12nd SRUK/CERU INTERNATIONAL SYMPOSIUM

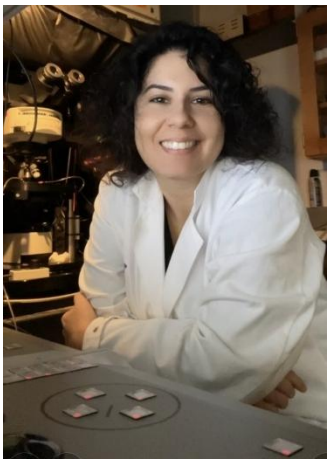
"FACING CHALLENGES"

Biography: Speakers

Elena López Gunn: Keynote Speaker 1 & Round Table 1

Dr Elena López Gunn is Founder and CEO of ICATALIST, and Senior Research Fellow at the Royal Elcano Institute. She is a member of the European Scientific Advisory Board on Climate Change (ESABCC) and Lead Author of IPCC Working Group II on Adaptation, vulnerability and impacts. She is an EU Climate Pact ambassador, and part of the UNESCO Task Force on a Science Based Water Assessment. She collaborated as an Expert in the Spanish Citizens' Climate Change Assembly She has a PhD in Geography from King's College, a Masters from the University of Cambridge and a Master in Investigative Journalism data and Visualization from Juan Carlos I University. She was a Cheney Fellow at the University of Leeds (United Kingdom), an Associate Professor at IE Business school in Madrid (Spain), and a Senior Fellow at the Botin Foundation Water Observatory and a Fellow at the London School of Economics (United Kingdom).

Patricia González Rodríguez: Keynote Speaker 2 & Round Table 1



Patricia González Rodríguez is a neuroscientist specialising in Parkinson's disease. She is a Principal Investigator of the "Bioenergetics and Metabolism in Parkinson's Disease" research line at the University of Seville's Institute of Biomedicine (IBiS).

Dr. González Rodríguez's academic journey includes training at four prestigious research institutions across three countries: the École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland, Northwestern University in Chicago, USA, the University of Minnesota in Minneapolis, USA, and the University of Seville in Spain.

Her research focuses on the role of metabolism as a driver of neurodegenerative diseases, particularly Parkinson's disease. Notably, she developed the first progressive mouse model of Parkinson's that replicates human pathology, challenging existing paradigms of the disease. Her team demonstrated that damaged neuronal mitochondria alone can cause Parkinson's symptoms and progression, paving the way for identifying biomarkers for early disease stages.

Throughout her career, Dr. González Rodríguez has secured competitive funding and holds two U.S. patents related to Parkinson's disease. She is also committed to teaching at the University of Seville and actively engages in science communication and advocacy for women's roles in science.

Her contributions have been recognized with numerous awards, including the Manuel Losada Villasante "Research in Innovation" Prize (2023), the L'Oréal-UNESCO For Women in Science Award (2023), the Hipatia Woman in Science Award for Young Scientific Talent (2022), and the Medal of Andalusia (2018).

Javier Andreu Pérez: Keynote Speaker 3 & Round Table 1

Javier Andreu-Pérez (SMIEEE, FHEA, MEPRC) received the Ph.D. degree in 2012 at Lancaster University (UK). He is currently a Reader (Associate Professor, tenured) in Human-Centred Artificial Intelligence at the School of Computer Science and Electronic Engineering (CSEE) and group chair of the Smart Health Technologies Group at the University of Essex (UK). His expertise focuses on human-centred artificial intelligence, interpretable, continuous AI learning and uncertainty modelling in highly noisy, non-stationary, high-dimensional data. Javier's other interests are in sensor engineering, bio/neuro-engineering, and life science research.

Javier has published in journals edited by Elsevier, Springer-Nature, IEEE (TFS, TSMC, TBMI, JBHI, TDCS, etc.), and other venues in artificial intelligence and cognitive neuroscience. Javier's work in artificial intelligence and biomedical engineering has attracted 5000+ citations.

Javier was chair of the IEEE Computational Intelligence Society (CIS) task force on Extensions of Type-1 fuzzy sets (2018-2022). Javier acts as the Editor-in-chief (EiC) and associate EiC of the journals of Ambient Intelligence and Humanized Computing (Springer-Nature Q1) and Neurocomputing (Elsevier, Q1), respectively. He's been invited as an expert reviewer for significant publishers such as Science, The Lancet and BMC. He has served on the technical committee for IEEE WCCI on several occasions and as workshop chair for FUZZ-IEEE. UK research councils have funded Javier's research, and other funding schemes are supported by UKRI, Royal Society, Welcome Trust, NIHR, and big IT corporations such as Nvidia, Amazon, and Oracle. Javier has an extensive portfolio of completed successful knowledge transfer and collaboration with the industry.

Javier has won personal fellowship awards for his research career from the Japan Society for the Promotion of Science (2022), Talentia Senior Fellowship from the Andalusia Scientific Council (2020), and the best research associate research presentation at Imperial College London (2017). Javier's other passions are practicing sports and catching up with family and friends.

Fernando Gomollón Bel: Round Table 1 Chair

Fernando is a chemist and science communicator based in Cambridge, UK. In 2022, he co-founded Agata, a start-up focused on delivering science and innovation to the right audiences. Currently, the company is a full partner in four Horizon Europe grants funded with almost €20 million in total. Specialised in science writing and storytelling, he's also collaborated with popular science magazines such as Chemistry World, Principia, and C&EN, as well as several radio and TV programmes in Spain. Before Agata, he worked in science communications and public relations, first as a Press Coordinator at ICIQ, one of the most prestigious chemistry research centres in Europe, and then as deputy Communications Leader at the Graphene Flagship, one of the largest research projects ever funded by the European Commission.

María José Martínez Bravo: Round Table 2

Born and raised in Seville, Spain, I studied Pharmacy and earned my PhD researching protein mismatch and its role in the development of Graft-versus-Host disease following allogeneic stem cell transplantation. After defending my thesis, I moved to Sweden for a two-year postdoctoral position at the Karolinska Institute, where I investigated exosomes as novel delivery systems for vaccines and explored their potential as biomarkers for diseases such as sarcoidosis.

My research journey then took me to King's College London, where I joined as a Research Associate as part of the EMI-TB consortium, working towards the development of better vaccines against *Mycobacterium tuberculosis*. These experiences deepened my passion for scientific discovery and knowledge-sharing, inspiring me to transition into teaching.

Now, as an Immunology Lecturer at UCL School of Pharmacy, I have the opportunity to share my passion for science and immunology with MSc students, equipping them with both theoretical knowledge and research skills.

Beyond academia, I have been an active member of SRUK, particularly within the Wom=n in Science committee, where I served as Chair for over two years and have been an active member for more than five. My focus has been on developing the "Awakening Vocations" project, which investigates gender bias in science among primary school children and whether exposure to a female role model can shift perceptions. In collaboration with the IgR committee from RAICEX, I also contributed to the White Paper on Gender Policies in Science and Academia, writing the chapter on the United Kingdom.

Francisco Vilaplana: Round Table 2

Francisco Vilaplana is a multidisciplinary scientist specializing in carbohydrate biotechnology, bioanalytical chemistry, and polymer/material sciences. He currently serves as a Professor at the KTH Royal Institute of Technology in Sweden. He is founding Director of KTH FOOD, a multidisciplinary research centre for a sustainable food system.

