



# Prachi Varshney

<b>Technology Centre:</b>	Shannon Applied Biotechnology Centre
<b>Academic Mentor:</b>	Dr. Sushanta Kumar Saha
<b>Company Partner:</b>	Tralee Bay Hatchery
<b>Company Mentor:</b>	Dr. Henry Lyons

Dr. Varshney holds a PhD (2018) in Microalgal Biotechnology and Ecophysiology from the IITB-Monash Research Academy in India, which is a joint venture between the Indian Institute of Technology Bombay (IITB) and Monash University in Australia, as well as an M.Tech (2011) in Chemical Engineering from the Indian Institute of Technology, Banaras Hindu University (BHU) Varanasi, India, and a B.Tech (2009) in Chemical Engineering from Chhatrapati Shahu Ji Mahanraj University in Kanpur, India. She worked as a Senior Research Scientist at Bharat Petroleum Corporation Limited (a Fortune 500 firm and India's second-largest downstream oil company)'s Corporate Research and Development Centre following her PhD (2018-2021). She has extensive experience in a variety of microbiological, biochemical, and analytical techniques as well as bioprocess development and has leveraged her expertise in the development of biotechnological processes for the conversion of both algal and lignocellulosic biomass to biofuels & biochemicals, and bioremediation of industrial wastewater & stack gases.

## Dr. Sushanta Kumar Saha

Dr. Sushanta Kumar Saha is working as a Microalgal Biotechnologist at Shannon Applied Biotechnology Centre in Technological University of the Shannon: Midlands-Midwest, Moylish Campus, Limerick. Dr. Saha has over two decades of cyanobacterial and microalgal biotechnology research experience. Dr. Saha and his team at Shannon ABC have created a unique biobank of Irish marine cyanobacteria, marine diatoms, and microalgae, and are currently exploring their potential for producing carotenoids (astaxanthin, lutein,  $\beta$ -carotene, fucoxanthin), bioactive lipids, and omega fatty acids, bioenergy (biodiesel, bioethanol), and other value-added molecules for anti-microbial, anti-inflammatory, anti-cancer, and anti-protozoan activities. They are also establishing a "Food-grade Microalgae cultivation Suite" as an indoor sustainable cultivation platform for producing microalgal biomass suitable for food, cosmetics, aquaculture, and feed applications. He has received numerous highly competitive Irish Government grants and has submitted about ten invention disclosure forms (IDF) to protect intellectual property through licensing or possible patenting. Apart from industries, he has strong ties to academic institutions all over the world and has collaborations in Ireland, India, Hong Kong, United Kingdom, and the United States.

## Dr. Henry Lyons

Dr. Henry Lyons is the project's company mentor. He is currently a Scientific Advisor to the company partner (Tralee Bay Hatchery) and is also the Technical Director of Nutramara Ltd. Dr. Lyons was the head of development at the Institute of Technology (IT) Tralee until 2005, when he accepted formal retirement to pursue other interests. He was responsible for external liaison with public and private sector groups in the region, as well as campus enterprise development. Dr. Lyons has long been interested in natural products derived from marine and terrestrial plants, and he has used his scientific background to assist several coastal communities in establishing small enterprises and environmental projects. This has aided in the creation of much-needed employment in these areas as well as the development of some novel agricultural goods and solutions. Since 1984, he has led over 25 R&D projects totalling over €2M in financing. He is a founding director of Kerry Innovation Centre Ltd and the driving force behind the establishment of the Tom Crean Business Incubation Centre, which is in the IT Tralee North Campus adjoining Kerry Technology Park. Dr. Lyons is a Fellow of the Royal Society of Chemistry (C.Chem., F.R.S.C.) and the Institute of Chemistry of Ireland (F.I.C.I.) and. Since 1970, he has written numerous editorials, news items, reviews, and general articles for Irish and European publications, as well as several research papers in international journals.

