in Portugal. The data were collected through semi-structured interviews with policymakers representing Portugal's regional and national tourism organisations. The findings include six main dimensions: financial actions, structural and logical strategies, demand-related strategies, workforce aspects and actions, marketing and promoting strategies, and optimisation of funds.

The financial actions that the policymakers underline contain (i) monetary support, (ii) postponement of debts, (iii) direct non-refundable support, especially for SMEs and (iv) financial support for companies to retain qualified employees. Structural and logical strategies were revealed as (i) sustainable tourism development, (ii) digital transformation, innovation and creativity, (iii) partnership and cooperation and (iv) eliminating seasonality and mass tourism. The demand-related strategies are (i) preparedness for high demand and new consumer expectations and (ii) offering unique and personalised experiences. The workforce aspects and actions were shaped as (i) saving qualified employees, (ii) the need for skilled employment, and (iii) training for qualifications and skills. Furthermore, marketing and promoting strategies extracted as (i) market diversification, (ii) positioning strategy-differentiation, (iii) marketing and promoting strategies from proximity to long distances, and (iv) certification for safety and service quality. Finally, the optimisation of funds contains (i) sustainability and technology, (ii) transport system, (iii) workforce and SMEs, and (iv) product development and promotion.

By providing the necessary actions and strategies, the results of this research will be helpful for destinations to develop effective crisis management planning in the (post-)viral tourism to revive. It is the first attempt to unveil in detail the dimensions of (post-)viral tourism revival from the perspectives of policymakers who are in significant positions of regional and national level tourism organisations.

1 – Department of Economics, Management, Industrial Engineering and Tourism & GOVCOPP, University of Aveiro.

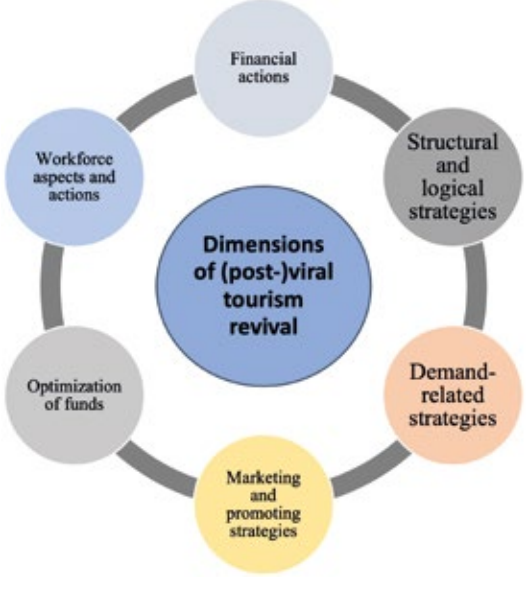


FIGURE 1
Dimensions of (post-)viral tourism revival.

Analysis of the Temporal Evolution of Climate Variables Such as Air Temperature and Precipitation at a Local Level: Impacts on the Definition of Strategies for Adaptation to Climate Change

Leonel JR Nunes[1, 2]

1 – proMetheus, Instituto Politécnico de Viana do Castelo.
2 – Department of Economics, Management, Industrial Engineering and Tourism & GOVCOPP, University of Aveiro.

Climate change is a global issue that impacts neighboring regions and their communities in diverse ways. The unique characteristics of each territory necessitate adaptive measures to address climate change-induced challenges and build more resilient communities capable of adapting to this new reality. Tailoring measures to the specific needs of territories and their communities enhances their effectiveness. A deep understanding of local climate evolution and the requirements of resident populations is crucial for this purpose.

A survey conducted among citizens in Portugal revealed a consensus that climate change affects geographically close areas differently. In this study, Guimarães, a municipality in northern Portugal, was used as a case study. A comparative analysis was performed between the current climate, characterized by the 1971-2021 period, and the climate from a century ago, represented by the 1896-1905 decade. The goal was to identify trends in air temperature and precipitation variables.

The analysis showed an increase in winter temperatures and less uniform precipitation distribution throughout the year. These changes in air temperature and precipitation necessitate planning adaptive measures to enhance the territory's and its communities' resilience to climate change. By understanding the local climate changes and addressing the specific needs of resident populations, tailored solutions can be implemented to create more adaptable and robust communities.

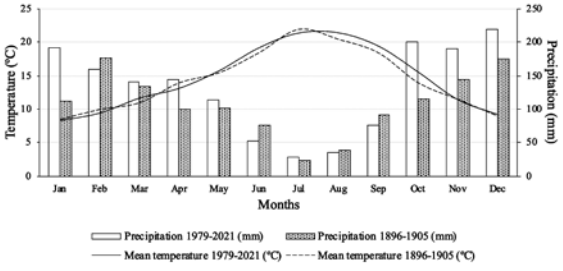


FIGURE 1
Overlay of climate data for the period of 1979–2021 and climate data for the period of 1896-1905.

Theory of defects in SiC – impact on the sensitivity of radiation detectors

Vitor Torres[1], José Coutinho[1]

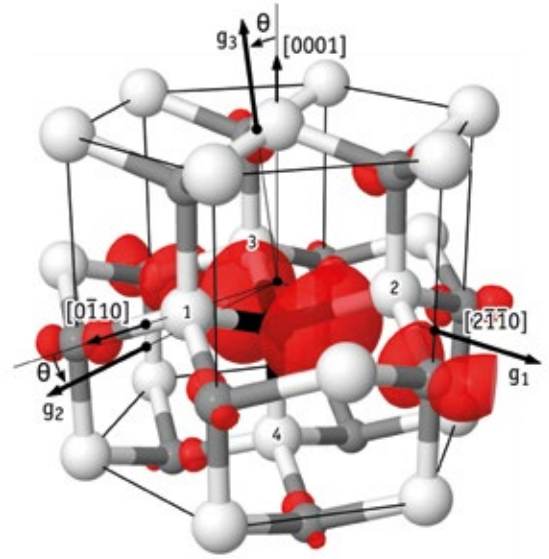
Increasing geopolitical risks have urged a mass-deployment of screening systems capable of detecting chemical, biological, radiological and nuclear threats. This is the underlying motivation of E-SiCure2, a project funded by NATO Science for Peace and Security Programme, which joins research teams from Slovenia, Croatia, Japan and Portugal (i3N-Aveiro). The goal is to develop a miniaturized semiconductor structure capable of detecting ionizing radiation, including neutrons, emitted from radiological sources, and of being incorporated into a pixelized device.

Researchers from the Theoretical and Computational Physics group at the i3N-Aveiro have been developing physical models for the excitation, transport, and loss of impact-generated carriers within silicon carbide (SiC), a semiconductor known for withstanding high radiation doses. According to a recent paper published in Physical Review, they found that boron, a contaminant often found in commercial SiC materials, has the properties of a recombination center. Such centers are highly harmful as they attract both electrons and holes, promoting their annihilation, and consequently, leading to the loss of signal during radiation detection.

The work was able to account for a multitude of boron-related optical, junction, and paramagnetic resonance experiments available in the literature. By describing the motion of thousands of electrons around a boron impurity in SiC (Figure 1), it was concluded that boron is ineffective as a p-type dopant. In n-type SiC, which is the detector-grade material of choice, boron contaminants are negatively charged, are effective traps for impact-generated holes, and therefore are likely to act as strong recombination centers. These results will improve our ability to monitor boron contamination in SiC devices, and ultimately to raise detection sensitivity by fabrication of boron-free SiC.

Acknowledgements

The present work was supported by the NATO Science for Peace and Security Programme, Project No. G5674. We also acknowledge the FCT through projects LA/P/0037/2020, UIDB/50025/2020 and UIDP/50025/2020.



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This publication is supported by: The NATO Science for Peace and Security Programme

1 – Department of Physics & i3N, University of Aveiro.

FIGURE 1

Spin-density close to a boron impurity in 4H-SiC. The principal directions of the calculated gyromagnetic tensor are also depicted. This quantity allowed us to unambiguously connect the model with an observed paramagnetic signal, and by that way to monitor and quantify the boron contamination [adapted from Torres et al., Phys. Rev B 106, 224112 (2022); DOI:10.1103/PhysRevB.106.224112].

INSTABAT EU-project – Innovative physical/virtual sensor platform for battery cell

Micael Nascimento[1], Lucca Matuck[1], Vitorino Neto[1], João P Santos[1], Carlos Marques[1], João L Pinto[1]

1 – Department of Physics & i3N, University of Aveiro.

Since 2019, according to the European Green Deal, several initiatives have been targeting to transform the European Union economy for a more sustainable future, reducing the emission of greenhouse gases (CO_2) and improving the energy transition by mitigating climate change [1]. BATTERY 2030+ research initiative aims to contribute to carbon neutrality by developing more sustainable batteries for the future. The INSTABAT EU-project is integrated in this initiative and focussed in the development of new methodologies to sense critical parameters, towards smart batteries [2].

UAveiro/i3N team is dedicated in the designing of innovative optical fiber and virtual sensors for internal and simultaneous sensing of lithium-ion battery cells (LiBs) safety parameters, such as temperature, strain/pressure, and state of charge. In particular, customized optical fiber sensors (OFS), based on fiber Bragg gratings recorded in standard and polarization-maintaining fibers, and hybrid sensors based on Fabry-Perot interferometers are being developed and instrumented into LiBs to simultaneously monitor internal and external parameters during galvanostatic cycles [3-5]. Furthermore, studies with a Particle Filter and the consecutive comparison to an Extended Kalman Filter have been carried out to predict temperature and state of charge [6]. The results obtained shows good feasibility and reproducibility, indicating that by operating as a multiparameter decoupled system, they can decrease the complexity and intrusiveness in batteries and simultaneously monitor different safety parameters. In this way, the sensing data recorded will be a useful tool to (1) be correlated with internal electrochemical events and the different battery states (SOX); (2) be integrated with machine learning (ML) algorithms for the virtual sensor's development; and (3) extend the battery quality, reliability, and life (QRL), as shown in Figure 1.

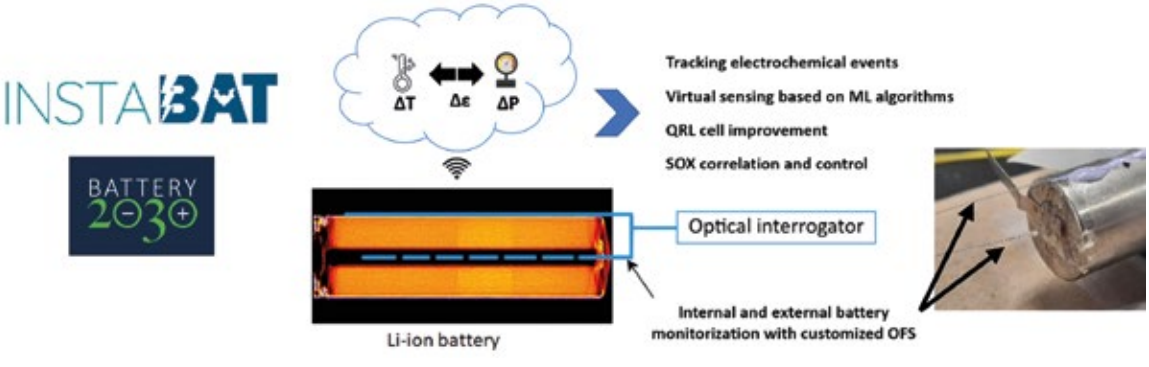

FIGURE 1
Schematic diagram of the developed monitoring system with fiber sensors for internal and external safety parameters tracking in LiBs, within the *INSTABAT* EU-project. The data from the sensed parameters are used to correlate with internal electrochemical events and different SOX, in order to develop ML algorithms for virtual sensing and QRL cell improvements.

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Antibiotic resistance genes in the gut microbiota of mothers and linked neonates with or without sepsis from low- and middle-income countries (BARNARDS)

Maria J Carvalho[1, 2], Kirsty Sands[1, 3], BARNARDS Group, Timothy R Walsh[1, 3], *et al.*

Sepsis is a primary cause of mortality in newborns, particularly in low – and middle-income countries (LMICs). The "Burden of Antibiotic Resistance in Neonates from Developing Societies" study – BARNARDS – established a network of 12 clinical sites across Bangladesh, India, Pakistan, Ethiopia, Nigeria, Rwanda, and South Africa and developed analytical tools to understand the burden of antimicrobial resistance, risk factors and microbiological causes of infant sepsis. Involving over 160 researchers, clinicians, nurses, and data managers, we produced unprecedent data on neonatal sepsis in LMICs by blending microbiology, whole genome sequencing, and sociodemographic and clinical data. BARNARDS was a combination of two research programs funded by the Bill & Melinda Gates Foundation aiming at reducing infant mortality in LMICs.

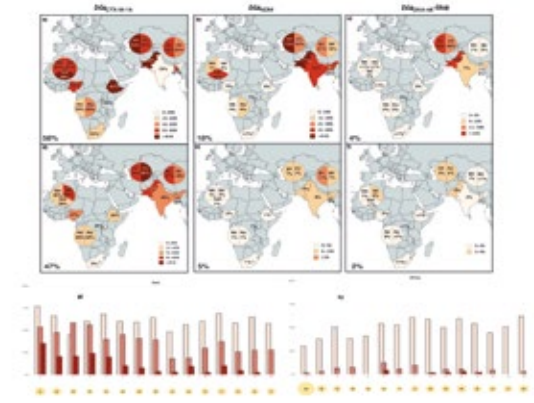
In this study, we characterized the Gram-negative gut microbiota of 15,217 mothers and 2,931 neonates with clinical signs of sepsis carrying clinically important antimicrobial resistance (AMR) genes ($bla_{\text{CTX-M-15}}$, bla_{NDM}, bla_{KPC} and $bla_{\text{OXA-48}}$-like genes). We showed that the incidence of AMR gut carriage is extremely worrying in these countries (Figure 1a-f) and that resistant bacteria are present in neonates after just a few hours of life (Figure 1g,h).

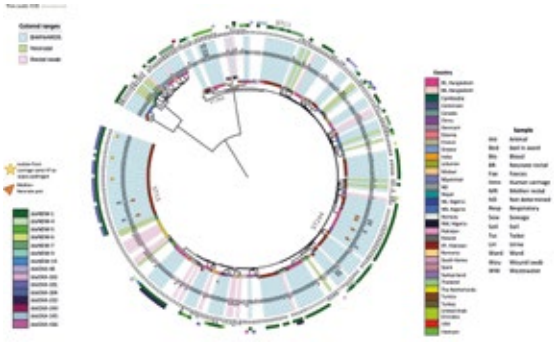
We showed that poorer WASH indicators, use of antibiotics and previous infection were probably associated with gut microbiota carriage of $bla_{\text{CTX-M-15}}$, bla_{NDM} or $bla_{\text{OXA-48}}$-like genes. Furthermore, the carriage of these genes was a predictor of neonatal sepsis and adverse birth outcomes.

Finally, using whole-genome sequencing (WGS), we characterized common Gram-negative bacteria carrying carbapenemase genes, detailing specific variants and plasmid types across the different study sites (Figure 2). We showed that transmission dynamics can be very complex, as we found links between carriage, infection, and sanitation and hygiene.

Reference

Carvalho, M.J., Sands, K., *et al.* Nat Microbiol (2022) doi: 10.1038/s41564-022-01184-y





1 – Institute of Infection and Immunity, Cardiff University, United-Kingdom.

2 – Department of Medical Sciences & iBiMED, University of Aveiro.

3 – Ineos Oxford Institute of Antimicrobial Research, Department of Zoology, University of Oxford, United-Kingdom.