He leads a research group on plant biochemistry and biotechnology for sustainable development, focused on the structural understanding of biomass molecular components and their valorisation into bio-based products for biomaterial and nutritional applications using green chemistry and enzyme technology.

In addition to his research, Vilaplana has held leadership roles, including serving as Head of Division, President of the Research Panel on Bioprocess Technology at the Swedish Research Council, President of the Association of Spanish Scientists in Sweden (ACES) and the Network of Associations of Spanish Researchers and Scientists Abroad (RAICEX).

Eva Ortega Paíno: Round Table 2

Dr. Eva Ortega-Paíno is a distinguished biochemist and oncology researcher. She earned her Ph.D. in Chemistry from the Universidad Complutense de Madrid. Her doctoral research at the Immunology Department of Hospital Ramón y Cajal focused on tumor inhibitors, specifically studying the role of proteins in the proliferation and growth of chemically induced solid tumors in mice.

Following her Ph.D., Dr. Ortega-Paíno pursued postdoctoral studies at Lund University in Sweden, where she concentrated on identifying targets in Mantle Cell Lymphoma through gene silencing techniques. Her 15-year tenure in Sweden and 2 years in a biotechnology company in Oslo included a pivotal role as Coordinator for the South Sweden Service Center for BBMRI Infrastructure, a pilot project encompassing teaching, promoting biobank activities, and counseling on ethical, legal, and societal issues. She also contributed to linking analytical platforms, researchers, and biobanks in a dynamic manner.

In 2019, Dr. Ortega-Paíno returned to Spain to join the Spanish National Cancer Research Centre (CNIO) as the Scientific Director of the CNIO Biobank. In this capacity, she aimed to position the CNIO Biobank at the forefront of cancer biobanking both nationally and internationally, facilitating high-quality research for precision diagnostics and personalized medicine.

By 2021, she was appointed Coordinator of the Biobanks area within the National Platform of Biobanks and Biomodels, National Node Director for Spain in the European infrastructure BBMRI-ERIC, and Director of Management of the National Network of Brain Metastasis (RENACER). These roles underscore her leadership in advancing biobanking and cancer research initiatives.

In December 2023, Dr. Ortega-Paíno was appointed as the General Secretary for Research at the Ministry of Science, Innovation and Universities in Spain. Her extensive experience across academic research, healthcare, industry, and the third sector, spanning over three decades, positions her uniquely to influence and advance Spain's scientific research landscape.

Alba Fernández Sanlés: Round Table 2

Dr Alba Fernández-Sanlés is a biologist working in Population Health Sciences to advance disease prevention and healthy ageing. She is also active in science communication and in advocating for environmental sustainability, equity, and inclusion.

She holds a five-year BSc in Biology, specialising in Molecular Biology and Biotechnology, from the Universidade de Santiago de Compostela (Galicia, Spain). She earned her PhD in Biomedicine at Pompeu i Fabra University (Barcelona, Spain), followed by a three-year postdoctoral position at the MRC Integrative Epidemiology Unit, University of Bristol. She is currently a Research Fellow at University College London, having held positions within the Department of Population Health Sciences and, more recently, the Division of Psychiatry.

Outside academia, Alba is extensively involved in community engagement and activism. She served on the Executive Committee of the Society of Spanish Researchers in the UK (SRUK/CERU), leading its Outreach and Public Engagement Department, and continues to support its activities. Her activism spans the climate crisis, equity, and cultural diversity. In response to an environmental disaster in Galicia (Spain), she founded the Volunteer Initiative for Environmental Innovation and Research of the Atlantic (VIEIRA), a collaborative bringing together scientists and citizen scientists.

She is also part of Homeward Bound, a global leadership initiative for women and non-binary people with a STEMM background working toward planetary sustainability. She completed its year-long online programme as part of cohort HB8 (2023–2024), and earlier this year voyaged to Antarctica in the final and largest Homeward Bound expedition to this polar region. The expedition brought together 124 international participants from multiple sectors and diverse disciplines, all dedicated to tackling pressing global challenges (including climate change), advancing gender equity in leadership, and fostering interdisciplinary collaboration. She was the first woman of Galician origin to participate in a Homeward Bound expedition.

Isabel Torres: Workshop

Dr Isabel Torres is the co-founder and CEO of Mothers in Science. After completing a PhD degree in genetics at the University of Cambridge and a postdoc at the MRC Laboratory of Molecular Biology in the UK, she moved to France where she worked for several years as a science writer, editor and consultant before founding Mothers in Science in 2019. A dedicated science communicator, Dr Torres co-founded the UK-based science outreach project Microscopes4Schools in 2012 and later launched Pretty Smart Science, an online platform that aims to promote scientific literacy and increase the visibility of women in science. She is a passionate mentor and advocate for women in STEMM, gender equality and social justice. She is a mother of four children.

12nd SRUK/CERU INTERNATIONAL SYMPOSIUM

"FACING CHALLENGES"

Symposium Organising Committee

Sara Franco Ortega: Symposium's Chair

Sara holds a degree in Biotechnology at the University of León (Spain) and two Master's Degrees, one in Advanced Microbiology (University of Barcelona) and another in Quality Management and Safety in the Food Industry (Madrid's Institute of Training, Spain). She obtained her PhD in plant pathology at the University of Turin (Italy) in 2019, where she specialised in the development of new molecular techniques for the diagnosis of plant pests. She did her first postdoc at Newcastle University working on a project in partnership with Syngenta UK. This project led to new insights into the roles of enzymes involved in the detoxification of xenobiotics in wheat, where she looked into the molecular and biochemical mechanisms of herbicide-resistant weeds. Right now, Sara works as a postdoc at the University of York, focusing on the use of bacteriophages as biocontrol agents of the major plant pathogen Ralstonia solanacearum in the plant rhizosphere.

Alejandro Martínez Jiménez

Alejandro Martínez Jiménez is an associate researcher at the University of Kent. He started his career with a bachelor's degree in Physics at the Universidad de Murcia, continued doing a Master's in Photonics at the Universitat Politecnica de Cataluña and, finally, a PhD at the University of Kent. During his PhD, he worked on the "Next generation of tunable lasers" and the use of laser sources to improve the capabilities of optical imaging techniques, specifically in optical coherence tomography. During the last year as an associate researcher, he has also focused on new endoscopic systems.

Elisa López Capel *

Dr. Elisa Lopez-Capel is a Senior Lecturer in Soil Science at the School of Natural and Environmental Science, Newcastle University. Her research primarily addresses the sustainable utilization of natural resources for food production and the intricate processes of carbon sequestration in soil. For more details, please visit her research profile.

Dr. Lopez-Capel became a member of SRUK/CERU in 2022. She is a founding member of the North East constituency and the Environment Committee. Additionally, she frequently organizes SRUK/CERU events, including the XI International Symposium in Newcastle (Summer 2023) and the "Science-me a Story" events.

Carmen Sánchez Cañizares: Round Table 2 Chair

Carmen Sánchez is an agronomist and the main focus of her research is a process called Biological Nitrogen Fixation, which only certain microbes can carry out to convert atmospheric nitrogen into a biochemically usable form for the plants, acting as biofertilisers.

