

Industries transforming our world

# INNOVATORS

MAGAZINE

JANUARY 2019

*Steps to a*

## **SUSTAINABLE FUTURE**

**Creating**  
a circular  
economy

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Plating up  
the future  
of **food**

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# Editor's word



**W**elcome to this New Year edition of **Innovators Magazine**, which is being distributed at the annual conference of the **Industrial Biotechnology Innovation Centre (IBioIC) in Glasgow**.

Finding solutions to the long list of global grand challenges is the only pathway that leads to a sustainable future for humanity. The fate of tomorrow's generations, like never before, now depends on the actions industry and government leaders choose to take today.

Step forward biotechnology, which has a major role to play in developing innovations that can deliver a majority of the UN Sustainable Development Goals, or what has been labelled the 'blueprint for a better future'. Exploring this argument further inside this edition, we look at what fast-tracking the transition to a sustainable bioeconomy would mean for efforts to tackle the climate crisis, define the future of food, and create a more circular economy.

Pointing the way, Joanna Dupont-Inglis, Secretary General of the European Association for Bioindustries, EuropaBio, writes about how effective cross-sector collaboration can speed up the process. While Bruce Friedrich, Executive Director of the Good Food Institute, looks at the mainstreaming of the plant-based food revolution. Dr Rocio Ortego, our expert analyst on global health and climate issues, also discusses the work Doctors Without Borders is doing to raise awareness of the links between health and climate. And in our special feature section on IBioIC, we highlight how the market in Scotland is impacting biotech at a national and international level.

**Iain  
Robertson**  
Editor

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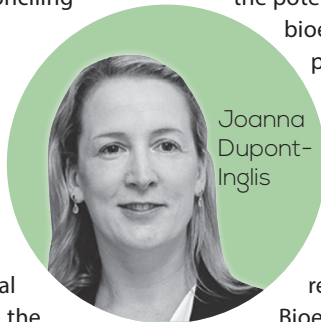
# Make the connection

» Fostering partnerships and collaboration to realise the potential of Bioeconomy in Europe

By Joanna Dupont-Inglis, Secretary General, EuropaBio



Over the past couple of years, the European bioeconomy has become a key discussion point for policy makers, scientists and industry alike. The European Commission aims to move towards a more low-emissions and innovative economy “reconciling demands for sustainable agriculture and fisheries, food security, and the sustainable use of renewable biological resources for industrial purposes, while ensuring biodiversity and environmental protection”. Investing solely in the development and commercialisation of new sustainable technologies and products is not enough to achieve such an ambitious goal. One important point to realise the potential of the bioeconomy is strong mobilisation and collaboration between actors in the bioeconomy and the bio-based industries, throughout all segments of the value chain. New partnerships can result in new ideas which in turn can help to more rapidly deploy bio-based solutions, including at



Joanna Dupont-Inglis

regional and local level. Cooperation, new initiatives, efforts and knowledge exchange between actors such as entrepreneurs, brands, local communities, policy makers, scientists, producers and journalists are thus key factors to raise awareness about the potential and benefits of the bioeconomy. Several alliances, partnerships, clusters, and projects have been put in place over the last years and will remain important vehicles for change, not least in view of the implementation of the recently updated European Bioeconomy Strategy.

These important endeavours have included the creation in 2015 of the European Bioeconomy Alliance, where EuropaBio is a founding member. This group is composed of 12 members representing sectors active in the bioeconomy, namely agriculture, forestry, biotechnology, sugar, starch, vegetable oils, pulp and paper, bioplastics, renewable ethanol, and research & innovation.

Bringing critical mass, connecting key sectors and creating new value chains in

the bioeconomy are amongst the driving forces behind the Bio-Based Industries Joint Undertaking (BBI JU), launched in 2014. EuropaBio played a leading role as founding partner in the initiation and development of this €3.7 billion public-private partnership between the European Union and the Bio-Based Industries Consortium. BBI JU has a diverse project portfolio, covering value chains based on agro-food by-products, forest biomass, bio-waste and aquatic biomass, and the activities are well-balanced between research & innovation actions, demonstration, flagship and coordination and support actions. Due to these BBI JU projects, sectors that may have never collaborated before, are now working together under one pan-European structure. By building bridges between key stakeholders from across a diverse range of relevant industrial sectors, including large companies and SMEs, academia, regional and technological clusters, relevant knowledge is combined to achieve innovation objectives and leverage investments. It will be important to keep building upon these successes.