FIGURE 1

Prevalence of $bla_{\text{CTX-M-15}}$, bla_{NDM}, and $bla_{\text{OXA-48}}$-like genes among the rectal swabs of neonates and mothers. a-c, Prevalence of these genes among the rectal swabs of neonates. d-f, Prevalence of these genes among the rectal swabs of mothers. g,h, Carriage of $bla_{\text{CTX-M-15}}$, bla_{NDM}, and $bla_{\text{OXA-48}}$-like genes among neonates' rectal swabs against age of neonates at rectal swab collection per continent: Asia (g) and Africa (h). The prevalence of each AMR gene is plotted. The total number of samples collected per day is shown in the circles below the graphs.

FIGURE 2

The predominant gut isolates carrying ARG found were *E. coli, K. pneumoniae* and *E. cloacae* complex. *K. pneumoniae* isolates were also found to be the most common cause of sepsis in neonates enrolled in BARNARDS (Sands K*, Carvalho MJ* et al. doi: 10.1038/s41564-021-00870-7). This figure contains the phylogenetic tree based on the core genome of 268 *K. pneumoniae* genomes, including 161 from BARNARDS and 107 from other studies.

Bioaccessibility by perspiration uptake of minerals from sulfurous peloids

Carla M Bastos[1, 3], Fernando Rocha[1], Carla Patinha[1], Paula Marinho-Reis[2]

1 – Department of Geosciences & GEOBIOTEC, University of Aveiro.
2 – Institute of Earth Sciences (ICT), Pole of the University of Minho.
3 – Exatronic, Lda.

The risks associated with the use of peloids in thermal centers, spas, or at home, need to be tested to develop appropriate safety guidelines for peloids formulations and the release of high concern substances. Also, the beneficial effect of some elements on human health should be assessed, to assist in the interpretation of therapeutic action and effectiveness on dermatological or osteomuscular disorders, using pelotherapy. Our team developed a methodology to understand better the biogeochemical behavior of the elements in peloids formulated bentonite clay and sulfurous mineral-medicinal waters. A stabilized, ready-to-use, artificial perspiration test was used to simulate the peloids' interaction with skin. Thirty-one elements extracted from the two prepared peloids were analyzed by ICP-MS. The data were analyzed and related to the mineralogical composition of the original clay and supernatant composition of the maturation tanks. The content of some potentially toxic elements and metals bioaccessibility by perspiration showed very low solubility and undetectable amounts extracted from the studied samples. This analytical method provided some reliable information about dermal exposure and the identification of some elements that may enter the systemic circulation and for which surveillance and control measures must be implemented.

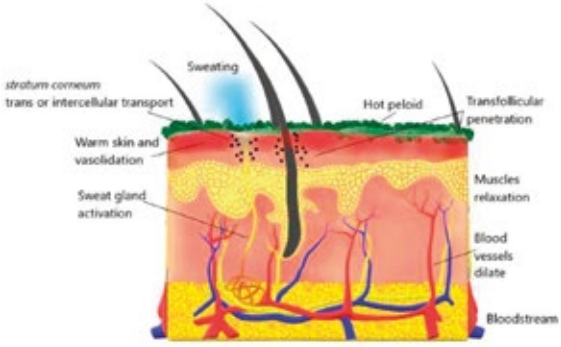
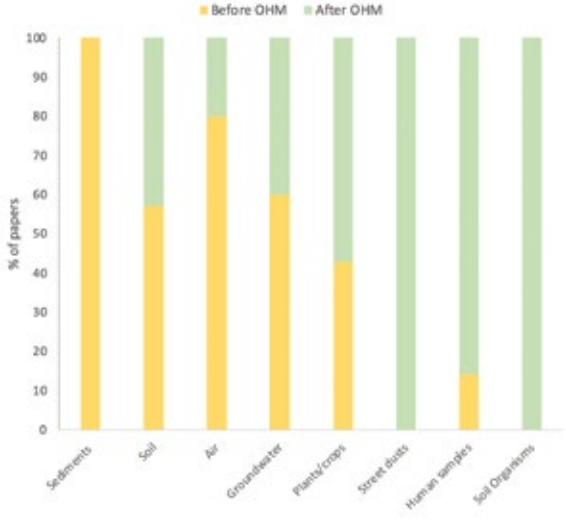


FIGURE 1
Routes of penetration by electric current and heat (iontophoresis in conjunction with pelotherapy.

Ten years of the international Human-Environment Observatory of Estarreja: evolution and major achievements

Anabela Cachada[1], Carla Patinha[2], Jean-Philippe Bedell[3], Anne-Marie Guihard-Costa[4], Eduardo F Silva[2]

During five decades, the liquid effluents from the Estarreja Chemical Complex (ECC) were discharged to the Ria de Aveiro lagoon or deposited in evaporation ponds, through open channels and pipelines. For this reason, this area has been intensely studied by the scientific community since the 90s of the last century. The first studies about the impact of the industrial activity in Estarreja were focused on the geochemical aspects of contamination, whereas studies regarding the relationship between industrial activities, populations and their health status, and biological ecosystems remained in an early state. The complexity of this system, together with the human-environment interactions issues, could only be approached through interdisciplinary inputs and contributions from social and health sciences. Thus, to enlarge the scope of the research carried out in Estarreja it was created, in March 2010, the OHMI-Estarreja – Observatoire Hommes-Milieux Estarreja International from the Labex DRIIHM-CNRS (https://ohm-estarreja.in2p3.fr/pt). Indeed, since the creation of this observatory there was a shift in the focus of studies conducted, from geochemically based to the assessment of environmental and human health effects, reflected by the target matrix studied (Figure 1). Also, since the OHM establishment, different approaches have been considered (e.g.: spatial-temporal evolution of the contamination level; health studies of the population; societal changes in the area), allowing to better understand the risk induced by the ECC. The results obtained in the last 10 years clearly show that interdisciplinarity was a key factor to address this complex issue of human-environment interactions. Nevertheless, several knowledge gaps were identified (e.g.: toxic elements speciation, biological individual responses to contamination, particularities of family lifestyles) that can contribute to confirm or infirm this relationship between health, contamination and socio-ecosystem.



1 – CIIMAR & Department of Biology, Faculty of Sciences, University of Porto.
2 – Department of Geosciences. & GEOBIOTEC, University of Aveiro
3 – LEHNA, CNRS Ecole, Nationale des Travaux Publics de l'Etat, France.
4 – UMR & CNRS, Université Paris Cité, France.

FIGURE 1
Distribution of papers by matrix studied, published since 1989 until the OHM creation (before OHM) and during the last ten years (after OHM).

Conceptual Models and Methodology to assist Doctoral Design Research – The 4-category Model innovation

Violeta Clemente[1], Katja Tschimmel[2], Fátima Pombo[3]

1 – School of Design, Management and Production Technologies & ID+, University of Aveiro.
2 – School of Economics and Management & ID+, University of Porto.
3 – Department of Communication and Art & ID+, University of Aveiro.

FIGURE 1
Design Research Classification Model© Authors.

FIGURE 2
Design Research Classification Model Map© Authors.

After conducting research and workshops on research methodologies with doctoral students in design from different countries and universities over the last six years, the authors have observed that students are often eager to learn more about how to progress from a research interest, typically sparked by a design question, to a methodologically robust and coherent research plan guided by high-quality research questions. The 4-category design research classification model developed by the authors is designed to be open and flexible enough to potentially accommodate any kind of design research by adding a fourth category: research 'from' design (Figure 1). This 4-category classification model intended to aggregate perspectives into an organized and terminologically consensual research 3-category model adding the research "from" design[1] and having achieved international recognition in the field of Design research in leading journals such as *Design Studies* (vol 78, 2022) and in books as *Applied Design Research: A Mosaic of 22 Examples* by J. Van den Eijnd, Routledge, 2022; *Teaching Research in Design: Guidelines for Integrating Scientific Standards in Design Education* by Dittenberg et al., Transcript Verlag, 2023. Aiming to provide another visual representation of the model, we positioned these four categories in a classification model map (Figure 2) organized around 4 layers involved in the design field: Processes, People, Philosophy and Products. We consider three main design processes: Academic Design Research, Higher Design Education and Professional Design Practice and we choose to represent them by a pyramid shape because we see them as personal processes or trajectories that an individual undergoes as a design student, researcher and practitioner. If in our analysis design project assumes a central role, it however, differs on the place where the design project is developed and when the author's reflection and analysis occurs.

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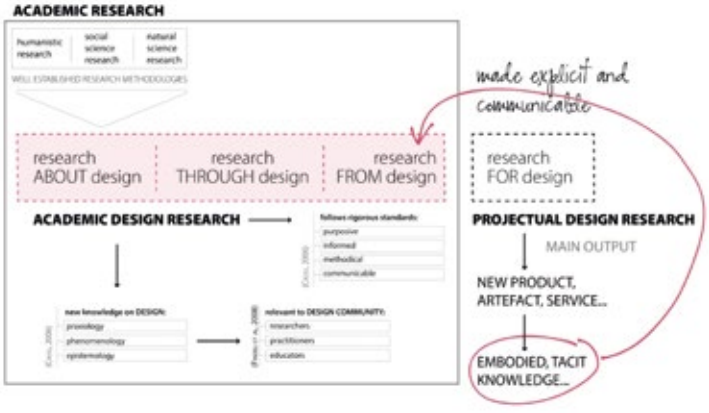

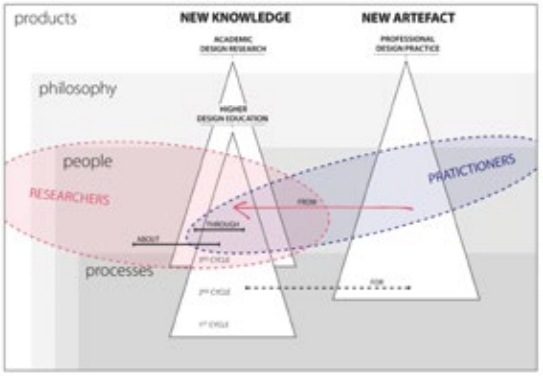

Modelling patient trajectories using multimodal information

João F Silva[1], Sérgio Matos[1]

Electronic Health Records (EHRs) offer a multi-dimensional longitudinal view of the patient medical history and thus contain a trajectory that is representative of the evolution of the patient health status through time. This context can be used by physicians to monitor patient health and make more accurate prognoses or diagnoses, but the volume, variety and variability of this information hinders its effective use. Patient trajectory modelling can assist by exploring existing information in a scalable manner and can contribute to health care quality by guiding management decisions and fostering preventive medicine practices. Such models can be applied in various problems, such as predicting disease progression, recommending therapies, or predicting when a patient will be readmitted to the health care system.

This work describes a flexible neural network architecture for patient trajectory modelling that combines different types of information and considers the temporal aspect of clinical data. The model encodes each patient admission as a continuous vector representation derived from different data modalities. These patient admission representations are then combined through a recurrent network to model the patient trajectory. In this work we used data from the public MIMIC-III clinical database and considered the prediction of two different clinical outcomes: patient readmission within a period of 30 days after the patient is discharged, and disease progression, by predicting the expected diagnoses on a future admission. We encoded clinical text using ClinicalBERT contextual embeddings and explored the inclusion of timing and coding information. The proposed model can be easily expanded to support more data modalities as well as the prediction of other clinical outcomes and is publicly available at https://github.com/bioinformatics-ua/PatientTM.

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

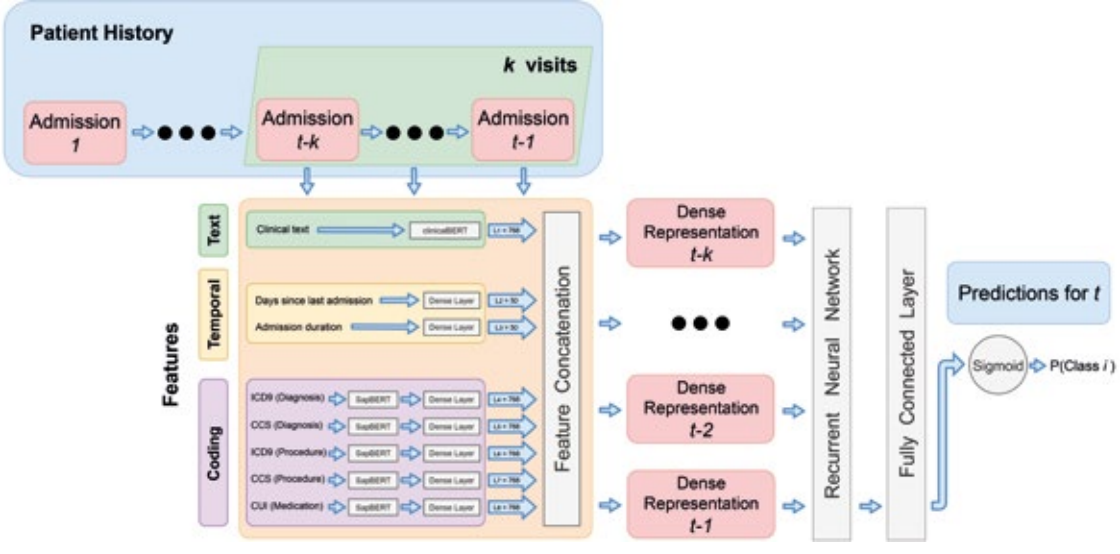

FIGURE 1
The trajectory modelling architecture generates vector representations for each patient admission at the Feature Concatenation layer. The model considers sliding windows with *k* admissions for each patient, scanning from the oldest to the most recent admission.
The resulting vector representations are forwarded through a recurrent model and a fully connected layer. Finally, *N* sigmoid activations are used to calculate class probabilities, where *N* corresponds to the number of classes to predict. In diagnose prediction this corresponds to the diagnoses considered, while in readmission prediction the output layer is simplified to consider a single output.

Exploring Pervasive Augmented Reality in the Industry Sector

Bernardo Marques[1], Rafael Maio[1], André Santos[2], Tiago Araújo[1], Carlos Ferreira[3], Pedro Ramalho[2], Duarte Almeida[2], Paulo Dias[1], Beatriz S Santos[1]

1 – Department of Electronics, Telecommunications and Informatics & IEETA-LASI, University of Aveiro.
2 – Bosch Thermotechnology S.A.
3 – Department of Economics, Management, Industrial Engineering and Tourism & IEETA-LASI, University of Aveiro.

Industry 4.0 is changing shop floors thanks to technological innovations in manufacturing processes, with significant impact in the way they are controlled, influencing circular economies, sustainability, and the production value. One of its nine pillars is Augmented Reality (AR), given its ability to support operators in faster decision-making while improving work processes, through interactive computer-generated information superimposed over the real-world environment.

This research, conducted in the scope of the Augmented Humanity Project, used Pervasive AR to understand operators' context and present digital content in a continuously manner as they move through space. This was done through a Human-Centered Design (HCD) methodology with partners from the industry sector, defining real-life use-cases, identifying stakeholders' needs, as well as requirements for development of two prototypes: 1- allowing workers to be guided during picking tasks with validation of the components selected; 2- supporting real-time data monitoring and problem detection in an assembly line. These were iteratively evaluated through user studies conducted over a three-year period, with countless hours spent at the shop floor. More than 60 stakeholders and domain experts in their respective fields participated in this process (e.g., operators, technicians, production line and logistic managers, process development engineers and ergonomics engineers, etc.).

Results suggest that Pervasive AR is robust and accurate to be applied in real setups, being easy to use and having great potential to support the operator's task, especially inexperienced operators. Also, having lower cognitive effort when compared to the alternatives being used. Furthermore, it enables visualization of synchronous data associated with each pre-defined station, as well as have a grasp of the assembly line as a whole, helping to identify issues and intervene accordingly to ensure the levels of productivity are achieved.

FIGURE 1
Example of an Industrial scenario, having an operator visualizing how to perform a picking task (1), while his actions are monitored and validated (2) through Pervasive Augmented Reality (AR) in a Head-Mounted Display (HMD).