She is currently working in the Department of Biology at the University of Oxford as a Royal Society University Research Fellow studying the regulatory networks that control the metabolism of these bacteria in order to understand the molecular mechanisms responsible for the establishment of an efficient symbiosis with legume plants.

During her time in Oxford, Carmen have been a lecturer in Biological Sciences at The Queen's College and participated regularly in several outreach activities. She is actively involved in the Society of Spanish Researchers in the United Kingdom (SRUK/CERU), being a former director of the Oxford constituency, and SRUK/CERU president.

Clara Albiñana

Clara is a postdoctoral researcher at the Big Data Institute, University of Oxford, working on integrating blood biomarker data from population-based biobanks to advance our understanding of disease risk and generate prediction tools to improve early detection. She completed her PhD in statistical genetics at Aarhus University, Denmark, and she currently hold a Lundbeck Foundation Postdoctoral Fellowship, a Danish foundation focused on neuropsychiatric research. Clara has a particular interest in psychiatric disorders, having worked on psychiatric genetics during my PhD and focusing on the circadian hypothesis of depression during my postdoc.

Clara is a relatively new member of SRUK/CERU but she is highly motivated to engage in this enriching community.

Ana Aragón González *

Ana Aragón is a postdoctoral researcher, and her work focuses on understanding the mechanisms underlying Parkinson's disease using CRISPR technology to selectively suppress genes in patient cellular models. She is based at the Nuffield Department of Clinical Neurosciences (NDCN) at the Kavli Institute, University of Oxford. Ana studies how these genes contribute to disease pathogenesis and cellular diversity. During her PhD at the University of Sheffield and Malaga, she specialised in modeling the Blood-Brain Barrier (BBB) using stem cells from ALS patients. She later received a Spanish Fulbright Scholarship to further this research at Nationwide Children's Hospital (USA) to investigate neurodevelopmental disorders. Her research goal is to elucidate the molecular pathways involved in neurodegeneration and contribute to the development of new therapeutic strategies.

Rosa Sánchez Lucas # Talk

Dr. Rosa Sanchez-Lucas finished a higher engineering degree in Agronomy with a project about holm oak seedlings response to drought at the University of Cordoba. After that, she completed a master's degree on Plant Protection, Production and Breeding with the project about nitrogen fertilization effects to frost response in olive tree. Her PhD in Agricultural, Food, Forestry and Sustainable Rural Development Engineering studied warming temperature effects on olive tree. Currently, she works as a postdoctoral researcher at the department of Plant Sciences at the University of Birmingham, studying the induced resistance of oak against powdery mildew.

During all her professional career, she has studied the effect of stress on trees: and how they respond through physiological and biomolecular approaches: 1) abiotic stress as drought (undergraduate), temperatures (master and PhD) and elevated CO_2 concentration (current postdoc). 2) Biotic stress as oak powdery mildew, oak acutate decline and ash dieback (current postdoc). 3)Epigenetics changes caused by plant (a)biotic stresses. 4) Transgenerational inheritance of epigenetics in forest trees.

Yaiza Gutiérrez Vázquez

Yaiza Gutiérrez is a bioinformatician at the UK Health Security Agency (UKHSA), in the Public Health Microbiology team. Her role focuses on developing new bioinformatics pipelines and supporting other teams with data analysis. A key part of the work contributes to pandemic preparedness, helping to track and understand infectious diseases through genomic surveillance.

Before joining UKHSA, Yaiza completed a PhD in fungicide resistance at Fera Science Ltd and Newcastle University. The research aimed to understand the relationship between phenotype and genotype, uncovering how genetic mutations translate into real-world resistance. It was through this work—diving into sequencing data and developing analytical approaches—that my passion for bioinformatics truly began.

She enjoys solving complex problems, building efficient workflows, and using data to inform public health decisions. With a strong background in genomics and data analysis, Yaiza am committed to advancing bioinformatics to protect public health.

Virginia Martín Torrejón *

Virginia Martín is a Marie Curie Fellow based at Brunel University London, where her research focuses on developing algae-based biomaterials for sustainable packaging applications. This work aims to create environmentally friendly alternatives to conventional plastics, addressing pressing global challenges such as plastic pollution and resource depletion.

During her PhD at Brunel University, Virginia specialised in the development of biobased foams designed for thermal insulation and cushioning in packaging applications. Building on this work, she continued to advance this research during her postdoc at the Southern University of Science and Technology in Shenzhen (China).

Francisco Romera

Francisco works as a Senior Lecturer and Course Leader for the BSc Business and Marketing at Falmouth University from 2022. He has previously worked at other universities. He has been a member of SRUK/CERU since 2021 and part of the Symposium's Organising Committee since 2022.

His research interest considers innovation and knowledge management as an axis for sustainable development in different industrial sectors, with the tourism sector being one of the most studied.

12nd SRUK/CERU INTERNATIONAL SYMPOSIUM

"FACING CHALLENGES"

Posters presenters and abstracts

Poster No. 1: Elisa López Capel *Organising Committee, see biography above

Poster abstract:

Real-Time Monitoring of Soil Health Using Soil Sensors at Cockle Park Farm: Insights from Agroforestry and Tillage Trials

The integration of advanced soil sensor technology at Cockle Park Farm aims to revolutionize the monitoring of soil health under sustainable agricultural practices. This research explores the deployment of soil sensors in agroforestry and tillage trials to gather real-time data on soil moisture, temperature, weather conditions, and soil electrical conductivity. Utilizing the LoRaWAN network, these sensors are designed to transmit data from the field to the farmyard, where it will be processed and visualized on a dashboard. This system aims to enable the generation of predictive models for soil carbon, nitrogen, and phosphate levels, which can then be used to create heat maps of soil nutrients. These heat maps are intended to provide critical insights for informed decision-making in sustainable agriculture.

The monitoring system at Cockle Park Farm is currently being developed to collect evidence on the impacts of various management practices. For instance, the data is expected to reveal how tillage practices influence soil carbon and moisture levels, and how trees in agroforestry modify the microclimate experienced by crops, acting as buffers against temperature and water stress. By integrating this monitoring system with other farm management systems, we aim to enhance the overall efficiency and sustainability of agricultural practices.

Preliminary findings from the tillage and agroforestry case studies at Cockle Park Farm highlight the potential applications and benefits of real-time soil health monitoring. This research underscores the importance of continuous monitoring and data-driven decision-making in achieving sustainable agricultural practices. By leveraging advanced sensor technology and robust data networks, we aim to better understand and manage the complex interactions between soil health, crop

performance, and environmental conditions. This research contributes to the growing body of evidence supporting the use of technology in sustainable agriculture and offers valuable insights for farmers, researchers, and policymakers committed to advancing sustainable farming practices.

In conclusion, the development of soil sensors at Cockle Park Farm represents a significant step forward in the quest for sustainable agriculture. The ability to monitor soil health in real-time and generate actionable insights is expected to empower farmers to make informed decisions that enhance soil quality, optimize crop yields, and mitigate environmental impacts. As we continue to refine and expand this monitoring system, we anticipate even greater integration with farm management systems, leading to more comprehensive and effective sustainable agricultural practices.

