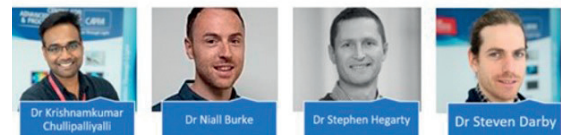


# BIOTECH FOR BUSINESS

## €350,000 AWARDED TO DEVELOP BIOPHOTONICS AT SHANNON ABC AND CAPP

The focus of most biological challenges over the past century has been how to do things faster, better, and more efficiently. Applying a range of technologies has helped address this; biology has always benefitted from cross-cutting technologies. Shannon ABC and CAPP (Centre for Advanced Photonics and Process Analysis) have been awarded €350,000 by MTU to establish BioPhotonics as a core expertise area – BioPhotonics@MTU. The funding provided through the Technological University Transformation Fund (TUTF) will provide funding for staff to develop and drive BioPhotonics as a knowledge domain.



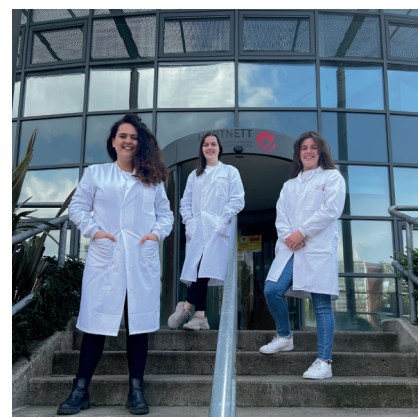
Biophotonics encompasses all light-based technology platforms (e.g. surface imaging, see-through imaging, microscopy, biosensors, medical lasers, spectromolecular and others) used in the life sciences. CAPP and Shannon ABC have collaborated in the past on small biophotonics projects; however, due to the short duration and limited bridging expertise, only basic questions could be addressed. This core funding will accelerate technology development, leading to solutions for Irish enterprises and undergraduate and postgraduate education.

BioPhotonics@MTU is being led by Dr Joanna Tierney (Established Research Leader, Shannon ABC), Dr Niall Burke (Emerging Research Leader, Shannon ABC) and Dr Mike McAuliffe (Established Research Leader, CAPP), supported by Dr Tim Yeomans (Shannon ABC Centre Manager) and Dr Liam Lewis (CAPP Centre Manager), as well as the broader teams.

Shannon ABC and CAPP are based on the Kerry and Cork campuses of MTU, respectively. Researcher secondments will be facilitated across both sites over the three-year project, bridging knowledge silos and facilitating genuine collaborative development across photonics and life sciences. This interdisciplinarity will be translated to the undergraduate level, and the team will work with academic staff to design 3rd and 4th-year projects based on BioPhotonics. As these students develop, this will ultimately deliver a pipeline of talent to grow BioPhotonics@MTU.

## Shannon ABC researchers on the RUN!

Technological University of the Shannon Midlands Midwest (TUS) is a founding member of the European Universities Initiative Erasmus+ funded Regional University Network-European University (RUN-EU) alliance which bring together seven like-minded, regionally focused Higher Education Institutions (HEIs): Politécnico de Leiria, Portugal; Häme University of Applied Sciences, Finland; Politécnico do Cávado e do Ave, Portugal; NHL Stenden University of Applied Sciences, Netherlands; Széchenyi István University, Hungary; Vorarlberg University of Applied Sciences, Austria. RUN-EU comprises more than 76,000 students, 8000 staff, 53 faculties, 97 research centres and groups and more than 30 associated partners including Regional, National, and international authorities. As part of the RUN-EU WP5 Discovery program three SABC researchers have been successful in the RUN-EU Discovery research mobility call.



Dr. Hande Ermis will be visiting HAMK University in Finland where she will work with Dr. Ulla Moilanen and Dr. Marika Tossavaine. This work will involve growth of selected microalgae under different light conditions, and analysis of various chemical compounds from the produced biomass. This visit will strengthen collaboration between Ireland and Finland in the field of algal biotechnology and lay the groundwork to build a long-term research collaboration between TUS and HAMK.

Jessica Walshe will be visiting MARE (Marine and Environmental Sciences Centre) at the Polytechnic Institute of Leiria in Portugal. She will work with an experienced team of researchers, under the supervision of toxicology expert Dr. Sara Novais. Researching the area of cannabinoids as part of her PhD, Jessica will explore the use of cell culture techniques to investigate whether a synergistic link exists between certain terpenes and enhanced cannabinoid activity. This will be done using a cell-based system, rather than animal based. Jessica will also assist researchers at MARE in the use of chromatography-based systems, such as HPLC, MSMS and GCMS, during her time there.