FIGURE 2
Example of an industrial scenario, having an assembly line manager visualizing real-time data of the whole line (1), as well as detailed information for a given station (2) through Pervasive Augmented Reality (AR) in a Head-Mounted Display (HMD).

Topo(S)grafia

Nuno Aroso[1], Henrique Portovedo [1], Gisela R Faria[2]

Intended for the Colina de Guadalupe, where the Torre Miradouro do Sagrado Coração de Jesus (which belongs to the Catholic University of Portugal – Braga Regional Centre) is located, the original presentation proposed a live annotation of the "act of walking" as an aesthetic practice – a performative gesture inspired by the Situationist Psychogeography of Guy Debord. The myth of Sisyphus (Albert Camus, 1941), analogous to routines that generate movements of repetition and effort, is closely related to the purposes of *Topo(S) grafia*, leading participants to integrate a metaphor of contemporary society. The event implied open relationships with the venue, sometimes provoking, sometimes emphasizing a space of alterity in the relationship between the self, the other and the urban context that belongs to us all. The human bodies of "Os Especialistas", and their wanderings over the landscape, suggest a model of the daily movement that, like Sisyphus, repeatedly and uninterruptedly pursues the (uncertain) walk towards the destination that simultaneously attracts and condemns. The music was created and performed on site by Nuno Aroso and Henrique Portovedo, over an original text by Gonçalo M. Tavares. A poem of transdisciplinarity was created, which promoted a dynamic of dislocation in the landscape. The performative action, at the top of the tower, touched the highest point of the visible landscape. In the symbiosis between place – space – matter – sound – performativity, the human scale emerges as a relational measure and a device capable of constructing narratives. The music for *Topo(S)grafia* emerges with the intention of allowing a renewed experience of fruition of the artistic material of the performance. The manipulation of the sound objects contains a performative intention, enhancing the principles underlying the creation.

1 –Department of Communication and Art & INET-md, University of Aveiro.
2 – Department of Philosophy, University of Porto.

#100daysofpractice: Selection and adaptation of self-regulated learning strategies in an online music performance challenge

Camilla S Silva[1, 2], Helena Marinho[1], Carlos Fiorini[2]

1 – Department of Communication and Art & INET-md, University of Aveiro
2 – Arts Institute, State University of Campinas, Brazil

This reflective case study sought to apply a social-cognitive approach to music practice and performance, based on the use of social media. The first author of the article is also the study participant: a classical guitarist and Ph.D student who took part in the Instagram challenge *#100daysofpractice*, which involves recording and posting a video of one's daily musical practice for 100 uninterrupted days. We used autoethnography as a methodological tool, organizing and analyzing its results according to the six psychological dimensions of Self-Regulated Learning and the processes involved therein. Results showed that the Self-Regulation processes often concurrently affected more than one of the six dimensions as well as the strategies applied. This suggests that (a) some dimensions may be interdependent, and (b) learning strategies should be planned and evaluated considering this interdependence. Social media presents a specific perspective on feedback: the exchange with national and international peers allowed the participant to access information sources and different perspectives on what she was playing. With this self-reflective article, we hope to encourage other musicians to monitor and record their daily practice and to share the processes involved while learning and practicing, as new processes that require metacognitive thinking can improve music performance and goal achievement. As self-reflection is a critical process in SRL, an autoethnographic approach could present new perspectives on SRL and promote metacognitive behavior. This article is part of a broader research on Self-Regulated Learning and advanced music practice, and a result of the academic cooperation between University of Aveiro and UNICAMP (Brazil), funded by São Paulo Research Foundation (2018/20809-2 and 2019/21491-3).

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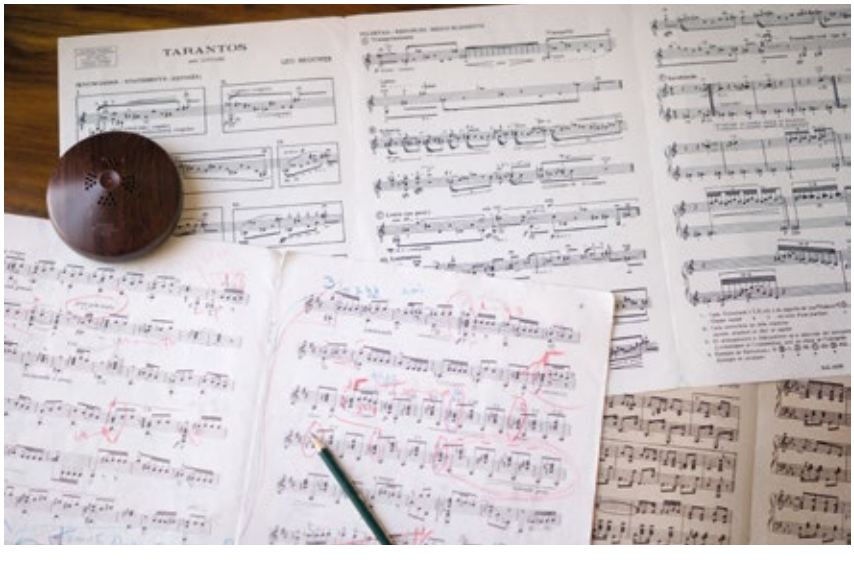

Quantum Enabled Private Recognition of Composite Signals in Genome

Nuno A Silva[1], Nelson J Muga[1], Manuel Santos[2], Paulo Mateus[2] and Armando N Pinto[1, 3]

Genomic data must be handled and examined with extremely secure privacy-preserving procedures to comply with people's rights to privacy and legal requirements. In this use case, we implemented a quantum-enabled secure multiparty computation (SMC) service involving three private genome databases placed at three distinct nodes in the Madrid Quantum Network. The three nodes ran a quantum-enabled SMC procedure to jointly compute the matrix distance of the genome sequences present in the private databases. The final objective was to compute a phylogenetic tree without revealing private genome sequences. Each node pair consumed oblivious keys generated through the implemented QODK protocol, which was supported by a Continuous-Variable Quantum Raw Key Distribution (CV-QRKD) link and symmetric keys generated by the QKD systems. The final output, shared by the three nodes, was the phylogenetic tree corresponding to the genome sequences belonging to the three private genome databases. The consortium was comprised of Instituto de Telecomunicações (PT), who coordinated the project and contributed with two research groups (Optical Quantum Communications and Security and Quantum Information), CBR Genomics, a genomics as a service SME that brings genetic information to the physician's practice, and Huawei Technologies Duesseldorf GmbH, a leading global information and communications technology solutions provider. The project benefited from the support of the OpenQKD partners IDQuantique, UPM, RedIMadrid.

Acknowledgements

This work was supported in part by the QuantERA II Programme funded by the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 101017733, and with funding organisations, FCT (QuantERA/0001/2021), ANR, and AEI, and by AIT Austrian Institute of Technology GmbH and 37 further beneficiaries of OpenQKD (project number: 857156, action QuGenome).

Figure 1 and 2

The QuGenome project (http://qugenome.av.it.pt/) implemented a secure multiparty computation (SMC) of phylogenetic trees involving three private genome databases placed at three distinct nodes in the Madrid quantum network (see Figure 1): Quintin – Node A, Quijote – Node B, Quevedo (CSIC node on RM Network) – Node C. This SMC service enables distributed parties in a network to jointly compute arbitrary genome analysis without revealing their private genome sequences. The three nodes run a quantum-enabled SMC procedure to jointly compute the SARS-CoV-2 genome sequences' matrix distance over the private databases. After the computation of the matrix distance entries corresponding to the sequences from the same database, the three nodes shared the missing matrix distance entries via encrypted messages, whose cryptography keys were generated by the QKD systems. Once the full matrix distance was reached, the three nodes iteratively grouped the genes with the fewest differences between them. The final output, shared by the three nodes, was the phylogenetic tree (see Figure 2) corresponding to the genome sequences belonging to the three private genome databases.

1 – Institute of Telecommunications & University of Aveiro.
2 – Institute of Telecommunications & Instituto Superior Técnico.
3 – Department of Electronics, Telecommunications and Informatics & IT, University of Aveiro.

FIGURE 1
Madrid quantum network left) links used; right) three computation diagrams.

FIGURE 2
Computed phylogenetic tree.

Multi-Criteria Dynamic Service Migration for Ultra-Large-Scale Edge Computing Networks

Hao R Chi[1], Rui Silva[2], David Santos[2], José Quevedo[1], Daniel Corujo[2], Osama Abboud[3], Ayman Radwan[1], Artur Hecker[3], Rui L Aguiar[2]

1 – Institute of Telecommunications.
2 – Department of Electronics, Telecommunications and Informatics & IT, University of Aveiro.
3 – Huawei Technologies, Germany.

Multi-access edge computing (MEC) service migration is a technology whose key objective is to support ultra-low-latency access to services. However, the complex ultra-large-scale edge service migration problem requires extensive research efforts, regarding the foreseen ultra-densified edge nodes in 5G and beyond. Therefore, we proposed a novel dynamic service migration optimization architecture for ultra-large-scale multi-access edge computing networks, with edge exposure function, monitoring and global/local optimization modules, which could achieve global optimal dynamic service migration and releasing the centralized traffic burden of cloud server, simultaneously. We developed a new multi-criteria decision-making algorithm: Technique for Order of Preference by Similarity to Ideal Solution with Attribute-based Niche count, named TOPANSIS, which showcased its strength to provide an optimal solution for service migration in large-scale deployments towards optimal data rate, latency, and load balancing. We further decentralized the operation of TOPANSIS to release the traffic burden from central datacenters by leveraging local decision making by edge nodes, while relying on central cloud coordination to account for the overall network information. The feasibility of the proposed solution was validated by means of a proof-of-concept implementation and experimental assessments. Experimental and simulation results showcased that the proposed architecture outperformed the selected benchmarks with an average improvement of 39.41% for latency, 2.92% for data rate, as well as 10.53% and 6.26% for RAM and CPU load balancing, respectively. Therefore, the developed MEC-based service migration architecture can achieve optimized latency, data rate, and load balancing, comprehensively, which provides referable architectural guidance to the future dynamic ultra-large-scale MEC service migration networks.

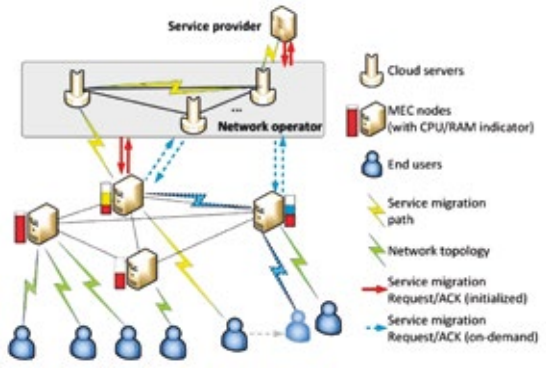

FIGURE 1
The proposed multi-criteria service migration optimization architecture for ultra-large-scale MEC networks, which achieves on-demand service migration/instantiation with low latency and high QoS.

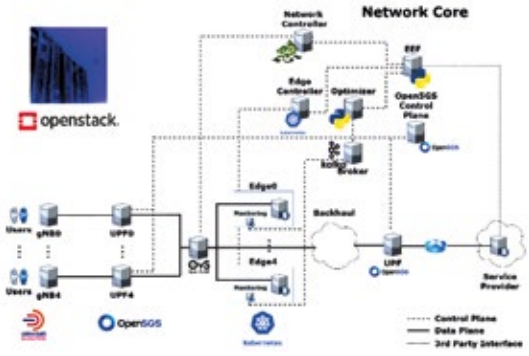

FIGURE 2
Prototype and Scenario Evaluation: proof-of-concept implementation implemented in an OpenStack-based virtual environment from the 5GAIner infrastructure.

Autonomous Shuttle Cooperative Perception and Control through Communications and Sensing

João Amaral[1], João Viegas[1], Bruno Lemos[1], Pedro Almeida[1], Andreia Figueiredo[1], Rodrigo Rosmaninho[1], Gonçalo Perna[1], Pedro Rito[1], Miguel Luís[2], Susana Sargento[1]

As part of the Ride2Autonomy European Project (https://ride2autonomy.eu/), Aveiro was chosen as a city to test an autonomous shuttle. In October 2022, at Aveiro Tech Week, an autonomous shuttle was riding on Rua Direita in Aveiro. The shuttle was integrated in the Aveiro Tech City Living Lab infrastructure, which allowed, not only to integrate the information from the existing sensors on the shuttle with the sensors of a lamppost, both equipped with video cameras, but also all the information was transmitted through vehicle communication to infrastructure and 5G technologies. This information makes it possible to have, both in the infrastructure and in the shuttle, a map of all objects and people, their location and movement, which allows, through mechanisms of data fusion and artificial intelligence, to make a cooperative perception system for the best movement decisions of the autonomous vehicles ([Alm23]). A video of this system in operation is presented at https://www.youtube.com/watch?v=8CIknpDDiWM and in [Ama23]. With this autonomous vehicle in Aveiro, we were able to build an accident prevention system to improve safety on roads with less human influence. The research of virtual traffic lights in the infrastructure and its interaction with the autonomous vehicle through communication messages between the lamppost and the vehicle, allow to send "stop" and "go" orders to the autonomous vehicle to demonstrate that it is possible to control the movement of the vehicle through a smart city. This mechanism has been extended with sensors and intelligent algorithms to detect the presence of people crossing the road: from the lamppost, a "stop" message is sent to the vehicle, the vehicle stops and people can cross the road. This mechanism has been demonstrated and tested in the road (https://www.youtube.com/watch?v=3q-LblHoZhY).

These works are being extended to the intelligent control of vehicles at intersections, roundabouts, and to build the autonomous mobility.

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1 – Department of Electronics, Telecommunications and Informatics & IT, University of Aveiro.
2 – ISEL – Instituto Superior de Engenharia de Lisboa, & IT, Instituto Politécnico de Lisboa.

FIGURE 1, 2
Autonomous shuttle in the Rua Direita, Aveiro. Autonomous shutlle interacting with the smart lamppost equipped with communication and computing devices and sensors, as part of the Aveiro Tech City Living Lab.

Valorization of Macroalgae as a Natural Source of Valuable Bioactive Compounds

Marcelo D Catarino[1], Ana R Circuncisão[1], Sónia Silva[1], Susana S Braga[1], Artur Silva[1], Susana M Cardoso[1]

1 – Department of Chemistry & LAQV-REQUIMTE, University of Aveiro.

In light of the SDGs 2030 agenda, researchers at the University of Aveiro are focused on exploring seaweed as a sustainable source of compounds with applications in multiple fields.

So far, we have extracted several bioactive compounds such as polysaccharides, phlorotannins or fucoxanthin, and found that they can exert interesting anti-inflammatory activities through inhibition of the NF-kB signaling cascade [1], activate apoptosis in tumor cells [2], modulate gut microbiota growth and promote short-chain fatty acid production in the gut [3]. Moreover, we showed that encapsulation is a viable approach to ensure the proper delivery of compounds such as phlorotannins in the gastrointestinal tract [4] while simultaneously cloaking eventual undesirable sensorial characteristics of the seaweed.

Additionally, and considering the challenges of the modern agrifood sector in moving towards sustainable and eco-friendly practices while simultaneously dealing with climate change, we are seeking ways to use seaweed extracts as crop biostimulants. Thus far, we have demonstrated their promising drought-protective effects. The work of our multidisciplinary team has already led to relevant findings, ultimately demonstrating that sourcing compounds from seaweed is a plausible strategy to tackle several SDGs simultaneously, and contribute to a world where we can live better together.