Poster No. 2: Beatriz Monterde Martínez

Beatriz obtained a PhD in Molecular Biology and Biomedicine from the University of Cantabria (Spain) in 2023, within the "Genomic Analysis of Tumor Development" group under the guidance of Dr. Ignacio Varela. In 2024, she joined the "Evolutionary Immunogenomics" team led by Dr. Luis Zapata with a Postdoctoral Fellowship Training. Her current research focuses on elucidating the role of the immune system during tumour evolution. To achieve this, she is developing immunogenomic-based metrics to predict response to immune checkpoint inhibitor therapies, utilising data obtained from high-throughput technologies (such as whole genome sequencing, whole-exome sequencing, RNA-Sequencing and spatial transcriptomics). In addition to this, Beatriz is the head of the Outreach and Public Engagement Department of SRUK/CERU and oversee the travel bursaries from the ICR Postdoc Committee.

Poster abstract:

Exploiting Genomic Data to Predict Cancer Treatment Outcomes

Introduction: Cancer arises from genetic alterations accumulated over an individual's lifetime, affecting its growth rate, immortality, metastatic potential, and immune evasion.

Immunotherapy has revolutionised cancer treatment by unleashing the ability of the immune system to target and eliminate cancer cells. However, its effectiveness varies across tumour types, and the reasons behind these differences remain unclear.

Understanding how genetic alterations shape clonal selection and tumour immunogenicity is essential for developing predictive models of cancer risk and treatment outcomes.

Methodology: To investigate this, we analysed genomic data from a cohort of 308 metastatic cancer patients from the Hartwig Medical Foundation, all of whom received different types of immunotherapies. We correlated their genomic profiles with treatment response and overall survival.

Results: We developed a novel metric, "Immune dN/dS", which measures the ratio of non-synonymous (N) to synonymous (S) mutations in the immunopeptidome (i.e., all peptides presented by the MHC complex). This metric stratifies patients into two groups:

- Immune-edited (Immune dN/dS<1): antigenic mutations are removed by negative selection, leading to poor immunotherapy response and lower survival rates.

- Immune-escaped (Immune dN/dS~1): tumours retain antigenicity, exhibit the best response to immunotherapy and improved survival outcomes.

Conclusions: Our findings establish Immune dN/dS as a potential biomarker for predicting immunotherapy response in cancer patients.

Poster No. 3: Ariadna Vidal i Herrera

Ariadna is a Biologist with a MSc in Microbial Biotechnology and Environmental Microbiology from the University of Barcelona. Aiming to use microorganisms as a tool to solve sustainability problems, her PhD in Metabolic Engineering at Newcastle University focuses on enhancing biohydrogen production through dark fermentation of agricultural waste. She is part of the Renewable Energy Northeast Universities (ReNU) CDT by EPSRC UKRI, an added-value programme with training in areas such as business, innovation and policy in the green energies sector.

Poster abstract:

Cell engineering to enhance biohydrogen production from agricultural waste

Biohydrogen is a promising alternative to fossil fuels and can be produced via dark fermentation of biomass. This project explores feedstocks, microbial strains and metabolic engineering strategies for optimising biohydrogen production from lignocellulosic agricultural waste. Feedstocks such as willow, hay, wheat, and barley—rich in carbon—were pretreated by hydrolysis and characterised to assess their suitability for microbial fermentation.

Shewanella oneidensis MR-1, Cellvibrio japonicus Ueda107, and Sorangium cellulosum So ce26 were tested for H_2 and volatile fatty acids (VFA) production. This is the first report of these strains being used for biohydrogen generation from lignocellulosic substrates. Maximum H_2 concentrations were obtained with S. oneidensis (70.9 ± 6.2 ppm at 12 h) and C. japonicus (76.6 ± 1.9 ppm at 36 h). Hydrogen yields exceeded literature values by up to sevenfold. S. oneidensis primarily produced acetic acid (6.48 mmol/L in willow medium) demonstrating that the strain follows acetic fermentation, which holds the theoretical maximum for hydrogen production at 4 mol H2/mol glucose.

S. oneidensis has been genetically engineered to enhance hydrogenase expression, guided by metabolic modelling. This work highlights how synthetic biology and metabolic engineering can improve microbial hydrogen production.

Poster No. 4: Virginia Martín Torrejón ***Organising Committee, see biography above**

Poster Abstract:

Zero-Waste Use of Seaweed to Create Sustainable Packaging and 3D Printing Materials of Sustainable Hydrogels, Films and 3D Printing Filaments

Seaweed is a material that grows in the ocean without needing land, fertilisers or freshwater. One particular species, Chondrus crispus, is commonly used to extract a polysaccharide called carrageenan, which forms gels widely used in various applications, such as food and cosmetics. However, traditional carrageenan extraction methods often discard large portions of the seaweed, generating waste and utilising harsh chemicals.

In our project, we take a different approach: we utilise the entire seaweed, minimising waste, and apply green chemistry principles to enable the seaweed to release its natural gelling substances without the use of harsh chemicals. These substances are then used to create soft gel-like materials and films, which can be applied to packaging and biomedical fields.

But we do not stop there. Instead of discarding what is left after the gels are made, we utilise the remaining seaweed to create filaments that can be used in 3D printing.

What makes this project special is that nothing is wasted, all the seaweed biomass is used to produce valuable materials. This supports the idea of a circular economy, where we aim to create new materials while reducing waste.

Poster No. 5: Ana Aragón González *Organising Committee, see biography above

Poster Abstract:

Silencing of α-Synuclein expression using CRISPRi in mature iPSC-derived Dopaminergic Neurons

α-Synuclein accumulation is causatively linked to the degeneration of midbrain dopaminergic neurons (DANs). This is supported by the identification of familial Parkinson's disease (PD) patients with α-Synuclein gene (SNCA) multiplications, where increased gene dosage is associated with disease severity. Our objective is to suppress SNCA gene expression in mature iPSC-derived DANs with SNCA triplication in order to understand the reversibility of α-Synuclein proteotoxicity.

To achieve this, we generated a doxycycline inducible dCas9-KRAB SNCATRIP human inducible pluripotent stem cell (hiPSC) line. HiPSCs were transduced with lentiviruses expressing SNCA gRNAs. Doxycycline was added at different time points and cellular phenotypes in DANs were monitored up to day 80.

We confirmed the induction of dCas9-KRAB with doxycycline and gRNA mediated silencing of SNCA. Early activation during floor-plate induction was remarkably effective, fully silencing SNCA gene expression. α-Synuclein levels were normalised when dCas9 was induced during the dopaminergic maturation phase. The reversibility of aggregation and aggregate-induced phenotypes will be presented.

Our study shows that an inducible CRISPRi can effectively reduce α-synuclein levels in mature hiPSC-derived DANs from PD patients, providing a valuable model for investigating molecular mechanisms underlying synucleinopathies.

Poster No. 6: Paula Bahillo Pobes & Lucía Sánchez Casanova

Paula is currently an undergraduate research visitor at the University of Hertfordshire, where she is undertaking a five-month project. This project serves as the final component of my degree program in Biotechnology at her university in Spain.

Lucia is a Spanish student who is doing a six-months project as part of her bachelor's degree at the University of Hertfordshire. She is studying biotechnology in Universidad Francisco de Vitoria back in Spain. Next year, Lucia will be doing a master's degree in translational medicine at Universidad Complutense de Madrid. Her main professional focus is on cancer research, although she is currently studying transcriptomics in duckweed. This is her first experience abroad and this will be her first scientific symposium.