Another initiative that promotes a more



cohesive approach amongst stakeholders throughout the bio-based communities is EFIB, the European Forum for Industrial Biotechnology and the Bioeconomy. Initiated twelve years ago with a few dozen participants, the annual forum now brings together more than 500 delegates in search for collaboration and engagement with new interlocutors from the bio-based community. Finally, a recent and important milestone in the context of the European Bioeconomy was the publication by the European Commission in October 2018 of the updated European Bioeconomy Strategy. The revision of the strategy clearly paved the way to a more integrative plan of action, aiming to create a sustainable and circular bioeconomy in the EU. Initiated by the 2012 European Bioeconomy Strategy, the Bioeconomy Stakeholder Panel, a pan-European group made up of NGOs, trade unions, regional organisations, technology platforms, academia and industry representatives set out to align on guiding principles, actions and recommendations for the future development of a sustainable bioeconomy. A milestone event in this respect was the adoption of the European Bioeconomy Stakeholders Manifesto in



Delivering the European Bioeconomy Stakeholders Manifesto to Commissioner Moedas.

November 2017.

I would conclude by emphasising the importance of breaking through traditional silos in our quest to reduce, reuse, recycle and to produce smarter, more sustainable, renewable products. The bioeconomy has shown that it is no longer a niche sector but encompasses a vast landscape of disciplines and industries and pools national and regional assets, strengths, and skills. The ability to learn from one another and implement locally

by connecting the dots between the multi-actor bio-based networks will be essential in accessing sustainable solutions to deliver on this updated European Bioeconomy Strategy. As can be seen, many partnerships and achievements have already been realised. However, a lot of work is still to be done if we want to reach the enormous potential that the bioeconomy has to offer, but there is also great motivation to reach concrete results and to work together in this endeavour.

# Climate crisis + health

By Dr Rocio Ortego,  
contributing expert analyst on global health and climate

*‘The health impacts of climate change demand an urgent response, with unmitigated warming threatening to undermine health systems and core global health objectives’.*

**T**hat is one of the key findings in a recent report from Médecins Sans Frontières (MSF), which translates to Doctors without Borders, an organisation I am sure many of you are aware of. It is a worldwide movement of more than 42,000 people that provides medical assistance to people affected by conflict, epidemics, and disasters. At the recent COP24 in Poland, I caught up with Dr Maria Guevara, Senior Operational Positioning and Advocacy Advisor at MSF, for this biotech and sustainability edition of Innovators Magazine, to find out about the links between health and climate change and the work MSF is doing to raise awareness about it.

“There remains a ‘global denial’ on just how connected climate change is with health,

much less with humanitarian action, and the work to raise awareness of the issues is as much within the organisational fold as it is in the larger community,” Dr Guevara said. “Unfortunately, emergencies are increasingly becoming more complex. Unless we actually begin to see how interrelated emergency situations, whether due to conflict, natural disasters, or epidemics, are with climate change, we will fail to respond effectively to the needs. As it is, the international response capacity today is already ill-equipped.”

MSF, which works globally in the most underserved areas, and in the worst climate affected hotspots, is stepping up its efforts to end the denial. At COP24 Dr Guevara presented a briefing paper that integrated the findings of the 2018 report of the

Lancet Countdown ([lancetcountdown.org](http://lancetcountdown.org)) on the connections between climate change and health, with MSF’s on-the-ground experience in treating some of the world’s most vulnerable populations, with a view to highlighting the dramatic health consequences already unfolding.

“This report is our first foray into climate change discussions and is a glimpse of our initial reflections into making the linkages between climate change and health as an organisation,” she said. “We need to be better prepared, improve our knowledge-base, work more closely together and bring each of our collective advantages to the table. Seeing the reality on the ground of some of the larger health and humanitarian impacts places MSF at the heart of the issue, and we



Go to  
**msf.org**

to learn more about the  
issues and find out how you  
can get involved.

have the data to contribute greatly to help bridge the knowledge gap.”

Among the findings, is a call for greater cross sector collaboration and improved planning to ‘build the specific skills and capacities of humanitarian organisations’ to better tackle the many challenges that are arising. You can find a link to the briefing at [lancetcountdown.org/the-report](https://lancetcountdown.org/the-report).