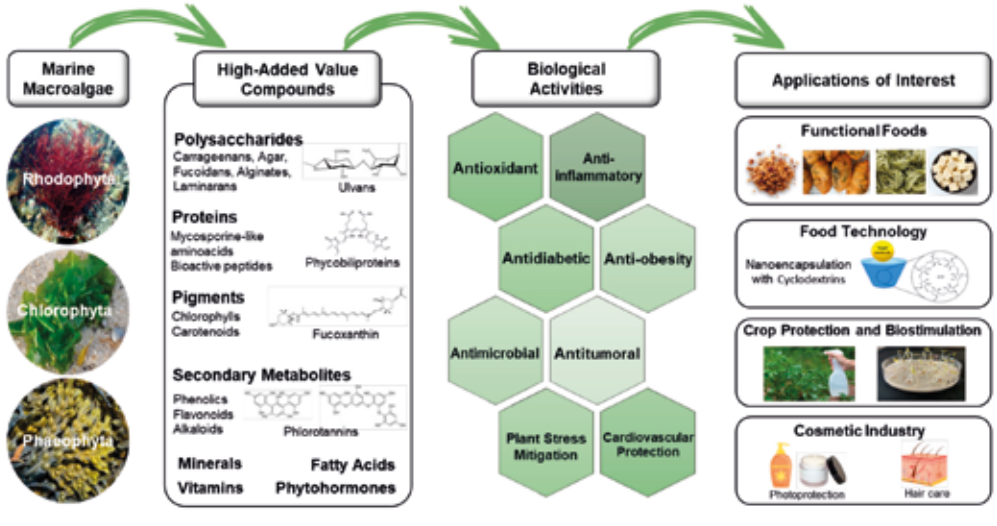

FIGURE 1
Schematic representation of the variability of compounds that can be obtained from macroalgae, their bioactive properties and potential applications.

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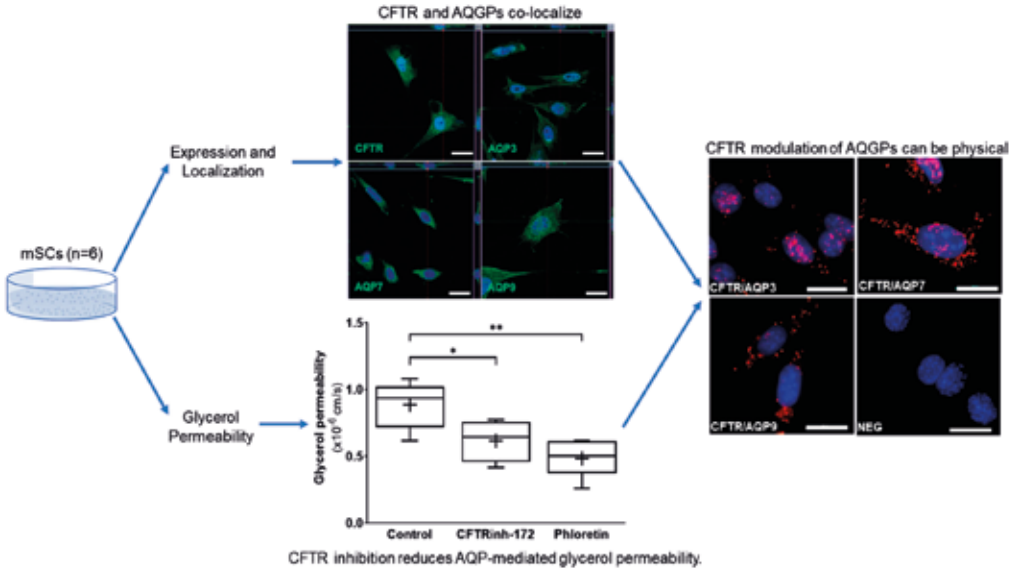
CFTR modulates membrane glycerol permeability in testicular cells – an intersection between cystic fibrosis and male infertility?

João Ribeiro[1, 2, 3], Raquel Bernardino[2, 3], David F Carrageta[2, 3], Graça Soveral[4], Giuseppe Calamita[5], Marco Alves[2, 3], Pedro Oliveira[1]

The cystic fibrosis transmembrane conductance regulator (CFTR) is an anion channel that regulates fluid dynamics in the male reproductive tract. Recent studies suggested that CFTR may interact with other transmembrane proteins, namely aquaporins (AQPs), also known to play a critical role in male fertility. This interaction could have important implications for understanding the complex processes involved in male reproductive health. With this study, we aimed to investigate the impact of CFTR inhibition on AQP-mediated glycerol permeability in Sertoli cells (SCs). We employed a combination of RT-PCR, Western Blot, and immunofluorescence techniques to determine the expression/localization of CFTR, AQP3, AQP7, and AQP9 in SCs. Subsequentially, we treated the SCs a CFTR inhibitor to evaluate its effect on glycerol permeability using stopped-flow light scattering technique, to shed light on the complex interplay between these two key proteins in male reproductive health. Our study revealed that inhibiting CFTR caused a significant reduction in glycerol permeability in SCs. To further explore the relationship between CFTR and aquaglyceroporins, we employed a DUOLINK proximity ligation assay to investigate endogenous protein-protein interactions. The assay detected an interaction of CFTR with AQP3, AQP7, and AQP9, suggesting a potential physical modulation of AQP-mediated glycerol permeability in SCs by CFTR. Our study highlights that CFTR malfunction can result in an impairment of AQP-mediated glycerol permeability, potentially due to a physical interaction between the proteins, contributing to a better understanding of the complex mechanisms underlying glycerol permeability in male reproductive tract. Given that CFTR variants are responsible for the most common genetic disease in the European population, understanding the relationship between CFTR and AQPs may provide a crucial link between male infertility and cystic fibrosis (CF), and aid in identifying potential therapeutic targets.

1 – Department of Chemistry & LAQV-REQUIMTE, University of Aveiro.
2 – Department of Anatomy, Unit for Multidisciplinary Research in Biomedicine (UMIB), Institute of Biomedical Sciences Abel Salazar (ICBAS), University of Porto.
3 – Laboratory for Integrative and Translational Research in Population Health (ITR), University of Porto.
4 – Department of Biosciences, Biotechnologies and Environment, University of Bari "Aldo Moro", Italy.
5 – Research Institute for Medicines (iMed.ULisboa), Faculty of Pharmacy, Universidade de Lisboa.
6 – Biotechnology of Animal and Human Reproduction (TechnoSperm), Institute of Food and Agricultural Technology, University of Girona, Spain.



CFTR inhibition reduces AQP-mediated glycerol permeability.

FIGURE 1
Figure shows the impact of inhibiting cystic fibrosis transmembrane conductance regulator (CFTR) on aquaglyceroporin (AQGP)-mediated glycerol permeability. The results are presented as means with error bars representing standard deviation. Statistical significance is denoted as (*) for $p < 0.05$ and (**) for $p < 0.01$. The findings suggest a significant effect of CFTR inhibition on glycerol permeability through AQGP channels.

Unique multiphthalocyanine coordination systems: vibrationally hot excited states and charge transfer states that power high energy triplet charge separated states

Jan Joseph[1], Leandro Lourenço[2], João Tomé[3], Tomás Torres[4, 5, 6], Dirk Guldi[1]

1 – Department of Chemistry & Pharmacy and Interdisciplinary Center for Molecular Materials, Friedrich-Alexander-University.
2 – Department of Chemistry & LAQV-REQUIMTE, University of Aveiro.
3 – Departamento de Engenharia Química & CQE, Instituto Superior Técnico de Lisboa.
4 – Department of Organic Chemistry, Autonomous University of Madrid.
5 – Institute for Advanced Research in Chemical Sciences (IAdChem), Autonomous University of Madrid.
6 – IMDEA-Nanoscience Institute, Interdisciplinary Research Centre.

Controlling molecular architecture of well-organized organic building blocks and linking their functionalities with the impact of solar-light converting systems constitutes a grand challenge in materials science. Strong absorption cross-sections across the visible range of the solar spectrum as well as fine-balanced energy- and redox-gradient are all important features that pave the way for either funneling excited state energy or transducing charges. In light of this, we used thiopyridyl-phthalocyanines (PcSPy) and ruthenium (tert-butyl)-phthalocyanines (RuPc) as versatile building blocks and demonstrated the realization of a family of multi-functional PcSPy-RuPc 1-4 by means of axial coordination. Sizeable electronic couplings between the electron donors and acceptors in PcSPy-RuPc 1-4 govern ground-state as well as excited-state reactivity. Time-resolved techniques, in general, and fluorescence and transient absorption spectroscopy, in particular, helped to corroborate a rapid charge separation next to a slow charge recombination (Figure 1). Key to these charge transfer characteristics are higher lying, vibrationally hot states of the singlet excited states in parallel with a charge transfer state and the presence of several heavy atom effects that are provided by ruthenium and sulfur. As such, our advanced investigations (Figure 2) confirm that rapid charge separation evolves from both higher lying, vibrationally hot states as well as from a charge transfer state, populating charge separated states, whose energies exceed those of the singlet excited states. Charge recombination involves triplet rather than singlet charge separated states, which delays the charge recombination by one order of magnitude.

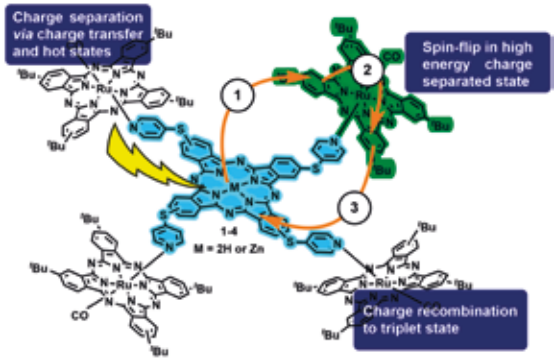


FIGURE 1
Versatile building blocks of thiopyridyl-phthalocyanines and ruthenium (tert-butyl)-phthalocyanines (PcSPy-RuPc).

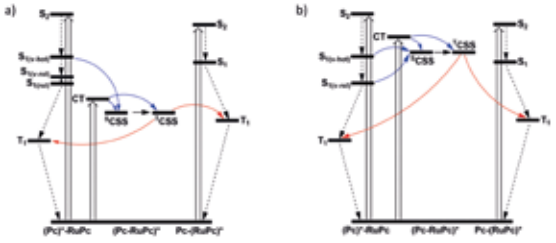


FIGURE 2
Jablonski scheme of pentamers a) $H_2PcSPy_4[RuPc]_4$ (3) and b) $ZnPcSPy_4[RuPc]_4$ (4) derived from GloTarAn analysis of femtosecond pump–probe experiments. Charge separation and charge recombination pathways are highlighted in blue and red, respectively.

BIM-based methodology for the seismic performance assessment of existing URM-RC buildings

Gonçalo C Lopes[1], Romeu S Vicente[1], Miguel D Azenha[2], Tiago S Ferreira[3]

The use of reinforced concrete (RC) in retrofitting interventions on existing unreinforced masonry (URM) buildings has been spreading all over the world since the beginning of the twentieth century. However, many of these mixed URM–RC buildings have revealed to be particularly vulnerable to seismic action, and the interaction effects from coupling RC structural elements to URM loadbearing walls is still a contentious issue for most of the research community. Considering their constructive complexity, with different structural modifications over time, these URM-RC structures may take advantage of innovative and practical tools for a fast and reliable seismic performance assessment.

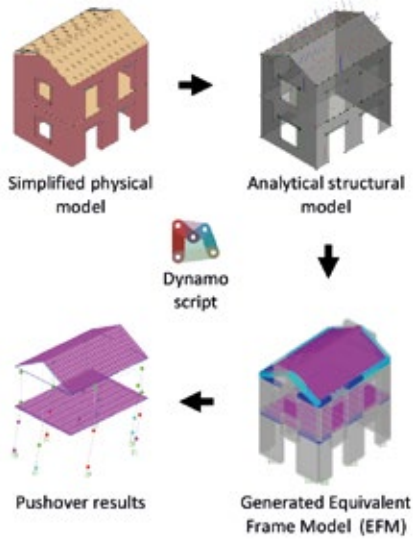
The main objectives of this work are: (1) To investigate the suitability of the use of RC in the seismic strengthening of URM buildings; (2) To assess the vulnerability of current mixed URM-RC buildings to earthquakes based on the pushover analysis of Equivalent Frame Models (EFM); (3) To improve existing mechanical-based models for Out-Of-Plan (OOP) failure mechanisms; and (4) To develop an efficient BIM-based tool for the automatic creation of EFM from the original BIM architectural models to be exported and analysed in a structural analysis software. This BIM environment aims to streamline the numerical modelling and structural seismic analysis of existing URM-RC buildings, taking advantage of the interoperability between the BIM modelling software and the numerical analysis software. For that purpose, a BIM-based computational tool (Dynamo script, see Figure 1) has been developed for the automatic creation of the EFM.

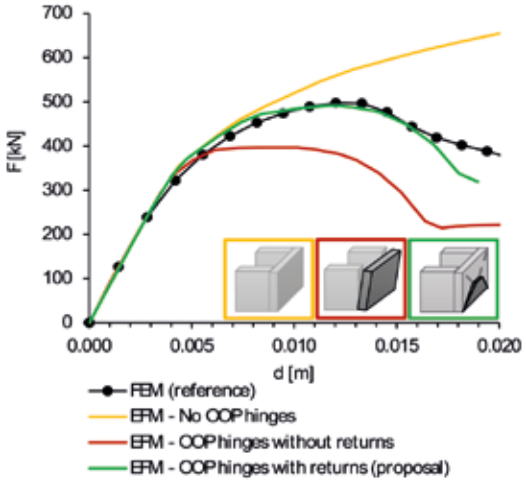
The validation of the presented methodology is based on the discussion and comparison between the experimental test results from a shaking table test campaign from the literature, and the numerical results obtained with Finite Element Models (FEM) (see Figure 2).

1 – Department of Civil Engineering & RISCO, University of Aveiro.
2 – Department of Civil Engineering & ISISE, University of Minho.
3 – College of Arts, Technology and Environment, University of the West of England.

FIGURE 1
Scheme of the models from BIM to EFM.

FIGURE 2
Influence of the out-of-plane (OOP) resistance.





Fire design of stainless steel I beams prone to lateral torsional buckling under end moments

Nuno Lopes[1], Carlos Couto[1], Paulo V Real[1], Dinar Camotim[2], Rodrigo Gonçalves[3]

1 – Department of Civil Engineering & RISCO, University of Aveiro.
2 – Department of Civil Engineering – IST & CERIS, University of Lisbon.
3 – Department of Civil Engineering – FCT & CERIS, Nova University Lisbon.

It is known that the loading type (bending moment diagram shape) influences the resistance of laterally unrestrained steel I-beams to lateral torsional buckling (LTB), which led to the development of Eurocode 3 (EC3) design rules accounting for the beneficial effect of non-uniform bending. New design formulae for stainless steel beams under fire conditions have recently been proposed for incorporation in the second generation of EC3 – their safety evaluation in the context of different bending moment diagrams is still a relevant issue that needs to be investigated.

This work presents a numerical study on the resistance of laterally unrestrained stainless steel I-beams with slender and non-slender cross-sections and undergoing LTB when acted by end moments at elevated temperatures, focusing on the influence of the (linear) bending moment diagram shape.

The safety and accuracy of the EC3 design approaches (current and second generation versions), as well as a design proposal previously developed for beams with stocky stainless steel sections, were assessed through an extensive numerical (finite element) parametric study using the software ANSYS. The validation of the numerical model developed was carried out through the comparison with results (failure moments and load-displacement equilibrium paths) obtained from experimental tests, and respective numerical simulations, reported in the literature. The parametric study comprised a total of 8701 I-section beams, (i) acted by five bending moment diagrams, (ii) made of three stainless steel grades (austenitic, duplex and ferritic), (iii) exhibiting various cross-section dimensions and LTB slenderness values and (iv) subjected to different elevated temperatures.