Poster Abstract:

Life lessons from a tiny plant

Duckweed is that tiny aquatic plant that you frequently find at a pond or lake. When you look at it, you may not think much about this plant, nonetheless when you start studying it, you realised the different and powerful biotechnological appliances that it has. It could be considered one of the plants of the future, since it can be used as a plant-based protein substitute and is a great example of how farm feeding can be sustainable. Duckweed is very used in phytoremediation for its metabolic properties, which leads to it being capable of cleaning wastewater from farms. The same duckweed can be fed to the animals that polluted that water, acting as a source of protein. Five months ago, we did not know the existence of duckweed, which we find now unbelievable, since it is an interesting plant that should be more popular. During our bachelor degree our main focus was biomedical research, which did not include an extensive formation in the plant world. Not only did we not know duckweed, but we were also lost in most topics regarding plants, which made working in this project quite challenging.

Moreover, being away from home for the first time it was a crucial moment in our lives, that forced us to learn time management and organisations skills. At the same time, we were doing our first ever project, but we could not forget that we were living on our own.

Additionally, we found ourselves far from home, having to communicate in another language.

All in all, this experience has help us to grow as better people and scientists, for what we are thankful to SRUK for this opportunity. However, we could have never overcome all these challenges

without the help and support of our research group. During this talk, I will present a protocol that aims to address data accessibility and reproducibility issues by (i) using a pre-defined file structure before analyses take place; (ii) working with git and GitHub to keep track of file versioning; and (iii) using a documentation that guides users through every step of the analysis while clarifying any computational technicalities behind each command. While this protocol could be applied to any research field, I will focus on the workflow that computational evolutionary biologists follow to estimate evolutionary timelines with the aim to gain new insights into the structure of Earth's biodiversity and establish the timing of key evolutionary events.

Poster No. 7: Cristina Barrero Sicilia

Dr. Cristina Barrero-Sicilia is a Senior Lecturer in Biomedical Science at the University of Hertfordshire with extensive expertise in molecular biology and plant biotechnology. Her research spans seed development, lipidomics, and gene regulation across crops and model species. She has led and contributed to interdisciplinary projects on stress tolerance, phytocannabinoid biosynthesis, and, more recently, the application of carbon quantum dots to enhance photosynthesis. A Fellow of the Higher Education Academy, she is dedicated to impactful teaching, mentoring, and inclusive, collaborative science that bridges academia and global agricultural challenges.

Poster Abstract:

Inclusive Innovation: Embedding Gender Equality in Climate-Focused Plant Science

As a plant scientist, my research often focuses on genes that help crops adapt to climate change. But a recent international project pushed me beyond my comfort zone: I had to write a gender equality plan for a research grant. What began as a funding requirement turned into an eye-opening journey into the real-life impacts of gender inequality in both science and agriculture.

Our project, funded by the International Science Partnerships Fund (ISPF), explores how Quantum Dots—tiny nanomaterials—can enhance photosynthesis in rice, a crop vital to global food security. In collaboration with University Putra Malaysia and local farming communities, we aim to boost yields sustainably.

Initially, I hadn't considered how gender would shape our work. But after speaking with gender experts and attending a climate and gender roundtable, I saw a clear gap—not just in my approach, but in the wider literature. Key plant science papers rarely acknowledge that women are both disproportionately affected by climate change and central to food production.

We committed to change this: through inclusive workshops with women farmers, flexible project design, and collaboration with social scientists to track impact via gender-disaggregated data. This experience also revealed the structural inequities in science—where female researchers remain underrepresented and underfunded.

By embedding gender equality into our research from the outset, we are not just addressing climate resilience—we're contributing to a more inclusive scientific culture. This journey has shown me that inclusive science isn't an add-on; it's a critical part of doing science that matters.

Poster No. 8: Eva Junque

Dr. Junque is an Environmental Scientist and Postdoctoral Research Fellow at the University of Birmingham, specialising in persistent organic pollutants (POPs), emerging contaminants (ECs), and human exposure. Her research focuses on the environmental fate and toxicological effects of PFAS, flame retardants, pesticides, and metals, with emphasis on food safety.

As part of the EU Green Deal-funded SCENARIOS project, she is developing innovative methods to detect and assess PFAS, including recent work on contamination in fish and water from the UK and Spain.

With a PhD in Environmental Chemistry and experience across public and private sectors, Dr. Junque supports policy development through environmental monitoring and risk assessment.

Poster Abstract:

Assessment of PFAS pollution in fish and water from the United Kingdom and Spain and implications for human exposure

Per- and polyfluoroalkyl substances (PFAS) are synthetic chemicals widely used in industry and consumer products due to their resistance to heat, water, and oil. However, this same resistance makes them highly persistent in the environment and in living organisms, raising increasing concern for human health.

This study investigates the presence and distribution of PFAS in edible fish from the United Kingdom (n = 238) and Spain (n = 50), and also in UK water samples, including freshwater (n = 8,099), groundwater (n = 2,048), and saline water (n = 180), collected between 2020 and 2024. The goal was to assess dietary exposure risks and identify contamination patterns.

PFAS contamination was widespread across all samples. PFOS, a well-known legacy compound, was the most commonly detected. Notably, fish from Spain showed higher concentrations of long-chain PFAS (such as PFNA, PFDoDA, and PFUnA) and emerging compounds like 6:2 FTS, whereas UK fish had higher PFOS levels.

Estimates of dietary exposure suggest that the consumption of fish contaminated with PFAS exceeds the tolerable weekly intake (4.4 ng/kg body weight) recommended by the European Food Safety Authority. Spanish consumers showed a higher estimated intake (24.62 ng/kg) than British consumers (10.71 ng/kg).

PFAS were also frequently detected in UK water bodies, with some sites—particularly in Moreton-in-Marsh—showing levels above drinking water safety thresholds. The contamination is likely linked to the use of firefighting foams and nearby industrial sources.

These results highlight significant public health concerns and call for more ambitious regulatory actions, long-term environmental monitoring, and urgent remediation strategies to reduce PFAS exposure.

12nd SRUK/CERU INTERNATIONAL SYMPOSIUM

"FACING CHALLENGES"

Short talks presenters and abstracts

Talk No. 1: Pablo del Pozo Lorenzale

Pablo is an EngD researcher in Formulation Engineering at the University of Birmingham, focusing on fragrance retention in textiles. His work investigates the physico-chemical interactions between perfume raw materials and woven fabrics to improve scent longevity in everyday consumer products. He holds an MChem from the University of Leeds and completed an industrial placement at GlaxoSmithKline, where he developed high-throughput analytical methods to support biotechnology research. Pablo's background bridges both academic research and industry application, with expertise in formulation science, analytical chemistry, and material performance. His goal is to contribute innovative solutions to the fast-moving consumer goods sector through a deeper understanding of how fragrance ingredients behave in real-world laundering environments.

Talk Abstract:

Enhancing Perfume deposition from Powder detergents

A fresh scent after laundry is something many consumers care about. But keeping that scent on fabrics after washing isn't easy. Perfume ingredients—known as perfume raw materials (PRMs)—are often lost during the wash, with a large portion ending up in the drain. One reason is that these ingredients are volatile (they evaporate easily) and come in different chemical types, which affects how well they stick to fabric.