## Shannon Applied Biotechnology Centre

**Shannon ABC** is a research centre and technology gateway, which has scientific expertise in bioresources detection, characterisation, sustainable cultivation, and valorisation. It is a collaboration between Munster Technological University (MTU) and the Technological University of the Shannon: Midlands-Midwest (TUS) and is core funded by Enterprise Ireland as part of the Technology Gateway Network. It brings together a multidisciplinary team of researchers from MTU's Kerry Campus, and TUS's Hartnett Enterprise Acceleration Centre on the Moylish Campus. The centre focuses on user-driven research and collaborates with businesses and other research centres to deliver expertise and knowledge in applied settings. It has established a range of cutting-edge facilities such as raw material processing, analytical, microbiological, microalgal and fermentation suite, etc. and is using science and technology to help the regional and national economies.

## Tralee Bay Hatchery (TBH)

**TBH** is a 100% Irish owned and operated Blue Biotechnology Company situated in Kilshannig, County Kerry, Ireland. This innovative marine company (trading as Little Samphire Island) was founded in 2013 as a commercial oyster spat hatchery with the goals of: generating commercial quantities of Gigas oyster seed and developing as a R&D centre for scallops, native oysters, seaweeds, and microalgae. It is Ireland's only commercial-scale, multi-species hatchery, and it is disease-free, which sets it apart from the similar enterprises in France and the United Kingdom. As a result, it is vital to the local shellfish farmers and producers.

The oysters are fed several kinds of microalgae as part of their growth cycle, and the hatchery grows microalgae on site to meet this requirement. TBH experience and skill with microalgae cultivation have grown in tandem with the hatchery's expansion. They've now found an opportunity to transition from low-value feed additive for oyster growth to new, high-value bioactive compounds for usage in the nutraceutical, cosmeceutical, and food & beverage industries, using their microalgal knowledge and have already been awarded a contract by TUS (host academic partner) to examine licenses for scale-up and commercialization of a range of microalgal strains.

## Host Institution: Technological University of Shannon: Midlands-Midwest (TUS)

**TUS: Midlands-Midwest** is a public Technological University in the Republic of Ireland. TUS is the result of the merger of two Institutes of Technology: The Athlone Institute of Technology and the Limerick Institute of Technology. It has six campuses in Ireland, spread over four counties and three provinces. They are in Limerick, Athlone, Thurles, Clonmel, and Ennis. It is a research-intensive university with an applied, industry-focused curriculum, world-class research and development capabilities, and cutting-edge facilities. The university currently has a population of 14000 students and 1200 staff members.

## Prachi's project

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### **"Investigating the commercialization potential of selected microalgae and addressing the constraints to commercialization of algae-based high-value products"**

Microalgae contain a large number of biologically active metabolites. Over the past decade, their application has increased considerably across a variety of industries including pharmaceuticals, food, cosmetics, and agriculture. Several national and EU grants totalling hundreds of millions of euros have been given for microalgae-based projects. Shannon ABC at TUS has also developed intellectual properties (IP) for natural colorants, omega-3 and-6 fatty acids, and biodiesel fatty acids from microalgae and cyanobacteria, with Technology Readiness Levels (TRLs) ranging from 4 to 5. However, all research-funded programs face the difficulty of utilizing IP at the end of the study and gaining access to scale. The ability to grow and handle microalgae at scales of 100s to 1000s of litres is inextricably linked to the successful application of information gained from these efforts. Depending on funding continuity, IP outputs can be shelved and not used, or placed on hold until future funds are secured.

In view of the foregoing, the proposed project has two goals: use Shannon ABC's IP as a platform for determining their commercial potential, and (ii) analyse and license the IP outputs from other institutes utilizing their EU-funded initiatives. This project will license microalgal expertise and IP that has progressed beyond the 'proof of concept' stage and needs to be scaled-up to take the research to the next level.

All the pilot and large scale microalgae growth optimisation and metabolite extraction research will be conducted at the host institute. The successful completion of this project will give the pipeline technological expertise, techno-economic information, and experience needed to industrialize the microalgae-based innovations, resulting in new commercial prospects in Ireland as well as in other EU countries.