A design proposal previously developed for stainless steel-beams with non-slender sections was shown to provide the best failure moment predictions for beams with both non-slender and slender sections.

FIGURE 1
Failure mode of a slender beam used on the model validation.

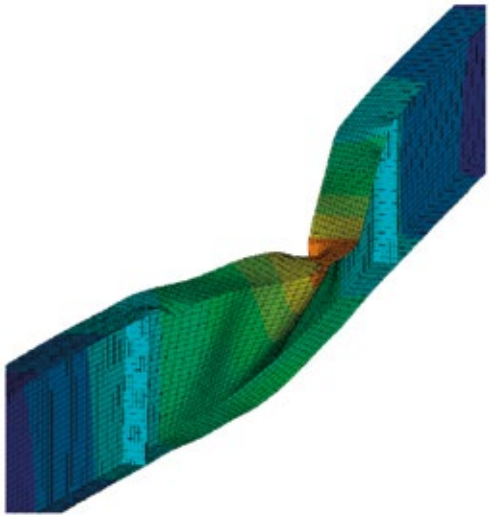
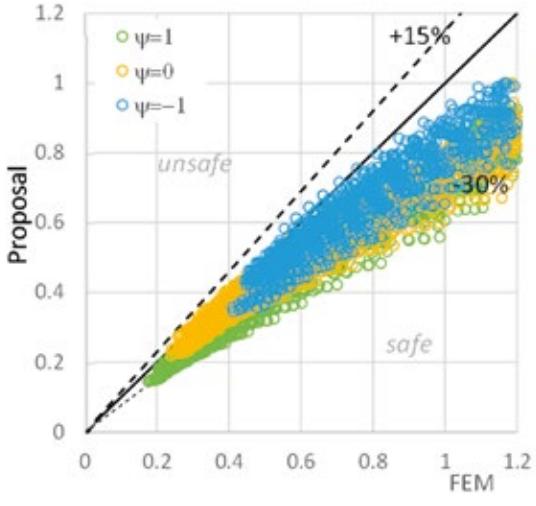


FIGURE 2
Results concerning the I-beams with slender sections acted by three bending diagrams.



Modelling and analysis of a complete adsorption heat pump system

João MS Dias[1], Vítor AF Costa[1]

Adsorption heat pumps (AHPs) can play a significant role in the future energy transition policies. However, the technology still needs to be matured and further research is still necessary. In this work, the detailed model of a complete AHP system suitable for domestic water heating is presented, aiming to fulfil the literature gap for models that can simulate the dynamics of these complete heating systems while maintaining a high level of modeling detail for the adsorbent bed. The model integrates all the main components of the AHP system, namely the evaporator, the condenser, the heater, the water reservoir and the adsorber. The adsorber is modeled by a 2D distributed parameter model with dynamic boundary conditions since the evaporator and condenser's temperatures vary within a cycle as well as from cycle to cycle. The novel model obtains the detailed temperature, pressure, and uptake fields in the adsorbent bed when integrated in a complete AHP system.

Real scale AHP systems cannot be accurately modelled by lumped-parameter models due to the heterogeneities on the temperature, pressure, and uptake in the adsorbent bed. The time evolution of the system's variables over five simulated cycles is obtained, as well as the coefficient of performance (COP) and specific heating power (SHP) of the whole system. For working conditions suitable for domestic water heating the system's COP is 1.35 and the SHP is 79.3 W.kg $1.s^{-1}$. The proposed model can be used in the future for detailed parametric analysis, aiming to find the optimal performances of similar AHP systems, leading to faster improved prototyping and AHP systems' development. Furthermore, the novel model is a valuable tool to evaluate the performance of new adsorbent materials operating in real systems, as well as to test control techniques and integration of AHP systems with other heating devices and technologies. It is also possible to use the proposed model for adsorption cooling applications.

1 – Department of Mechanical Engineering & TEMA, University of Aveiro.

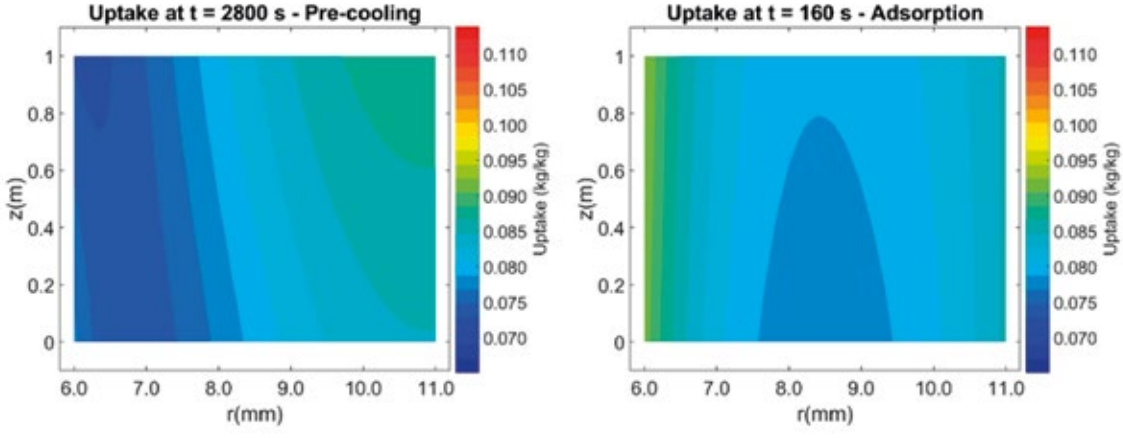


FIGURE 1
Uptake distributions in the adsorbent bed at selected instants during pre-cooling and adsorption phases.

Multifunctional smart bone implants: fiction or future? – A New Perspective

Inês Peres[1], Pedro Rolo[1], Marco PS Santos[1, 2]

1 – Department of Mechanical Engineering & TEMA, University of Aveiro.
2 – LASI – Intelligent Systems Associate Laboratory, Portugal.

Even though bone replacements are among the most performed surgeries worldwide, implant failure rates can still exceed 10%. Controversial positions multiply in the scientific community about the potential of each implant concept to minimize the burden related to implant failures. (Bio)chemical and modifications of the implants' surfaces have been considered the most effective methodology to design the next generation of implants. However, (i) their delivery dynamics does not consider the bone-implant states; (ii) osteoconductivity and osteoinductivity cannot be changed after implant insertion; and (iii) the ability to deliver different stimulations to target tissue peri-implant regions will most likely be quite difficult to attain.

The concept of Instrumented Implant is a disruptive approach that aims to engineer new types of implants incorporating inner electronics and instrumentation to perform sensing and therapeutic actuations along the bone-implant interface. By designing them embedding wireless communication, monitoring and non-autonomous powering systems (Figure 1A), several biomechanical quantities were already measured *in vivo*. These instrumented implants strongly contributed to the development of smart implants, but they did not bring about a technological revolution. Currently, bioelectronic implant technologies has emerged as a leading research topic that aims to design implants comprising biophysical therapeutic actuation, bone-implant interface sensing, implant-clinician communication and self-powering ability (Figure 1B). We argue that the next technological revolution will most likely emerge with instrumented active implants as multifunctional smart devices extracorporeally controlled by clinicians/surgeons. The true essence of instrumented implants is to enclose a hybrid architecture, in which optimal implant performances require smart instrumentation, smart coatings, and optimized geometries and materials (Figure 2).

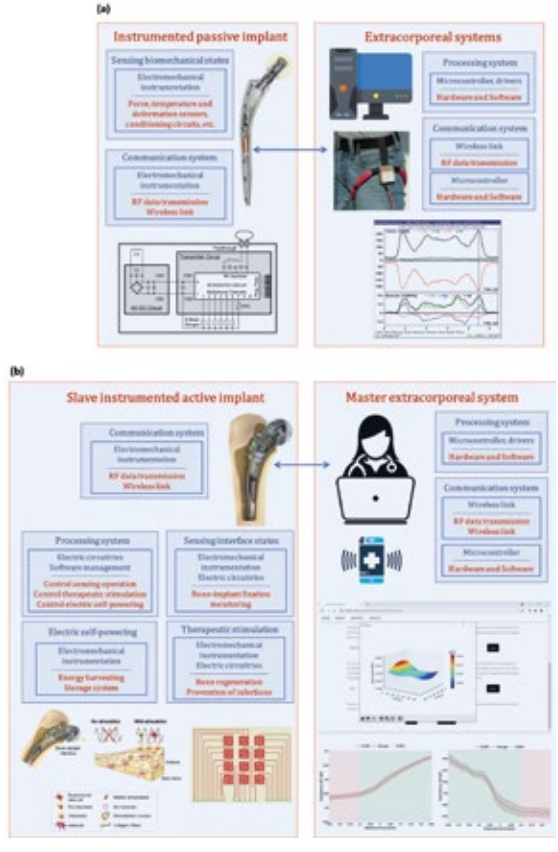


FIGURE 1
(A) Architecture used to design instrumented passive implants; (B) Architecture used to design instrumented active implants as multifunctional smart devices.

FIGURE 2
Multifunctional smart implants as hybrid technologies framing non-instrumented passive, non-instrumented active and instrumented passive implant technologies.

Development of FEM-based digital twins for machining difficult-to-cut materials: A roadmap for sustainability

Sílvia R Carvalho[1], Ana Horovistiz[1], Carlos Lauro[2], João Paulo Davim[1]

According to the united nations sustainable development goals, by 2030, the member states are expected to make significant advances towards sustainable manufacturing by applying of clean technologies and environmentally friendly processes. As machining is widely employed across various industries, stakeholders in the sector must promote sustainable and efficient practices. The goal is to effectively manage resources, including cutting tools, energy, and metalworking fluids (MWFs), while maintaining quality to avoid waste-related costs.

This work reports how MWFs have been used for machining difficult-to-cut alloys. Moreover, it emphasizes the need for shifting away from flood cooling with mineral oil based emulsions towards sustainable alternatives such as cryogenic machining and minimum quantity lubrication (MQL), as both use lower flow rates of MWFs with lower environmental impact.

It also highlights the worth of the finite element method (FEM) as a valuable tool for optimizing machining conditions and studying the thermo-mechanical response without the need for time-consuming experiments. On the other hand, it addresses how the lack of MWFs-assisted machining simulations is an obstacle when dealing with difficult-to-cut alloys, as MWFs play a crucial role in controlling surface integrity and tool life.

Meaningful questions such as, how to convert the MWFs and delivery systems into suitable variables for numerical simulation? How computational methods such as FEM and CFD (computational fluid dynamics) contribute to the sustainable use of MWFS in machining? What efforts have been made to increase the accuracy of MWFs-assisted FEM models? where answered in this work. Moreover, it was found that advanced cooling techniques, such as cryogenic MQL, electrostatic MQL, nanofluid MQL have been used, with promising results in difficult-to-cut alloys. All these efforts will contribute for building a society with responsible consumption and production standards.

Acknowledgements

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1 – Department of Mechanical Engineering & TEMA, University of Aveiro.

2 – Department of Mechanical Engineering & Centre for Innovation in Sustainable Manufacturing (CIMS), Federal University of São João del Rei.

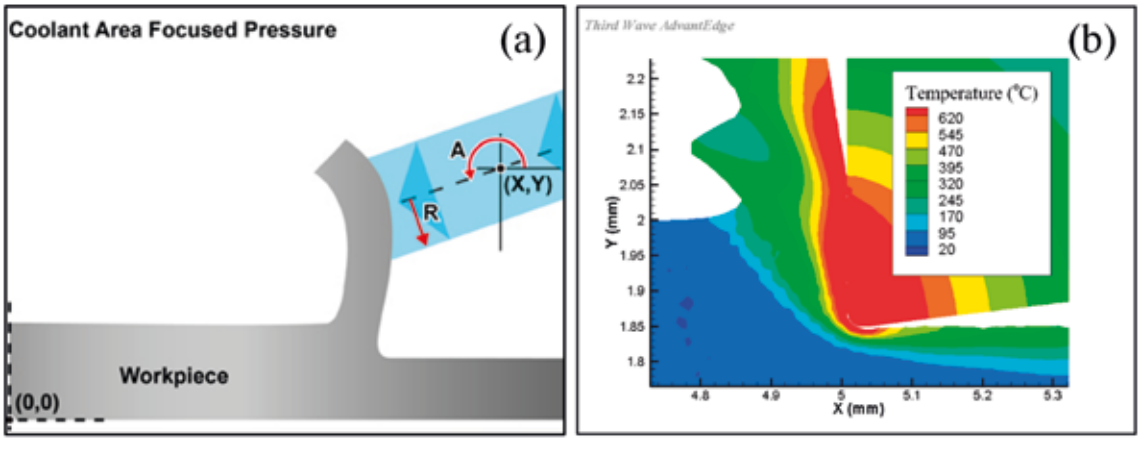

FIGURE 1

Development of metalworking fluid assisted simulations: (a) Method available in AdvantEdge for implementing a minimum quantity lubrication setup; (b) Temperature contour in machining simulation with FEM.

The impact of chronobiological variables on face processing and their interplay with individual differences

Isabel M Santos[1], Pedro Bem-Haja[2], André Silva[3], Diâner F Queiroz[4], Catarina Rosa[2], Carlos F Silva[1]

1 – Department of Education and Psychology & WJCR, University of Aveiro.
2 – Department of Education and Psychology & CINTESIS@RISE, University of Aveiro.
3 – Department of Education and Psychology, University of Aveiro; Piaget Institute, Almada.
4 – Department of Education and Psychology, University of Aveiro; FPCE, University of Coimbra.

Chronobiological variables, such as chronotype, time-of-day and sleep, have been shown to significantly affect various cognitive functions, as well as emotional processing. These effects are due to the interaction between the homeostatic sleep pressure and circadian factors, the most important of which, in humans, being the light-dark cycle, and to the person's preference and predisposition for morning or evening activities. Considering the prominent role that human faces occupy in our daily lives, being a highly relevant stimulus in personal, social and professional settings, two published articles, under the FCT funded project DORIAN (PTDC/PSI-GER/31082/2017), highlighted the important impact of chronobiological variables on face processing. A scoping review study[1] explored the impact of sleep on face recognition memory, showing an overall positive effect of sleep on memory for faces. However, the significant methodological variability between studies calls for the need of controlling confounding variables in future replications. Another study explored how individual differences in terms of chronotype and emotion regulation ability impacted the recognition of facial expressions of emotion, in particular expressive suppression[2], highlighting the importance of considering the interplay between circadian preferences and other individual characteristics, such as emotion regulation strategy, to reach a better understanding of emotional functioning.

Reference

[1] Santos, I.M.; Silva, A.; Bem-Haja, P.; Rosa, C.; Cerri, L.; Queiroz, D.F.; Barroso, T.; Alves, M.F.; Silva, C.F. (2022). The impact of sleep on face recognition memory: A scoping review. *Brain Sciences, 12*, 1385. https://doi.org/10.3390/brainsci12101385

[2] Santos, I.M.; Bem-Haja, P.; Silva, A.; Rosa, C.; Queiroz, D.F.; Alves, M.F.; Barroso, T.; Cerri, L.; Silva, C.F. (2023). The interplay between chronotype and emotion regulation in the recognition of facial expressions of emotion. *Behavioral Sciences, 13*, 38. https://doi.org/10.3390/bs13010038

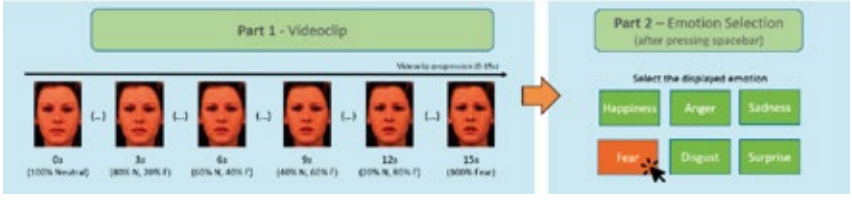

FIGURE 1
Trial scheme of the facial emotion recognition task used in study[2] (published in https://doi.org/10.3390/bs13010038).