Scientists have found that how well liquids spread and stick to surfaces depends on certain physical properties, especially something called interfacial tension (IFT)—a kind of "surface stickiness" between droplets and the fabric. Lower IFT generally helps liquids deposit better onto fabric.

How Surfactants Influence Fragrance Retention

In our study, we used special tools to measure IFT and see how different surfactants (cleaning agents that also help mix oil and water) affect the behavior of perfume droplets in water. This is important because detergents often contain surfactants, and the right kind can help fragrances stay on clothes longer.

We tested two common types of surfactants:

- Surfactant 1 (anionic) significantly lowered the IFT between perfume droplets and water—by more than 80%—for both water-loving (hydrophilic) and oil-loving (hydrophobic) perfume ingredients. This suggests it helps perfumes stick better to fabric.
- Surfactant 2 (non-ionic) had little effect, especially on water-loving ingredients, even when used in higher concentrations.

These findings suggest that choosing the right surfactant could be key to improving how much fragrance stays on fabric after washing.

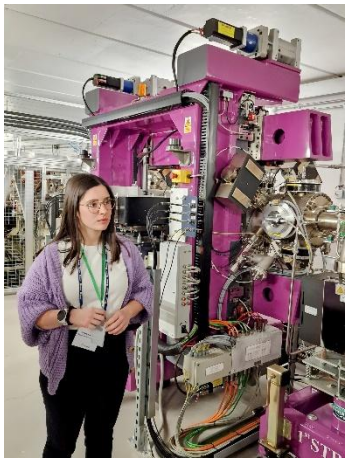
Why the Right Fragrance Blend Also Matters

Perfume mixtures in products are often made from a combination of fast-evaporating and longer-lasting ingredients. We wanted to find out if changing these mixtures could make a difference in how much fragrance remains on clothes after washing. To test this, we simulated washing conditions in the lab and then measured how much fragrance stayed on the fabric using gas chromatography–mass spectrometry (GC-MS). We discovered that blending in certain "sacrificial" ingredients—which are designed to be washed away—can actually help more of the desirable fragrance stay on fabric.

A Step Toward Longer-Lasting Laundry Scents

Our research looks at both the chemistry of surfactants and the design of fragrance blends to find better ways to keep scents on clothes after washing. By understanding how these ingredients interact with fabrics and water, we're helping to pave the way for next-generation laundry products with longer-lasting fragrance.

Talk No 2: Victoria García Giner



Victoria is a postdoctoral researcher at the Rosalind Franklin Institute, where she develops correlative workflows combining electron and light microscopy to study neurodegenerative diseases in model organisms.
She completed her PhD at Imperial College London, investigating the structural and biochemical effects of airborne pollution on human lung epithelial cells using correlative electron, X-ray, and fluorescence microscopy. She holds an MSc in Biomedical Engineering (Biomaterials) from Imperial and a BSc in Chemistry from the Universitat de València.

Talk Abstract:

From Materials to Cells: How High-Resolution Imaging Is Transforming Biology

One of the central challenges in the life sciences is understanding how diseases start and progress at the molecular level. The earliest signs of dysfunction often occur at the nanometre scale, within cells and organelles, long before symptoms appear. Capturing these subtle, early changes is key to developing a better understanding of disease and preventing its progression.

To study these events, researchers are increasingly turning to high-resolution imaging techniques, many of which were originally developed in physics and materials science. These methods, such as electron microscopy and synchrotron-based imaging, allow us to explore biological systems in three dimensions and at nanometre resolution.

As the saying goes, an image is worth a thousand words. In biology, combining microscopy with biochemical and clinical data helps build a more complete picture of disease. Whether visualising how pollution particles damage lung cells or how neurons begin to degenerate in Parkinson's, these techniques help us see what would otherwise remain hidden.

Talk No. 3: Javier Aguado Orea

I am interested in knowing more about early learning mechanisms associated with skills requiring complex cognitive systems, with a particular focus on the productive use of grammar by children. I have collected a longitudinal corpus of two children acquiring Spanish as their first language. And I have run analyses to test theoretical predictions on the extent to which children use particular combinations of words and morphemes productively (e.g., Aguado-Orea & Pine, 2015; Aguado-Orea, 2022). I have also designed experimental setups, such as the preferential looking technique or grammaticality judgement studies (e.g., Aguado-Orea et al., 2016) and I have developed an online scale for assessing adults' self-perceived language skills (Joyce and Aguado-Orea, 2021). I am co-author of a textbook on Psychology of Education for undergraduates.

Talk Abstract:

Why children play the same game or watch the same show over (and over) again, and how we know about it

This brief talk summarises a recent article in published by the author in The Conversation that has risen a considerable amount of interest, adding here more data from previous studies. Parents often find their children wanting to watch the same TV show or book at bedtime, even if it's just finished playing. This is due to the "input effect," which is a cognitive science concept that suggests children are sensitive to the occurrence of regularities and patterns in their lives. This is because babies are particularly adept at understanding certain types of material, such as the likelihood of certain sounds in speech. When young children return to watch the same show, they are driven by a desire to detect and consolidate the patterns in what they are watching, hearing, or reading. Repetition also has benefits for children's emotions, known as the "wellbeing effect." Children are constantly seeking out new experiences and stimuli, but the world can be exhausting and stressful. Well-known stimuli can provide comfort and security, buffering against stress and uncertainty. Deep interests in an activity can also provide wellbeing benefits through a sense of control and mastery. Regarding the empirical evidence for this, the main goal of this article is to show a new way to estimate the productive use of knowledge across development. The focus of this study is on how to use verbs with subjects productively in both English and Spanish. In English, one must use five different pronouns with verbs. Conversely, Spanish does not require explicitly using pronouns because verbs already incorporate this information. This distinction is relevant for the theories trying to explain the learning mechanisms behind the language acquisition process since they are expected to be universal. The constructivist approach indicates that young children can only represent their

immediate sensory environment initially and that this knowledge gradually becomes more abstract. Despite the appeal of the idea, observing the intermediate stages of complexity in real life is challenging due to the need to infer knowledge from actions. This study makes estimates of triteness (the number of verbs used with only one subject) and creativity (the number of subjects per verb) at different points and between children and their careers. The method is based on taking 1000 random tokens from the largest dataset that match the smallest dataset. We first conduct this analysis by identifying common verbs and pronouns across both datasets. The results show that children who speak Spanish use inflectional morphology in a less productive way in the early stages, but this variation is not observed for English children. In Spanish, these differences exist both within the child (at two different times) and between participants (based on bootstrapped comparisons of the differences in productivity), but not in English. These results have important implications for constructivist and nativist theories and will also be discussed in relation to the training mechanisms adopted by Large Language Models (LLMs), like OpenAI's Chat-GPT.