Ciara Davis will also be visiting HAMK University in Finland, studying under Dr. Marika Tossavainen and Dr. Salla Leppakoski working on biofortification of plants. Unlike her current approach in the CELLS research group (hydroponics), Ciara will be growing the plants in soil and applying the nutrients via foliar application. HAMK have a fantastic agriculture centre which will teach Ciara other ways of growth. This will be a four-week mobility abroad followed by elemental and metabolite analysis here in Shannon ABC.



## BOMB Calorimeter at Shannon ABC

Bomb calorimetry directly measures a substance's calorific or energy potential. The quantity of calories produced when a unit amount of material is completely oxidised is called its calorific value.

Bomb calorimetry has a range of applications, including analysis of;

- Animal feed
- Nutrition and food
- Fuel, e.g., Coal
- Oil
- Waste products
- Explosives



Within our client network, two essential applications include animal feed analysis and waste product analysis. Energy recovery from waste is an emerging technique as there is growing interest in biomass utilisation when transitioning to the circular economy. When waste cannot be recycled, the alternative is to convert it to energy. Bomb calorimetry can determine the amount of energy that can potentially be generated or its heating value.

In animal feed, energy is the most expensive component. The heat of combustion is the simplest way to describe the energy stored in food. Understanding the effects of energy on animal performance is essential for product development due to the economic importance of energy and its influence on animal performance.

This equipment is also helpful for food companies, particularly in the new product development pipeline, to assess the influence of product formulation on calorific value. The instrument at Shannon ABC is an IKA oxygen bomb calorimeter which is the market leader for determining the calorific values of liquid and solid samples.

## MEET THE TEAM

Shannon ABC is a collaboration between the TUS and MTU, and the Centre bring together a multidisciplinary team of researchers with commercial specialists to provide a centre of excellence in applied research, capable of exploiting opportunities in science and technology to the benefit of the Regional and National economy. Each quarter we will introduce you to some of our team.

**DR CAMILA BIBIANO** is a Postdoctoral Research Scientist at Shannon ABC in TUS. She is currently working on an Enterprise Ireland Innovation Partnership project that aims to develop novel agro-industrial products based on circular economy principles. Camila received her bachelor's honours degree in Agriculture Science from the Federal University Vales Jequitinhonha e Mucuri-UFVJM, Brazil, in 2012. Between 2009 to 2012, she was awarded Junior Scientist- CNPq scholarship, where she assisted part-time in two main projects related to herbicides phytoremediation and soil quality and intercropping systems.



Camila achieved her master's and PhD in Agrotechnology of Medicinal and Aromatic Plants from the Federal University of Lavras-UFLA, Brazil. Her research focused on crop management, secondary metabolites production and evaluation and bioactivity of natural compounds and their applicability in agrosience. In her primary research projects, she tested different sources and doses of organic fertilisers and their effects on the quantitative and qualitative plant metabolites' content. Additionally, she pushed the insecticidal effect of essential oils and their major compounds against fall armyworm (*Spodoptera frugiperda* L.) and its selectivity to non-target organisms (*Trichogramma pretiosum*). Her other expertise areas include phytochemistry and bioactivity of secondary plant metabolites, plant physiology, organic and sustainable farming, soil management and agrotechnology.

**STEPHEN EVANS.** In 2019, Stephen Evans received his BSc (Hons) in Bioanalysis and Biotechnology at Limerick Institute of Technology (now TUS). Stephen is a postgraduate student in Shannon ABC, TUS: Midlands Midwest. His project is on "The production of plant bioactive compounds using controlled environment systems" under the supervision of D. Siobhan Moane and Dr Peter Downey. The project aims to extract, purify, and quantify lutein in the flowers, leaves and stems of *Tropaeolum Majus* L. (Garden Nasturtium) grown under optimised controlled environment conditions. His 4th-year research project was on "The effect of a range of moss endophytic bacteria on plant growth and development".



**DR THERESA RUBHARA** is an agricultural economics researcher with experience in farm-level economics, food security, sustainability of food value chains and climate change. Currently, Theresa is a researcher at the Circular Bioeconomy Research Group, Shannon ABC, MTU, Tralee. Theresa is part of a team working on the SFI Farm Zero Carbon project, which aims to develop a model farm with a neutral greenhouse gas emission based on the Irish pasture-based livestock systems. Collaborating with researchers from TCD and UCD, Theresa forms part of a team developing the social innovation blueprint with a business model for farmers to mitigate climate change. The blueprint will contain essential resources and economic analysis of specific mitigation strategies, including the green biorefinery, which farmers can use to ensure carbon neutrality on the farm. Before joining MTU, Theresa worked as a post-doctoral researcher on the CAPRI Green project at Teagasc, which involved validating the CAPRI economic model with farm survey data to estimate economic, environmental and social sustainability on Irish farms. Theresa also worked on projects involving sustainability of the pork value chain and climate change for small scale farmers in South Africa. She received a PhD in Food Security from the University of KwaZulu Natal, South Africa, in 2018. Her research was focused on the economics of small-scale farm-level crop production choices. She also has a master's in rural development from Van Hall Larenstein University, Netherlands and a Bachelor's Degree in Agricultural Economics from Bindura University, Zimbabwe.