“Climate Change is real, the impacts of global warming are real, and as emergencies become increasingly more complex we are falling further behind the eight ball. The reality is that the international community is not equipped enough to manage the growing humanitarian crisis



globally,” added Dr Guevara. “It is important to remember that the impact of climate change is disproportionately affecting the ‘already vulnerable’. While the resilience of the global community is important, this will be a longer-term goal. Today the immediate concern is to go where the biggest needs are and where the most vulnerable people need help now. We need governments to act now, and enact policies to treat people with

humanity and provide the resources needed for climate change action that include health and humanitarian responses.”

#### **Acknowledgements:**

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Dr. Maria S. Guevara & Dr Rocio Ortego

*Changing*

# What we eat

By Bruce Friedrich, Executive Director, The Good Food Institute

*“If we can grow the meat without the animal,  
why wouldn’t we?”* →





It's a great question posed last August by then-CEO of global meat giant Tyson Foods, Tom Hayes.

Why not indeed, particularly when producing animal-free meat could solve some of the greatest global issues of our time while paying serious dividends to the bright minds who make it possible.

It's a question that a growing number of innovators have asked themselves as they race to bring the most compelling solutions – plant-based and clean meat – to market.

Since speaking to Innovators Magazine in January of last year, the momentum of this work to transform the global meat industry has been startling. This trillion Euro market is growing rapidly, but its inherent inefficiency makes it ripe for innovation. It can't happen soon enough, given the damage industrial animal agriculture causes to the environment, food security, public health, and animals.

That is why The Good Food Institute exists – to shift our supply from slaughter-based meat to plant-based and clean meat – which is real meat grown directly from cells. The potential has been recognised by governments, big food, and some of the world's largest meat producers, who, just like Tyson Foods, have made substantial investments in the space.

The success of established plant-based meat companies like Beyond Meat and Impossible Foods continues to boggle my mind. Despite expanding production facilities and adding new shifts, neither company can keep up with the demand for their products, which now feature at popular restaurant chains like TGI Fridays and White Castle.

Perhaps even more surprising have been the advances in clean meat. Startups working in this space are now closer than ever to commercialising their products, already achieving milestones that some had predicted to be far in the future. For example, California's Finless Foods aims to bring its bluefin tuna to market by the end of 2019, and Dutch company Mosa Meats has announced plans to sell clean meat beef by 2021.

Funding continues to pour into these



Bruce Friedrich

companies, coming from global venture capital firms to the world's leading meat companies like Tyson, Cargill, and PHW Group – which is the largest chicken company in Germany.

Canada's largest meat producer Maple Leaf Foods acquired plant-based meat companies Field Roast and Lightlife. Also in 2018, Mosa Meats announced that it raised \$8.8 million in funding with the support of Bell Food Group, one of Europe's leading meat processors.

These investments have been a pleasant surprise, given that years ago, it was an open question as to whether the meat industry would work to stifle innovation in meat production. But instead, more and more meat companies have embraced plant-based and cell-based meat as

they work to diversify their offerings to match consumers' changing appetites. And research shows that consumers are hungry for slaughter-free meat, reflecting a growing concern around the health, ethical, and environmental impacts of conventional meat production.

Plant-based meat sales are soaring, with The Good Food Institute's most recent survey with Nielsen showing that one in every five U.S. households are buying these products. Sales are up by 23 percent in just one year. If this growth rate continues like it did for plant-based milks, the market could soon be worth more than \$10 billion.

There is also widespread interest in clean meat, with most Americans saying they would be willing to try it and would consider replacing conventional meat with these slaughter-free products. Fully 40% say they would pay a premium for clean meat. And that's before any products are available on the market!

There is striking evidence to support our goal of transforming the meat industry to better means of production. From scientific breakthroughs and investor excitement to industry support and consumer demand, it could not be clearer that plant-based and clean meat will be the future.

These are the fields where innovators can do an amazing amount of good in the world, while doing very well for themselves in the process.


[gfi.org](http://gfi.org)





# DEFINING OUR ROLE IN THE UK'S BIOECONOMY STRATEGY

By Bouygues Energies & Services

 In December last year, the UK government published their bioeconomy strategy; **Growing the Bioeconomy: A national bioeconomy strategy to 2030**. Echoing many of the key messages highlighted in the European Bioeconomy Strategy, the UK paper emphasised the strength of our sector both in terms of societal impact and financial value.