Talk No. 4: José Ángel Tejero López

José Ángel Tejero López es Doctor Cum Laude en Ciencias de la Educación con Mención Dr Jose Tejero López is a AECID Teaching Fellow in Spanish Language at the School of Literatures, Languages and Cultures. He also collaborates as a lecturer and supervisor in different Master's programs for Teaching Spanish as a Foreign Language at Camilo José Cela University (UCJC), Alfonso X el Sabio (UAX) and Valencia International University (VIU). Jose is a certified Spanish Teacher by the Instituto Cervantes, holding qualifications as a DELE examiner for all levels, SIELE instructor, AVE Global tutor, and he owns the recent DADIC certificate: a teaching accreditation diploma by the Instituto Cervantes. Previously, he was AECID lectureship in Cairo University and Spanish Teacher at Instituto Cervantes in this city (Egypt), Spanish Teacher for refugees in ESIC University (Seville, Spain), and Spanish Teacher at Instituto Cervantes in Albuquerque (New Mexico, USA). Jose has a longstanding passion for innovative approaches to teach Spanish Language and Culture in diverse contexts. This interest has led him undertake teaching and research mobilities in countries such as a United States, Peru, Egypt, the UK, Slovenia and Spain. As a researcher, Jose especially focuses on the connection between languages and cultures, with a particular interest in teaching and learning languages in migratory contexts and for others specific purposes, and this is reflected in his research trajectory, including his international mention PhD, awarded with the distinction of cum laude. Recently, Jose has become increasingly engaged with the integration of technology and Artificial Intelligence (AI) in language learning, as well as exploring the essential role of teachers and institutions to incorporate the technology throughout the process of teaching, learning and assessment.

Talk Abstract:

Digital Teaching Profile (DTP) of University Spanish Language Teachers in the UK

This short talk will present an ongoing research project focused on the Digital Teaching Profile (DTP) of Spanish Language teachers working in the UK universities. The study explores how digital tools and Artificial Intelligence (AI) are being integrated into the teaching practices of Spanish as a Foreign Language (SFL), second language (L2), or third Language (L3). The growing presence of digital technologies in higher education, combined with the demand for Spanish instruction in the UK, underscores the need for clearer understanding the current landscape. Addressing the lack of empirical data on the use of digital tools and AI in university-level Spanish teaching, this study is based on responses of an online questionnaire completed by Spanish language teachers. This research is structured around three key sections: personal and professional information, digital

teaching profile, and the emergence of AI in language teaching. This talk will encourage reflection on the digital challenges faced by Spanish teaching professionals in the UK universities, and it will conclude with forward-looking insights and recommendations for integrating digital technologies more effectively into language teaching and learning.

Talk No. 5: Sandra Álvarez Carretero

Sandra (Sandy) Álvarez-Carretero, is a computational biologist working as a research fellow at University College London. Her main interest is focused on developing and applying reproducible, user-friendly, and well documented methods and pipelines to study evolutionary processes. Over the years, Sandra has specialised in Bayesian timetree inference analyses with both molecular and morphological continuous data. As part of the main project, she is involved on timetree inference, although now focusing on MCMC algorithms and the assembly of empirical datasets to study human speciation and diversification (aDNA), the timescale of vertebrate terrestrialisation, and reconstructing the eukaryotic Tree of Life.

Talk Abstract:

The importance of data accessibility and reproducibility in computational research

While we have a vast collection of data at our disposal to investigate almost anything you can think of, many research fields do not often have a clear consensus on the best protocol to follow for data analysis. Questions such as "How can I follow the same steps detailed in the section of the paper?", "I am not an expert in bioinformatics, is there an easy way to understand how to run this tool/program with my data?", or "Can I really reproduce these analyses from start to end?" are just examples of what many researchers tend to ask themselves when they start working on a research project. These user-related issues show that we do not only need to invest time and resources on developing more efficient and cutting-edge algorithms to deal with the ever-growing availability of datasets: we also need to pay attention to how accessible these computational tools and programs are while ensuring they can be used within a reproducible environment.

During this talk, I will present a protocol that aims to address data accessibility and reproducibility issues by (i) using a pre-defined file structure before analyses take place; (ii) working with git and GitHub to keep track of file versioning; and (iii) using a documentation that guides users through every step of the analysis while clarifying any computational technicalities behind each command. While this protocol could be applied to any research field, I will focus on the workflow that computational evolutionary biologists follow to estimate evolutionary timelines with the aim to gain new insights into the structure of Earth's biodiversity and establish the timing of key evolutionary events.

Talk No. 6: Juan F.R. Herrera

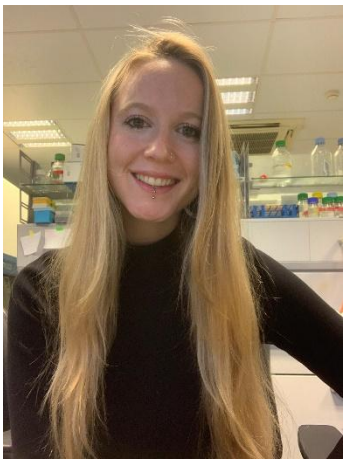
Juan Herrera joined EPCC in December 2015 after completing a PhD in Computer Science at the University of Almeria (Spain). He is the team leader for the training function of ARCHER2, the UK's National Supercomputer. He is also involved in other activities of the ARCHER2 service such as user support and outreach.

Talk Abstract:

ARCHER2 Uncovered: Insights into the UK's Supercomputing Service

Since its inception in May 2020, ARCHER2 has been at the forefront of the UK's supercomputing capabilities. Powered by an HPE Cray EX supercomputer with nearly 6,000 compute nodes, ARCHER2 offers exceptional processing capacity. This talk will delve into the components that constitute this service. We will examine the hardware features, including its architecture and performance metrics. Additionally, we will explore the software ecosystem available to users, designed to maximise the supercomputer's potential. The presentation will also highlight the comprehensive training programs aimed at equipping users with the necessary skills to effectively use ARCHER2, alongside the continuous technical support provided to address any challenges and optimise system usage. Attendees will gain a thorough understanding of how ARCHER2 is propelling research and innovation across the UK.

Talk No. 7: Lucía Cabello Alemán



Lucia is a PhD student in the area of Microbial Ecology. She holds a BSc in Biotechnology and a MSc in Research in Immunology from the University of Granada, with research stays in Berlin, Salamanca, and the Galápagos Islands (Ecuador). Her PhD thesis mainly focuses on the role of denitrifying bacteria in the bioremediation of nitrate-contaminated water in artificial wetlands near agricultural areas. More broadly, her research interests include biogeochemical cycles—especially the nitrogen cycle—in freshwater ecosystems and their relevance for mitigating global change impacts.