**RUTH SMITH** Ruth Smith received her BSc (Hons) in Herbal Science from Cork Institute of Technology in 2019. During her degree, she undertook a three-month internship at the Université de Bourgogne (UB), Science de Santé, Dijon, France, where she worked on extracting and purifying saponins from plants. Her final year research project was focused on analysing the antimicrobial activity of European propolis against antimicrobial resistant microbes. Currently, Ruth is working on the project titled 'Opti-biome: Natural extracts for dermo-cosmetic skin health' as part of her postgraduate study under the supervision of Dr. Joanna Tierney and Dr. Bridget Breen. The aim of the project is to evaluate the role of natural extracts to support the skin's microbiota and enhance skin health.





## CONTACT DETAILS:



**Dr Tim Yeomans** - Centre Manager  
 Phone: + 353 (0)66 714 4217 (Tralee)  
 Phone: + 353 (0)61 293 577 (Limerick)  
 Mobile: + 353 (0)86 106 0843  
 Email: tim.yeomans@mtu.ie  
 Shannon Applied Biotechnology Centre,  
 South Campus,  
 Munster Technological University,  
 Tralee, Co. Kerry, Ireland and  
 Hartnett Enterprise Acceleration Centre,  
 Technological University of the Shannon,  
 Moylish Park, Limerick, Ireland



**Dr Emma Murphy** - Senior Business  
 Development Scientist  
 Phone: + 353 61 293512 (Limerick)  
 Email: emma.murphy@tus.ie  
 Shannon Applied Biotechnology Centre,  
 Hartnett Enterprise Acceleration Centre,  
 Technological University of the Shannon,  
 Moylish Park, Limerick, Ireland  
 and South Campus,  
 Munster Technological University  
 Tralee, Co. Kerry, Ireland

[www.shannonabc.ie](http://www.shannonabc.ie)  
 @Shannon\_ABC



# Case Studies

## THE COMPANY

Ancient East Organics

## FUNDING SOURCE & VALUE:

Enterprise Ireland Innovation Voucher €5,000

## PROJECT TITLE

Development and Standardisation of recipe for Kombucha Tea

## PROFILE OF COMPANY

Ancient East Organics was established in 2019 as an SME in Co. Meath. The company was established to develop a standardised recipe for an Irish produced kombucha tea to add to the market. Ancient East Organics aimed to add flavour to the current Irish kombucha market by including both lavender and peppermint/mint, to enhance the properties and taste of their product.

## PROBLEM TO BE SOLVED

Ancient East Organics approached Shannon ABC to help in the development and standardisation of a Kombucha tea recipe, dependant on both fermentation time and temperature. The company wanted to determine:

- Which micro-organisms were present, and in what quantity.
- Total sugar content
- Total antioxidant activity

This information would allow them to compare against other products while also observing what effect the addition of lavender and mint/peppermint had on the bioactivity of the tea. .

## HOW GATEWAY DELIVERED SOLUTION FOR INDUSTRY:

Shannon ABC assigned a researcher to the project with expertise in microbiology and biochemistry. This researcher engaged regularly with the company and determined the optimal standardised recipe for the product. The development was carried out by experimenting with different parameters such as; water type, Scoby weight, fermentation temperature and time. Weekly samples produced at various conditions were delivered to the company for sensory analysis, to determine what production parameters aligned best with the company's expectations. A report was delivered at the conclusion of the project outlining the recipe development, microbial composition in addition to sugar and anti-oxidant activity.

## IMPACT FOR THE COMPANY

A standardised recipe for Kombucha tea was developed for Ancient East Organic Ltd that produced consistent results with an optimal fermentation time. The facilities and expertise at Shannon ABC, were central to the technical success of this project. Results from this study identified that the addition of lavender and peppermint/mint increased the antioxidant properties of tea, demonstrating the benefit of the addition of these ingredients.

## COMPANY TESTIMONIAL:

*"It was a pleasure working with the Shannon ABC team. I found them very professional, friendly and attentive to our requests and feedback, and particularly appreciated their practical approach."*

**Frederique Duchene, Owner**