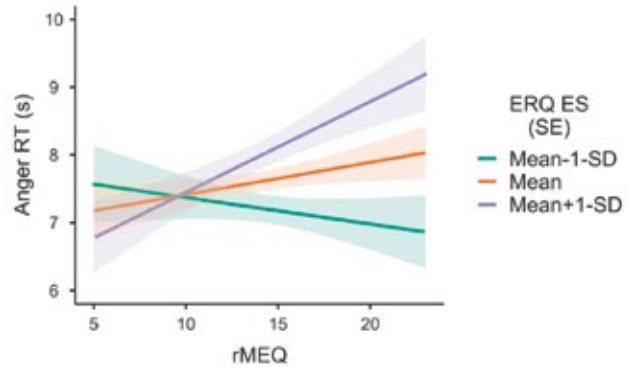

FIGURE 2
Simple main effects of chronotype (rMEQ) on response times (RT) in identifying anger from faces, according to the expressive suppression levels, as reported in study[2] (published in https://doi.org/10.3390/bs13010038).


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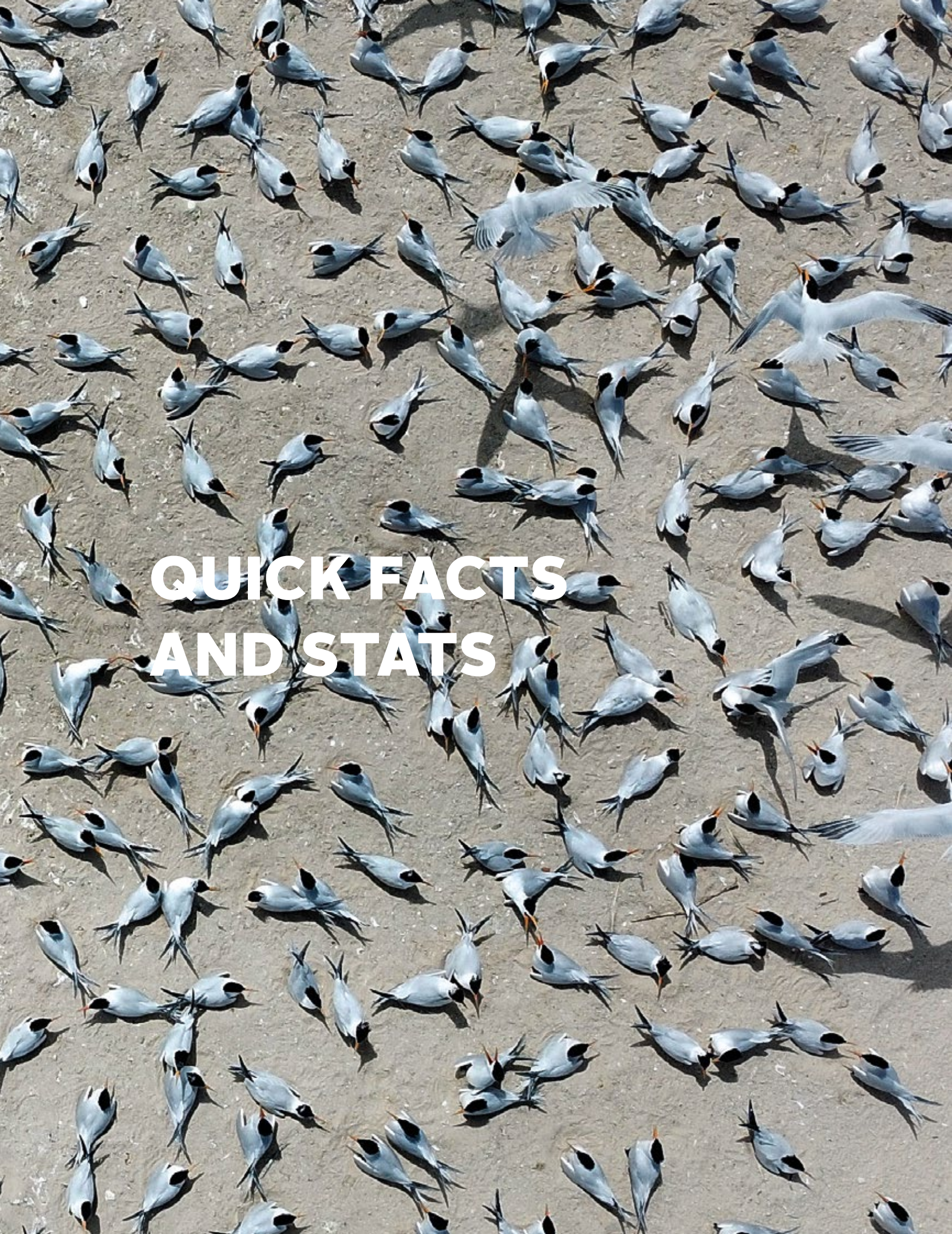


QUICK FACTS AND STATS

People

FACULTY BY DEPARTMENT

	FACULTY (FTE)			
	TOTAL	TOTAL	PERCENTAGE OF WOMEN	PERCENTAGE OF FOREIGNERS
UNIVERSITY	**2021**	**2022**		
Department of Biology	32,1	33,7	43%	
Department of Chemistry	43,9	41,3	47%	
Department of Civil Engineering	17,5	16,6	27%	
Department of Communication and Art	89,3	88,7	28%	4%
Department of Economics, Management, Industrial Engineering and Tourism	57,1	55,8	63%	4%
Department of Education and Psychology	41,5	42,5	65%	2%
Department of Electronics, Telecommunications and Informatics	79,6	81,5	8%	
Department of Environment and Planning	16	16	69%	
Department of Geosciences	14,3	13,6	37%	
Department of Languages and Cultures	47,8	50,5	62%	33%
Department of Materials Engineering and Ceramics	13	13	46%	
Department of Mathematics	56,8	58,4	48%	7%
Department of Mechanical Engineering	32,6	32,4	12%	
Department of Medical Sciences	24,2	27,1	61%	2%
Department of Physics	46	45	22%	9%
Department of Social, Political and Territorial Sciences	20,8	19,9	35%	
POLYTECHNIC SCHOOLS				
Águeda School of Technology and Management	61,4	66,7	48%	
Aveiro Institute of Accounting and Administration	76,9	77,7	53%	
School of Design, Management and Production Technologies of Aveiro North	30,6	35,1	29%	
Aveiro School of Health	55,6	57,8	61%	
TOTAL	**857,2**	**873,5**	**42%**	**4%**

RESEARCHERS BY DEPARTMENT

	RESEARCHERS (FTE)			
	TOTAL	TOTAL	PERCENTAGE OF WOMEN	PERCENTAGE OF FOREIGNERS
UNIVERSITY	**2021**	**2022**		
Department of Biology	101	104	67%	16%
Department of Chemistry	119	106	60%	15%
Department of Civil Engineering	5	5	20%	
Department of Communication and Art	14	14	71%	21%
Department of Economics, Management, Industrial Engineering and Tourism	4	2	50%	50%
Department of Education and Psychology	21	19	89%	16%
Department of Electronics, Telecommunications and Informatics	11	12	58%	17%
Department of Environment and Planning	35	30	63%	23%
Department of Geosciences	9	6	83%	17%
Department of Languages and Cultures	2	3	33%	67%
Department of Health Sciences	42	37	51%	19%
Department of Materials Engineering and Ceramics	17	19	26%	42%
Department of Mathematics	25	25	44%	32%
Department of Mechanical Engineering	17	18	72%	
Department of Physics	59	52	27%	35%
Department of Social, Political and Territorial Sciences	10	7	43%	14%
POLYTECHNIC SCHOOLS				
School of Design, Management and Production Technologies of Aveiro North		2	50%	50%
Aveiro School of Health	2	1	100%	
TOTAL	**493**	**462**	**57%**	**21%**

STAFF BY CATEGORY

		FTE		
	TOTAL	TOTAL	PERCENTAGE OF WOMEN	PERCENTAGE OF FOREIGNERS
UNIVERSITY	**2021**	**2022**		
Full Professors	60,3	51	18%	1%
Assotiated Professors	155	144,5	40%	3%
Assistant Professors	379	398,2	41%	4%
Lecturer	21,2	21,1	22%	
Other Teaching Staff	19,1	21,3	81%	45%
Researchers	440	414	57%	18%
Post-Doctoral Students	57	48	56%	44%
POLYTECHNIC SCHOOLS				
Coordinator Professors	28,9	28,9	55%	
Adjunct Professors	149,1	158,3	50%	
Lecturer	46,5	50,1	47%	
TOTAL	**1.356,2**	**1335,5**	**47%**	**9%**

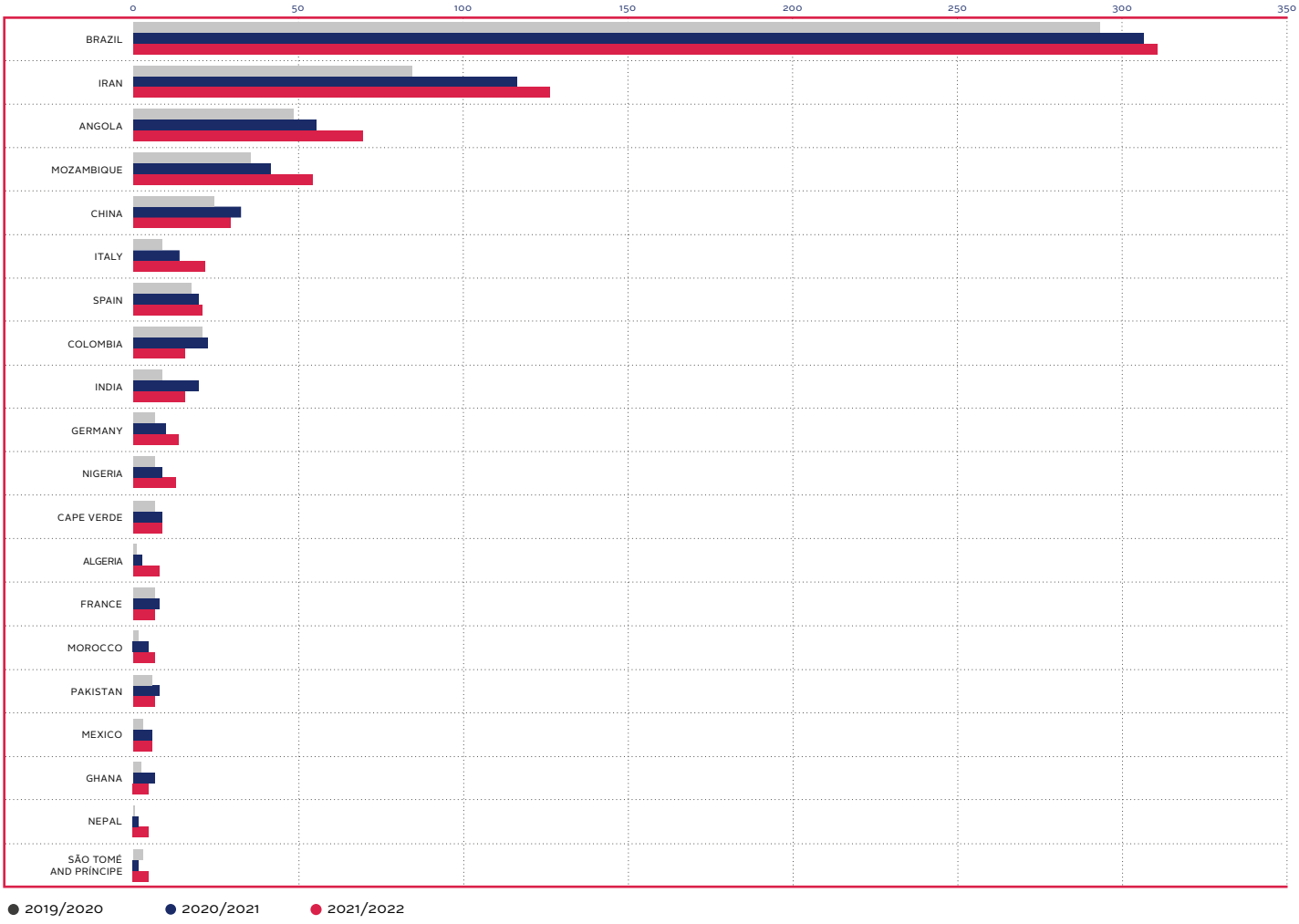
PHD STUDENTS BY DEPARTMENT

	PHD STUDENTS				
	TOTAL	TOTAL	PERCENTAGE OF WOMEN	PERCENTAGE OF FOREIGNERS	PERCENTAGE OF NEW STUDENTS
DEPARTMENT	**2020/2021**	**2021/2022**			
Department of Biology	146	151	69%	20%	20%
Department of Chemistry	251	274	61%	15%	32%
Department of Civil Engineering	78	88	33%	59%	31%
Department of Communication and Art	263	266	55%	50%	19%
Department of Economics, Management, Industrial Engineering and Tourism	345	376	49%	46%	29%
Department of Education and Psychology	279	282	76%	45%	18%
Department of Electronics, Telecommunications and Informatics	181	145	26%	41%	21%
Department of Environment and Planning	96	118	43%	49%	32%
Department of Geosciences	14	20	45%	45%	60%
Department of Languages and Cultures	109	103	62%	55%	25%
Department of Materials Engineering and Ceramics	113	115	46%	34%	24%
Department of Mathematics	37	51	31%	51%	47%
Department of Mechanical Engineering	71	85	33%	27%	29%
Department of Medical Sciences	108	115	73%	10%	15%
Department of Physics	87	89	38%	26%	27%
Department of Social, Political and Territorial Sciences	116	122	41%	52%	25%
Doctoral School	23	29	24%	55%	38%
TOTAL*	**2.116**	**2.222**	**53%**	**38%**	**26%**

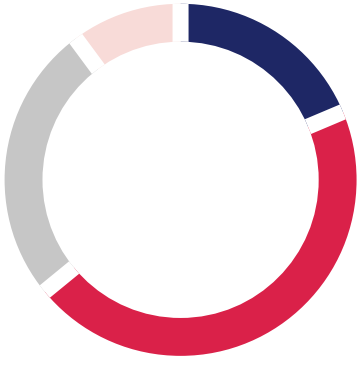
* The students of joint doctoral studies are considered in each participating department. Therefore, the sum of the students by department is superior to the total.