Talk Abstract:

Bacterial Denitrification in Headwater Streams: Tackling Nitrogen Pollution

Increasing urbanization and industrial and agricultural activities have long contributed to the release of large amounts of nitrogen (N) compounds into the environment. Particularly, in agriculture, almost half of the N fertilizer supplied is not used by plants and is lost through volatilisation, runoff or leaching. This loss of N leads to numerous and increasing environmental problems, such as the release of greenhouse gases (e.g., nitrous oxide, N_2O), eutrophication of water bodies, soil acidification and loss of biodiversity. Minimizing these negative impacts is currently a major challenge. Thus, improving our understanding of denitrification is crucial, given that it represents the main process that permanently removes reactive N from the aquatic environment, returning it to the atmosphere in its inorganic form. Aquatic ecosystems such as streams receive most of the excess N from their catchments, and land use types in a catchment can significantly affect the quantity and composition of carbon (C) and N inputs these ecosystems receive. These variations, in turn, can influence the N cycle, particularly the process of denitrification. This study examined the denitrification process in headwater streams draining catchments with four dominant land use types (natural vegetation, forestry, urban and agricultural) in three different bioclimatic regions of the Iberian Peninsula (Cantabrian mountain range, Sierra Nevada mountains and Mediterranean lowlands). We hypothesized that varying sources of C and N across land use types would influence the denitrification process. We collected water and sediment samples during winter-spring. Water was analysed for nutrient content (N and phosphorus, P) and physical properties (temperature, electrical conductivity and dissolved oxygen). In sediment samples, we measured the redox potential, organic matter content and major ions. Molecular methods (DNA extraction and conventional and real-time qPCR) were used to characterize the denitrifying bacterial communities and abundance of the main denitrifying genes (narG, nirS and nosZ). Urban streams from Mediterranean regions presented higher nutrient availability in water and sediment and lower dissolved oxygen and redox potential. Denitrification related genes were also higher at

Mediterranean urban streams. However, streams draining forested catchments (natural vegetation and forestry) had a lower nirS/nosZ ratio, suggesting a more efficient potential for denitrification.

Talk No. 8: Carlos Domingo Félez

In 2022 he moved to Scotland to work as a Lecturer in the Univeristy of Glasgow. Now, Carlos focus on developing environmental biotechnologies to reduce GHG emissions from water treatment, and teaches courses related to water treatment and hydraulics.

Talk Abstract:

Integrating dynamics of protein synthesis and decay in biokinetic models: The biohistory of N_2O emissions in WWT

Modern water treatment biotechnologies remove nitrogenous substances and rely on microbes that transform N species into harmless dinitrogen gas (N2). Unfortunately, a byproduct is nitrous oxide (N2O). N2O is a lesser-known yet potent GreenHouse Gas, with a warming potential 300x that of CO2. The GHG emissions (GHGe) profile from UK's water utility sector is dominated by process emissions and power consumption during wastewater treatment (WWT) and may prevent municipalities from becoming climate neutral. Scottish Water estimates over half of their process emissions originate from N-removal processes. Models that do not include the dynamics of gene regulation are incapable of consistently describing the different types of recovery kinetics after nutrient shifts. During wastewater treatment microbes are exposed to frequent disturbances, such as changes in oxygen levels or nutrient availability. This adaptation period delays the onset of exponential growth, observed as growth hysteresis. To estimate μ _max we must consider previous environmental conditions, i.e. biohistory [μ_max=μ _max·E, E∈(0,1)] because the cumulative previous conditions in WWT are always suboptimal. For example, the dual NH3 and O2 limitation of a WWTP model for AOB indicates a growth limitation (μ/μ_max) of 22 ± 7 %. The model assumes that the metabolic potential (maximum reaction rate) can only be determined if the past environmental history is known, captured through a convolution integral (1). The modelling framework compromises the complex structured models that incorporate the culture biohistory (DNA, mRNA, protein, etc.) and the relatively simple unstructured models (current models in wastewater treatment).

During WWT, N2O shows a higher variability than high-energy substrates (NH4+, NO3-, ~ mgN/L vs. ~ μgN/L) (2). Across the WWTP, the model: Tracks an activated sludge 'floc' across the WWT process to calculate its biohistory. Incorporates the growth hysteresis of the maximum activity of nitrifiers and denitrifiers (3). Quantifies the degree of inhibition on the maximum enzymatic activity. Results indicate a significant effect of cyclic aeration (30-90min) on N2O emissions and dynamics. However, the values for time-constants regulating the activity of key enzymes such as AMO, NXR, or NOS, lack in literature.

Talk No. 9: Karla Cárdenas Gómez

Karla is from Colombia and completed her Bachelor of Microbiology at Universidad de Los Andes. In 2013, she completed her Master of Food Science at The University of Melbourne, Australia. In 2022, she moved to the UK to start her PhD researching the evolutionary mechanisms of the plant pathogen Ralstonia solanacearum strain K60 to suboptimal temperatures. Her research involves in vitro experimental evolution, whole genome sequencing, variant calling analysis and in planta experiments. Karla is passionate about the complex relationships between microorganisms, plants and soil.

Talk Abstract:

Can temperature adaptation drive Ralstonia solanacearum strain K60 range expansion?

The Ralstonia solanacearum species complex (RSSC) consists of a group of phytopathogenic β-proteobacteria responsible for lethal wilts and rots in a wide variety of plants worldwide. The global distribution of RSSC strains is partly due to their ability to adapt and survive across different environments, resulting in spread to new locations in which they were not endemic before. In Europe, sporadic outbreaks of potato brown rot have been historically caused by cool- adapted RSSC strains. However, in the last years, tropical RSSC strains have been detected in cool-temperate regions of Europe, and a 2015 outbreak of warm-adapted Ralstonia pseudosolanacearum in greenhouse rose in the Netherlands has emphasized the potential risk of geographical range expansion of tropical RSSC strains into Europe. This study used experimental evolution to assess whether RSSC strain K60 isolated from tomato in the warm-temperate region of North Carolina (US) can adapt to colder climates. The ancestral K60 strain was experimentally evolved in rich liquid media at four different temperatures (15, 20, 28 and 34 °C) over 148 generations, after which phenotypic and genotypic adaptations were determined. The results showed that K60 can rapidly adapt to the 15 °C environment and that the improved growth at this temperature is especially clear in evolved non-mucoid colony types. In addition to identifying underlying genetic mechanisms of cool-temperature adaptation, in planta experiments comparing the virulence of ancestral and evolved populations in tomato model will be discussed.

Talk No. 10: Rosa Sánchez Lucas *Organising Committee, see biography above

Talk Abstract:

Epigenetic Memory in Trees: A Path to Forest Resilience

Memory is the acquisition, retention and transmission of information guiding future action. The imprinting of memory in plants mostly happens by altering their epigenetic signatures through changes in DNA methylation, which has been shown to contribute to both short-term phenotypic plasticity and the longer-term adaptive capacity. In our large project MEMBRA we are studying epigenetic changes and transgenerational memory because of different plant (a)biotic stressors in the key forest tree species (i.e. oak and ash). Elevated atmospheric CO2 (eCO2), drought and Acute Oak Decline endanger oak forest, while Ash Dieback Disease (ADD) threatens ash populations by altering vital forest traits.

Field experiments at BIFoR-FACE facilities and mixed plantations revealed intriguing epigenetic dynamics. Whole Genome Bisulfite Sequencing (WGBS) of DNA from leaves under different stresses were performed. Oak trees showed minimal global methylation changes (<5%) in CHH contexts, but DMR analysis revealed targeted alterations linked to transposable elements in CG and CHG contexts. Conversely, ash trees exhibited higher global methylation changes (12%) in response to ADD in CHH, being CG context linked to disease severity. Moreover, differences in basal levels of methylation were found among young and older trees.

Ongoing analysis of progenies exposed to these stresses aims to uncover seasonal and transgenerational epigenetic markers. These findings promise to transform tree memory into a functional trait, aiding in the selection of resilient forests for afforestation. By harnessing the immunological memory of trees, this research paves the way for creating adaptive and sustainable forest ecosystems in the face of climate change.