The strategy presents itself as the result of extensive consultation between government, industry specialists and the research community and defines bioeconomy as “the economic potential of harnessing the power of bioscience and biotechnology.”

As ambassadors of the UK bioeconomy, we are well aware of what our industry is worth. From the production of more sustainable food, to the development of environmentally friendly bio-fuels, the growth of the bioeconomy benefits us all. But the UK Bioeconomy Strategy also impacts the Clean Growth Strategy, the Life Sciences Strategy, the Industrial Strategy and of course the overarching European Bioeconomy Strategy. The importance of getting the UK bioeconomy right, is enormous.

Then there's the national economic impact of a thriving biotechnology sector. The UK bioeconomy is currently responsible for up to 5 million jobs in the UK, with an estimated worth of £220billion GVA; yet the government has ambitions for further growth, where the UK is a global leader in bio-based solutions. The government predicts that the UK bioeconomy will double in size in the next 10-15 years and with the global market for biorefineries alone set to soar to £550billion by 2021, this prediction doesn't seem at all unlikely.

**“The bioeconomy represents the economic potential of harnessing the power of bioscience and biotechnology”**

Richard Harrington, Parliamentary Undersecretary of State, Minister for Business and Industry said: “A strong and vibrant bioeconomy harnesses the power of bioscience and biotechnology, transforming the way we address challenges in food, chemicals, materials, energy and fuel production, health and the environment.”

“The strategy sows the seeds to grow a world-class bioeconomy, building on the UK's strength to develop solutions that are economically and environmentally sustainable.”

## Four key challenges

Growing the Bioeconomy delineates the government's approach to transformation by outlining a wide range of opportunities accessible to the UK, enabling us to boost national productivity and address key challenges such as food, chemicals, materials, energy production, health and environment.

### This is articulated through four high-level goals

1. To capitalise on the UK's “world-class” research, development and innovation base.
2. To maximise the potential of bioeconomy assets to increase productivity from our existing renewable biological resources.
3. To support industry in order to delivery positive benefits for the UK economy.
4. To create fair conditions in national and international markets to allow innovative bio-based products and services to thrive.

## Facilitating the strategy

These are the actions required to facilitate the growth of the UK bioeconomy, but to be successful continued collaboration between government, industry and research organisations is vital. Bouygues Energies & Services is one of the key players and contributors to the UK bioeconomy and they have a history of working in collaboration with the leading UK research organisations. From experience of working with a variety of highly innovative and pioneering clients, they agree that although the technology and ideas exist, there's a requirement for improved high-level investment process, better collaboration and knowledge exchange between the different stakeholders.

By accepting the challenge of investment for businesses operating in the biotechnology sector, hopefully the new bioeconomy strategy will pave the way for improved opportunities - especially for disruptive start-ups and spin-offs - potentially through the creation of lucrative Sector Deals like those that have been established for Life Sciences and Construction.

Reflecting upon this approach, Zeb Ahmed, Deputy Managing Director, Bouygues Energies & Services stated: “With an unprecedented demand for resources, Bouygues Energies & Services fully endorse and support making the UK the global



partner of choice for the bioeconomy, fundamentally underpinned by collaboration between research and industry. Utilising the UK's world-class bioscience base as the launch platform, this should accelerate and catalyse the production of new, diverse industries of the future. From clean energy to innovative medicines, advanced recycled materials and waste valorisation; the sky's the limit!

"Bouygues Energies & Services are fully committed to the low carbon economy and as a pioneer and leader in Industrial Biotechnology we will continue to invest and develop our organisation's resources and capabilities to be instrumental in influencing, shaping, transforming and accelerating the bioeconomy industry of today and tomorrow."

### "We need to strengthen the way in which research is translated into commercial success in the UK"

The government has outlined that innovators need support in turning cutting edge ideas into a commercial success, but accelerating commercialisation of ideas is not only about supporting research. It is about ensuring that the capabilities and infrastructure are in place to move from the feasibility stages in the first place. Businesses like Bouygues Energies & Services are available to de-risk investments in new, or cutting-edge technologies, and accelerate products to market by offering comprehensive solutions from

#### **FEED studies and proof-of-concept, to scale-up manufacturing facilities.**

Zeb added, "For the past 11 years we have played an outstanding role as a leader in the Industrial Biotechnology sectors and we are responsible for most of the UK's demonstrator facilities. The industrial demonstrator facility and process plant projects we have been involved with are recognised as the leading, flagship technology innovation centres for the bioeconomy in the UK and Europe, for which we remain extremely proud and privileged to be associated with."