Top 20

FOREIGN PHD STUDENTS BY NATIONALITY

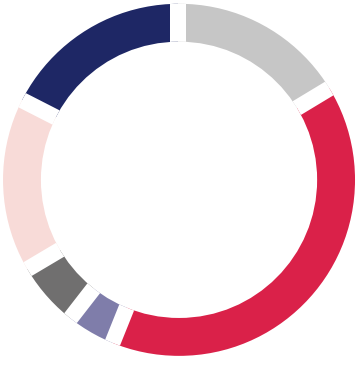


FOREIGN PHD STUDENTS BY CONTINENT



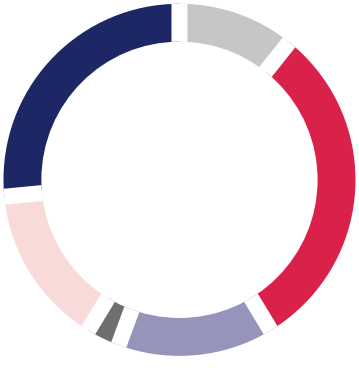
- Africa (19%)
- Asia (26%)
- America (45%)
- Europe (10%)

MSC THESES



- Arts and Humanities (16%)
- Health Sciences (6%)
- Engineering and Technology (40%)
- Life Sciences (16%)
- Social Sciences (18%)
- Exact Sciences (4%)

PHD THESES



- Arts and Humanities (11%)
- Health Sciences (3%)
- Engineering and Technology (31%)
- Life Sciences (15%)
- Social Sciences (26%)
- Exact Sciences (14%)

SCI Papers

TOP 10 SUBJECT AREAS FOR PAPERS PUBLISHED IN 2022	RECORD COUNT	% OF 3,168
Environmental Sciences	394	12,437 %
Materials Science Multidisciplinary	350	11,048 %
Chemistry Multidisciplinary	266	8,396 %
Physics Applied	221	6,976 %
Engineering Electrical Electronic	175	5,524 %
Biochemistry Molecular Biology	160	5,051 %
Chemistry Physical	146	4,609 %
Green Sustainable Science Technology	122	3,851 %
Computer Science Information Systems	111	3,504 %
Energy Fuels	105	3,314 %

* Data retrieved from ISI Web of Knowledge SM (Thomson Reuters) on 8th May 2023

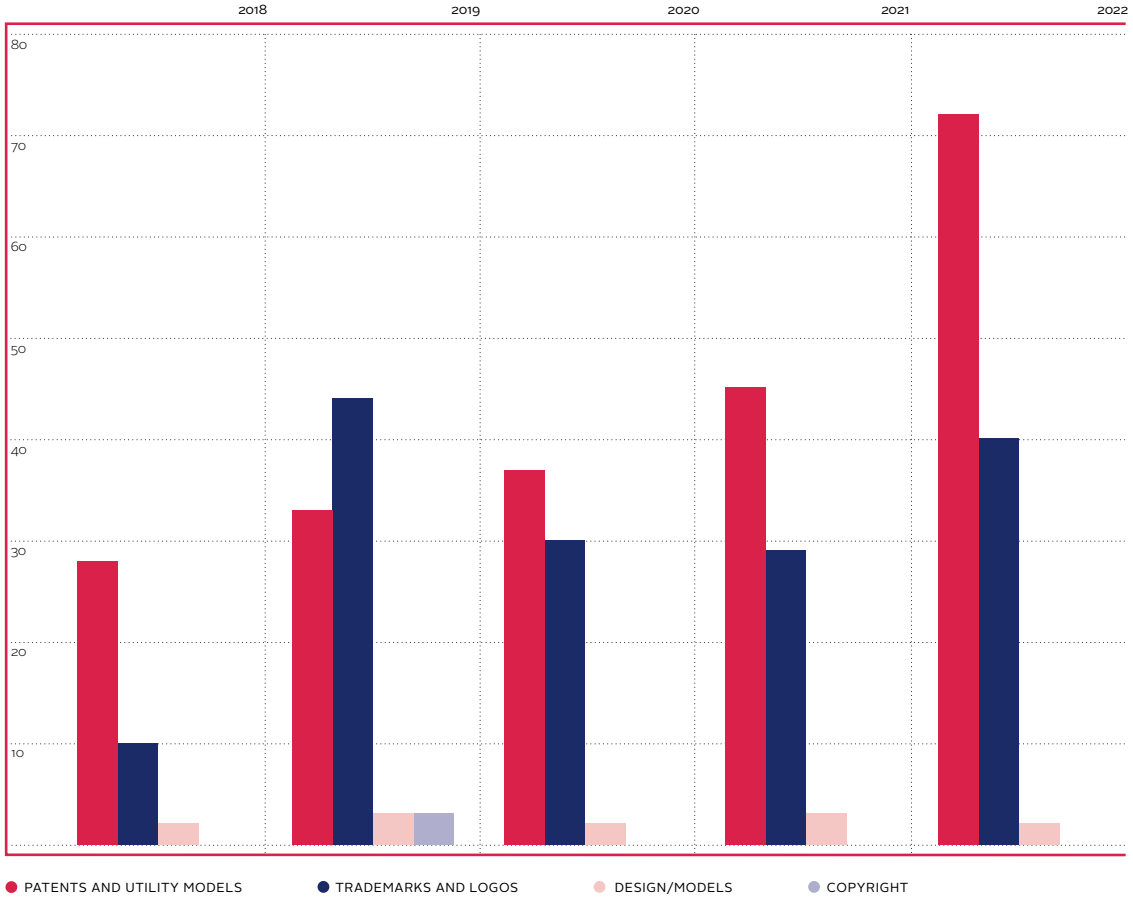
TOP 10 CITED PAPERS	TOTAL NR CITATIONS (2018-2022)
Kunkle, BW; Grenier-Boley, B; Sims, R; Bis, JC; Damotte, V; Naj, AC; et al (2019). Genetic meta-analysis of diagnosed Alzheimer's disease identifies new risk loci and implicates A beta, tau, immunity and lipid processing. NATURE GENETICS, 51 (3): 414-430	1.033
Brodkorb, A; Egger, L; Alminger, M; Alvito, P; Assuncao, R; et al. (2019). INFOGEST static in vitro simulation of gastrointestinal food digestion. NATURE PROTOCOLS, 14 (4): 991-1014	881
de Sa, LC; Oliveira, M; Ribeiro, F; Rocha, TL; Futter, MN (2018). Studies of the effects of microplastics on aquatic organisms: What do we know and where should we focus our efforts in the future?. SCIENCE OF THE TOTAL ENVIRONMENT, 645: 1029-1039	573
Klionsky, D J; Abdel-Aziz, AK; Abdelfatah, S; Abdellatif, M; Abdoli, A; et al (2021). Guidelines for the use and interpretation of assays for monitoring autophagy (4th edition). AUTOPHAGY, 17 (1): 1-382	522
Prata, JC; da Costa, JP; Lopes, I; Duarte, AC; Rocha-Santos, T (2020). Environmental exposure to microplastics: An overview on possible human health effects. SCIENCE OF THE TOTAL ENVIRONMENT, 702, 134455	490
Brites, CDS; Balabhadra, S; Carlos, LD (2019). Lanthanide-Based Thermometers: At the Cutting-Edge of Luminescence Thermometry. ADVANCED OPTICAL MATERIALS, 7 (5), 1801239	433
Martins, MAR; Pinho, SP; Coutinho, JAP (2019). Insights into the Nature of Eutectic and Deep Eutectic Mixtures. JOURNAL OF SOLUTION CHEMISTRY, 48 (7): 962-982	366
Prata, JC; da Costa, JP; Duarte, AC; Rocha-Santos, T (2019). Methods for sampling and detection of microplastics in water and sediment: A critical review. TRAC-TRENDS IN ANALYTICAL CHEMISTRY, 110, 150-159	358
Silva, ALP; Prata, JC; Walker, TR; Duarte, AC; Ouyang, W; Barcelo, D; Rocha-Santos, T (2021). Increased plastic pollution due to COVID-19 pandemic: Challenges and recommendations. CHEMICAL ENGINEERING JOURNAL, 405: 126683	354
Silva, AB; Bastos, AA; Justino, CIL; da Costa, JP; Duarte, AC; Rocha-Santos, T (2018). Microplastics in the environment: Challenges in analytical chemistry A review. ANALYTICA CHIMICA ACTA, 1017: 1-19	349

* Data retrieved from ISI Web of Knowledge SM (Thomson Reuters) on 8th May 2023

Intellectual Property

INTELLECTUAL PROPERTY RIGHTS REGISTRATION

	2018	2019	2020	2021	2022
Patents and Utility Models	28	33	37	45	72
Trademarks and Logos	10	44	30	29	40
Design/Models	2	3	2	3	2
Copyright	0	3	0	0	0



International Projects

EU-FUNDED PROJECTS STARTED IN 2022

EUROPEAN RESEARCH COUNCIL (ERC GRANTS)	ACRONYM	PROJECT COORDINATOR
Molecular Design of Electrically Conductive Covalent Organic Frameworks as Efficient Electrodes for Lithium-Ion Batteries	ELECTROCOFS	MANUEL SOUTO
Human based bioinks to engineer physiologically relevant tissues	HumanINK	JOÃO MANO

HORIZON EUROPE – PROJECTS COORDINATED BY UA	ACRONYM	PROJECT COORDINATOR
Blueprint for Atlantic-Arctic Agora on cross-sectoral cooperation for restoration of marine and coastal ecosystems and increased climate resilience through transformative innovation	A-AAgora	ANA LILLEBO
BOOSting excellence in environmental EPIgenetics	EPIBOOST	JOANA PEREIRA

HORIZON EUROPE – MONOBENEFICIARY PROJECTS	ACRONYM	PROJECT COORDINATOR
Ship Clones: Characterization and search for biomarker of marine transmissible cancers	SHIP CLONES	RICARDO CALADO
3D Printed Fouling-Resistant Photoactive Membranes for Wastewater Treatment	PURAQUA	TITO TRINDADE

HORIZON EUROPE	ACRONYM	LOCAL COORDINATOR
Mediated Biphasic Battery	MeBattery	JOÃO COUTINHO
Yeast cell factory for mRNA bioproduction	Yscript	MARA FREIRE
Developing Strategies by integrating mitigation, adaptation and participation to climate change risks	DISTENDER	JOANA FERREIRA
A touch of Blue in the EU Research Nights for a more Sustainable Use of the Ocean	BlueNIGHTs	DANIELA FIGUEIREDO
Innovative blockchain traceability technology and Stakeholders' Engagement strAtegy for boosting Sustainable sEafood visibility, social acceptance and consumption in Europe	SEA2SEE	CRISTINA PITA
Partnership for the Assessment of Risks from Chemicals	PARC	SUSANA LOUREIRO
Fabricating and Implementing Exotic Materials from Covalent Organic Frameworks	FANTASTICOF	MANUEL MELLE
Achieving Good Environmental Status for maintaining ecosystem SErvices, by ASsessing integrated impacts of cumulative pressures	GES4SEAS	HELIANA TEIXEIRA
Boosting the reduction of the environmental impact of pharmaceutical products throughout their entire life cycle	ETERNAL	SUSANA LOUREIRO
Civil Engineering and Geomatics Innovative Research on Heritage	ENGINEER	ALICE COSTA
Co-designing a Home with Dementia	HOMEDEM	LILIANA SOUSA

ERASMUS+ – PROJECTS COORDINATED BY UA	ACRONYM	PROJECT COORDINATOR
Entrepreneurship Education through Game Design & Maker-Centred Learning	Game it Away!	MARTA FERREIRA DIAS
Bridging the gap between higher education and labor market by fostering digital skills	BACK2BASICS	RITA SANTOS

ERASMUS +	ACRONYM	LOCAL COORDINATOR
Service Design for Wellness and Healthy Ageing	AGEWELL	RUI COSTA
Transparent Assessment for Online Learning by Digitally Competent Professors	DIGI PROF	ANTÓNIO MOREIRA
Sustainable Design and Process in Textiles for Higher Education	GREENTEX	ELISABETH PEREIRA
CoVEs for the Tourism Industry	TOURX	MANUEL OLIVEIRA
Be Inclusive: towards inclusion of children with special needs and their parents in ECEC	Be-In	ROSA MADEIRA
Procurement Educational Consortium for Innovationsourcing Using Sustainability	PRECIUS	MYRIAM LOPES
Digital education for adults and adult educators in egovernment access through context-based gamified scenario	DiG-Equal	MARLENE AMORIM
Enhancing the level of cybersecurity awareness in VET related to digital transformation	AWARE	MÁRIO RODRIGUES
Enhancing Social Entrepreneurship Capabilities Through Digital Educational Escape Rooms	ENHANCER	MARTA FERREIRA DIAS
AI Literacy Network in Primary Education	AILIT	MADALENA TEIXEIRA

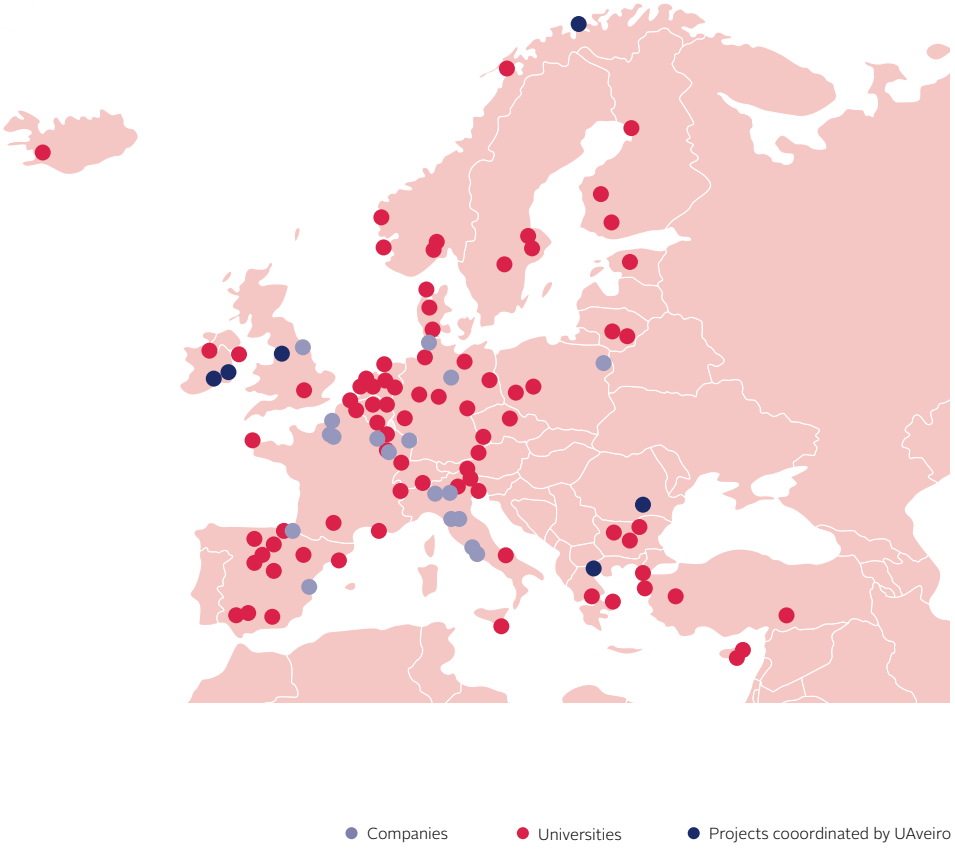
ERASMUS + (CONT.)	**ACRONYM**	**LOCAL COORDINATOR**
Sustainable Tourism Innovation Through Hybrid Project Management	HyPro4ST	MARTA FERREIRA DIAS
EntreAction: An Innovative Case-to-videostory Approach in Entrepreneurial Education	ENTREACTION!	ISABEL CAÇÃO
Creative learning for boosting bio-economy within HEIs' curricula	CL4BIO	VALENTINA CHKONIYA
Enhancing resilience of tourism sector through training & development of regenerative tourism experiences	ENFORCE	MARLENE AMORIM
Upgrading the skills of professionals for gender sensitive career guidance	GUIDE	MARLENE AMORIM
Building on Linguistic and Cultural Diversity for social action within and beyond European universities	BOLD	SUSANA PINTO
Upgrading higher education teachers' and students' hybrid learning competences	Hyb-IT-up	ANTÓNIO MOREIRA
Sustainable Logistics4.0: Digital and green skills for boosting innovation and sustainability of the logistics sector	SLog4.0	ELISABETH PEREIRA
Digital transformation in elementary music education	DigiMusi	CLARISSA FOLETTO
ECIU University	ECIUn+	ARTUR SILVA

DIGITAL EUROPE	**ACRONYM**	**LOCAL COORDINATOR**
PRODUTECH Digital Innovation Hub	PRODUTECH DIH	VICTOR NETO
Genomic Data Infrastructure	GDI	JOSÉ LUIS OLIVEIRA

INTERREG ESPANHA-PORTUGAL	**ACRONYM**	**LOCAL COORDINATOR**
Boas Práticas na Transferência de Conhecimento Universidade-Empresa Região Centro de Portugal-Castilla y León	INESPO PLUS	MARTA MARQUES
Punto de Acceso Unificado en el marco de la Plataforma transfronteriza para la implementación de soluciones innovadoras en la atención socio-sanitaria	INTEGRATENCION_II	ÓSCAR RIBEIRO

NETWORK OF EUROPEAN UNIVERSITIES AND COMPANIES WORKING WITH UAVEIRO IN EU PROJECTS STARTED IN 2022

AUSTRIA DISTENDER, ETERNAL, MeBattery
BELGIUM AGEWELL, Be-In, DEEP-REST, FANTASTICOF, HOMEDEM, TRUESOIL
BULGARIA ENFORCE, ENTREACTION!, GDI
CROATIA GREENTEX
CYPRUS CL4BIO, ENGINEER
CZECHIA GDI, GREENTEX
DENMARK EASEM, GES4SEAS, GUIDE
ESTONIA AGEWELL, GDI, Hyb-IT-up
FINLAND AGEWELL, ECIUn+, ENTREACTION!, GDI, Hyb-IT-up, PRECIUS, RN4EUHEALTH, SMART-ER CS Pilot, TRUESOIL
FRANCE BOLD, DEEP-REST, ECIUn+, SMART-ER CS Pilot
GERMANY BOLD, DISTENDER, ECIUn+, ENHANCER, ENTREACTION!, ETERNAL, GDI, Hyb-IT-up, MeBattery, TRUESOIL
GREECE DISTENDER, GES4SEAS, TOURX
ICELAND Be-In
IRELAND AILIT, DEEP-REST, ECIE, ECIUn+, GDI, HOMEDEM, RN4EUHEALTH, SMART-ER CS Pilot, TRUESOIL
ITALY CL4BIO, DISTENDER, ECIUn+, ENGINEER, GDI, HOMEDEM, YO-MEDIA
LITHUANIA DIGI PROF, ECIE, ECIUn+, GDI, GREENTEX, PRECIUS, SMART-ER CS Pilot
LUXEMBOURG GDI
MALTA BlueNIGHTs
NORWAY AILIT, DEEP-REST, ECIUn+, EEA Grants FBR, GDI, TRUESOIL
POLAND CL4BIO, DIGI PROF, ECIUn+, ENTREACTION!, GREENTEX, SLog4.0.
SLOVENIA GDI, SLog4.0.
SPAIN AILIT, BOLD, DEEP-REST, DIGI PROF, DISTENDER, EASEM, ECIUn+, ENHANCER, FANTASTICOF, INESPO PLUS, INTEGRATENCION_II, MeBattery, RN4EUHEALTH, SMART-ER CS Pilot, TailingR32Green, TRUESOIL, YO-MEDIA
SWEDEN ECIE, ECIUn+, GDI, HOMEDEM, SMART-ER CS Pilot
SWITZERLAND FANTASTICOF
THE NETHERLANDS AGEWELL, AILIT, BOLD, DISTENDER, ECIE, ECIUn+, ENHANCER, GDI, HOMEDEM, Hyb-IT-up, PRECIUS, RESILIENT, SMART-ER CS Pilot
TURKEY ENFORCE, ENTREACTION!, SLog4.0.
UNITED KINGDOM ENGINEER



Budget

TOTAL BUDGET OF THE PROJECTS STARTED IN 2022 BY RESEARCH CENTER AND FUNDING AGENCY*

RESEARCH CENTRE	CCDRC	EUROPEAN UNION	FOUNDATION FOR SCIENCE AND TECHNOLOGY	INNOVATION AGENCY	OTHERS INTERNATIONAL	OTHERS NATIONAL	PRR	2021	2022
CESAM	274.214	4.782.016	1.990.335		517.468	102.412		10.935.934	7.666.445
CICECO	514.725	3.008.626	1.103.719	239.921	147.304			10.937.554	5.014.295
CIDMA		61.536	86.944					348.297	148.480
CIDTFF		263.232	249.768					104.165	513.000
CINTESIS		339.390							339.390
DIGIMEDIA		85.153			10.000	121.575		315.467	216.728
GEOBIOTEC			2.917					185.607	2.917
GOVCOPP		814.472	242.025		48.892			1.639.713	1.105.390
I3N	115.958		330.157					1.401.485	446.115
IBIMED	148.392		602.231		70.000			1.717.564	820.623
ID+					79.932				79.932
IEETA		313.284	59.855					1.188.910	373.139
INET-MD		7.500						249.818	7.500
IT		903.703	434.171	25.393	503.835		8.157.996	5.853.367	10.025.099
NOT INTEGRATED**	217.759	526.414					26.341.500	2.030.445	27.085.673
REQUIMTE			232.206		12.500			306.449	244.706
RISCO			236.575		185.531			826.842	422.106
TEMA	114.136	316.509	545.741		49.800			2.200.489	1.026.187
WJCR			49.995		33.610				83.605
TOTAL	1.385.184	11.421.836	6.166.639	265.314	1.658.872	223.987	34.499.497	40.242.107	55.621.328

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

** Projects not integrated in research centers

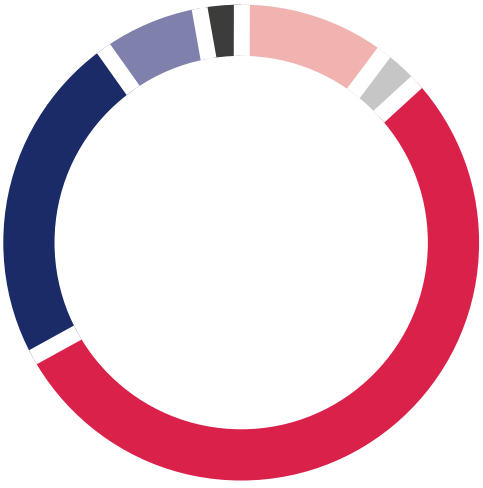
in euros

APPROVED BUDGET UNDER EU-FUNDED PROJECTS

EUROPEAN PROGRAMMES	2021	2022
H2020 – ERC AdG	2.499.683	
H2020 – ERC CoG	1.988.354	
H2020 – ERC StG	2.255.461	
H2020 – ERACHAIR	2.498.621	
H2020 -FETOPEN	374.109	
H2020 – TWINNING	603.572	
H2020 – INFRAIA	311.926	
H2020 – ITN-ETN	237.720	
H2020 – RISE	133.400	
H2020 – IF	307.630	
H2020 – NMBP	1.639.930	
H2020 – ICT	557.000	50.000
H2020 – ECSEL	299.900	
H2020 – PILOT	14.445	
H2020 – EDIDP	1.178.125	
H2020 – SWAFS	145.521	
H2020 – LC	280.000	
HORIZON ERC StG		1.498.619
HORIZON ERC PoC		150.000
HORIZON – CL1		1.195.975
HORIZON – CL4		77.500
HORIZON – CL5		243.110
HORIZON – CL6		1.007.541
HORIZON – MSCA – CITIZENS		57.160
HORIZON – MSCA – DN		659.606
HORIZON – MSCA – PF		329.397
HORIZON – PATHFINDER OPEN		1.030.884
HORIZON – TWINNING		814.571
HORIZON MISS OCEAN		1.745.838
ERASMUS +	940.107	1.811.223
INTERREG EUROPE	109.582	
POCTEP		149.416
CEF TELECOM	292.969	
UCPM	129.130	
DIGITAL		600.995
TOTAL	**16.797.186**	**11.421.836**

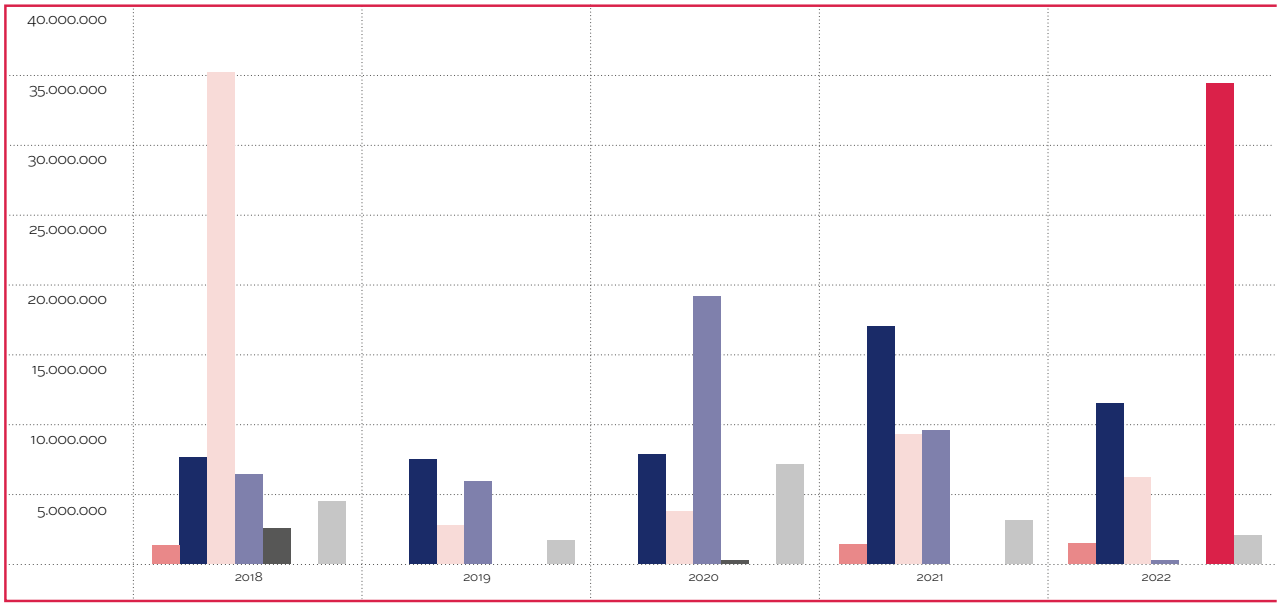
in euros

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*



CCDRC · European Union · FCT · Innovation Agency · AICEP · PRR · Others

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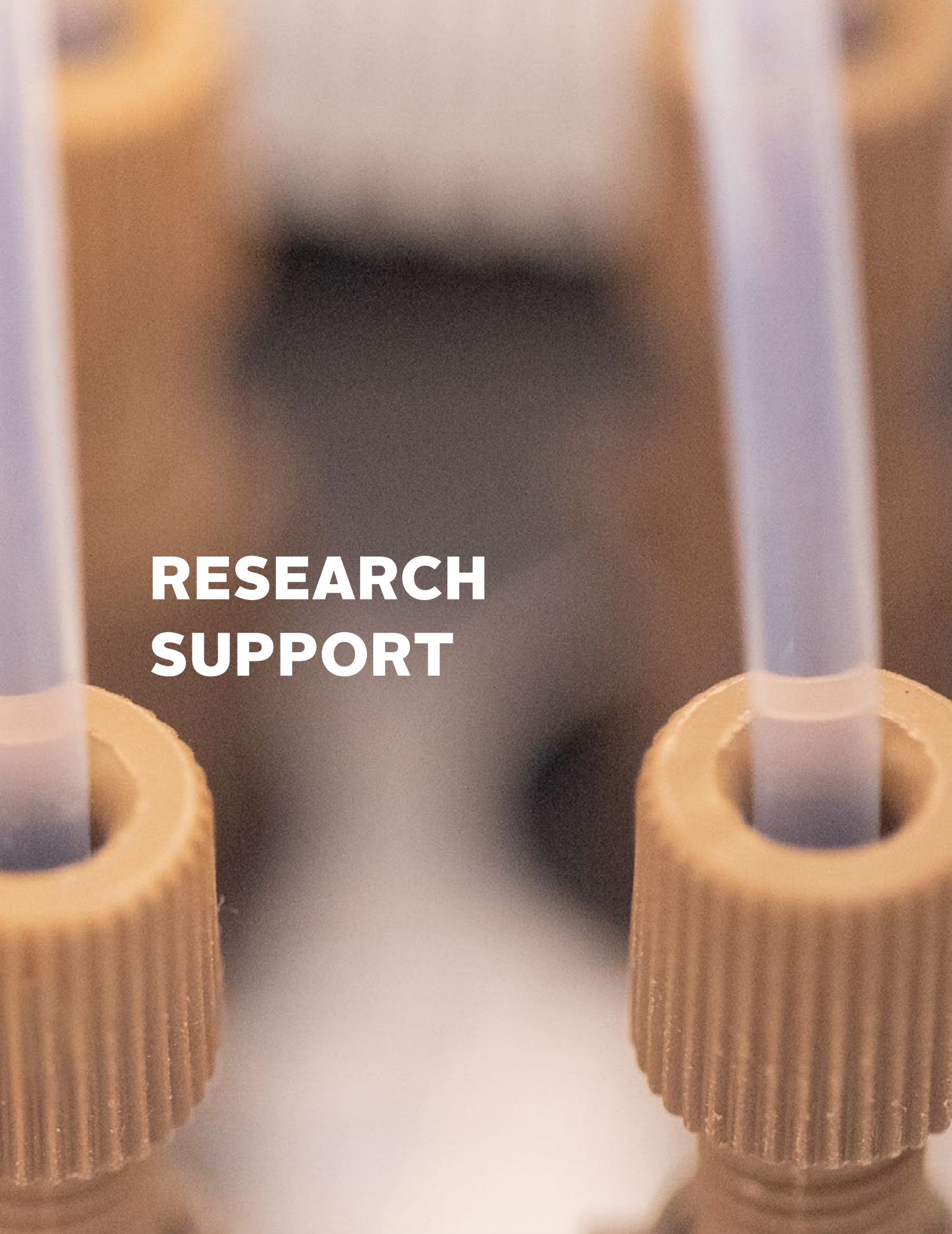

RESEARCH SUPPORT

Research Support Office

The University of Aveiro is a research-driven university. The excellence of its staff and quality of its infrastructures have been essential to carry out crosscutting research that contribute to the society – locally, nationally and internationally; this has put the University of Aveiro amongst the most renowned higher education institutions. Also, by supporting mobility across alumni, staff and the academic body and by fostering international research collaborations on the basis of individual academic interests, the University of Aveiro and its Research Support Office aim to deliver exceptional academics ready to face the challenges of globalization.

During 2022, 673 national and international research and technology transfer projects have been active in UAveiro, of which 70 funded by ERASMUS+, 53 by Horizon 2020, 18 by Horizon Europe and 9 by INTERREG. The UAveiro is the host institution of 11 ERC Grants and 1 ERA Chair, coordinates 1 FET Open and 4 TWINNING projects, among other relevant and strategic European projects. The projects are developed under the 20 research centers hosted by UAveiro which act in many different scientific areas. All research centers have been classified as Very Good or Excellent in the last evaluation process promoted by the National Foundation for Science and Technology.

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. Our extensive and ever-expanding network has a strong international character and a presence around the world which has served to boost several project proposals. The office provides high quality advisory, administrative, technical, contracting and financial services to researchers of all disciplines at the UAveiro, assisting the research community in its efforts to secure external funding (national, regional, international; grants, awards and prizes).

Formed by highly 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 coordinating 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.

The office serves as a vital link to an increasingly interconnected world, providing comprehensive support and guidance to researchers, ensuring the seamless execution of projects, and the pursuit of external funding opportunities. With the support of the Research Support Office, the university fosters an environment conducive to academic mobility and international research collaborations, preparing exceptional academics to undertake crosscutting research endeavors that resonate both locally and globally and to tackle society's challenges.

RESEARCH SUPPORT OFFICE
https://www.ua.pt/en/research-support
research@ua.pt

universidade de aveiro theoria poiesis praxis

www.ua.pt

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

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