Whilst historically this model of working has been very successful for businesses such as Bouygues Energies & Services, if the government are truly committed to accelerating the commercialisation of ideas, there needs to be improved provision of **opportunities for relationships between research and business to be established.**

Innovation centres such as the IBioIC offer great opportunities for businesses to connect with other members of the biotechnology community so that these alliances can happen, but without continued investment it is difficult to see how these communities will continue to grow and develop.

The IBioIC is proof that investment works; established with an

### Strategic goals

- 1 To capitalise on the UK's "world-class" research, development and innovation base.
- 2 To maximise the potential of bioeconomy assets to increase productivity from our existing renewable biological resources.
- 3 To support industry in order to delivery positive benefits for the UK economy.
- 4 To create fair conditions in national and international markets to allow innovative bio-based products and services to thrive.

initial investment of £10million by the Scottish Funding Council in 2012, the Scottish Industrial Biotechnology sector saw an 18% increase in turnover between 2013 and 2015 and is on course to generate £900million by 2025. If the Bioeconomy Strategy proposes to encourage similar growth across other parts of the UK, IBioIC's model is surely one that needs to be followed.

### Final thoughts: Delivering Positive Benefits for the UK Economy

The Bioeconomy Strategy should provide a lasting platform for innovators, researchers, industrials and policy makers to facilitate the actions needed to drive innovation and for the bioeconomy to thrive. It stresses that by 2030, the UK will be a leader in bio-based solutions. Our industrial heritage certainly makes it difficult to envisage a United Kingdom that doesn't aspire to fulfil its role in the next evolution of industry, but is 2030 soon enough?

The nationwide STEM shortage is no secret; we need to ensure that we have a workforce equipped with the skills that the bioeconomy demands right now. The decades of damage caused by previous industrial activity is potentially irreversible; we need to halt environmentally harmful manufacturing and **make the switch to cleaner, bio-based products** before it is too late, not after.

Ultimately, it is clear that Bouygues Energies & Services, alongside their partners, have an exciting role to play in the UK's transition to a sustainable and circular bioeconomy. By delivering demonstration and pilot facilities they can reduce "perceived investment risk" for their clients; by offering FEED studies prior to project kick-off they can help clients improve efficiency and accelerate speed to market.

It is the next steps that are of crucial significance; the actions outlined by this strategy must become reality, and quickly, so that we may continue our collective progress in a UK sector that has almost limitless potential.

INFORS **HT**

# NEW CHAPTER IN ONGOING **SUCCESS STORY**

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 Over 20 years after the Multitron was first introduced on the market, INFORS HT now presents its fourth-generation, redesigned incubation shaker—one representing a new, even better solution for ideal cultivation conditions and delivering unsurpassed capacity, a minimal footprint and easy operation.

The new Multitron offers researchers even better conditions for cultivating microorganisms, cell cultures and phototropic organisms. The new temperature-control concept allows users to achieve optimum, gradient-free temperature uniformity, guaranteeing comparable growth conditions across all batches. The hygienic design of the new Multitron has been improved as well, with rounded interior corners for a chamber that has fewer components, making it far easier to clean. And its new UV decontamination

feature, its condensate-free, direct-steam humidification, and its antibacterial coating for the housing mean that the Multitron meets the stringent requirements of cell-culture applications.

The new Multitron also satisfies the increasing efficiency demands of the biotech industry. As was the case with its predecessor, the capacity-to-footprint ratio of this incubation shaker is unlike any other: by using a three-tier stacked configuration, researchers can cultivate over 50 liters and/or 23,000 batches in parallel—even though the base is only 1 m wide. The top unit remains at a comfortable working height of 1.40 m, while the new door mechanism and quick, automated start-stop feature keep interruptions in the cultivation process to a minimum.



“By combining traditional advantages with new features, the new Multitron is a response to trends and to new demands in research and development—developments that include increasing digitalisation. Starting now, for example, the Multitron comes with an Ethernet interface that can be used for connecting to simple SCADA software such as eve®.”

**Dr. Dirk Hebel, bioprocess equipment product manager for INFORS HT.**

# Welcome

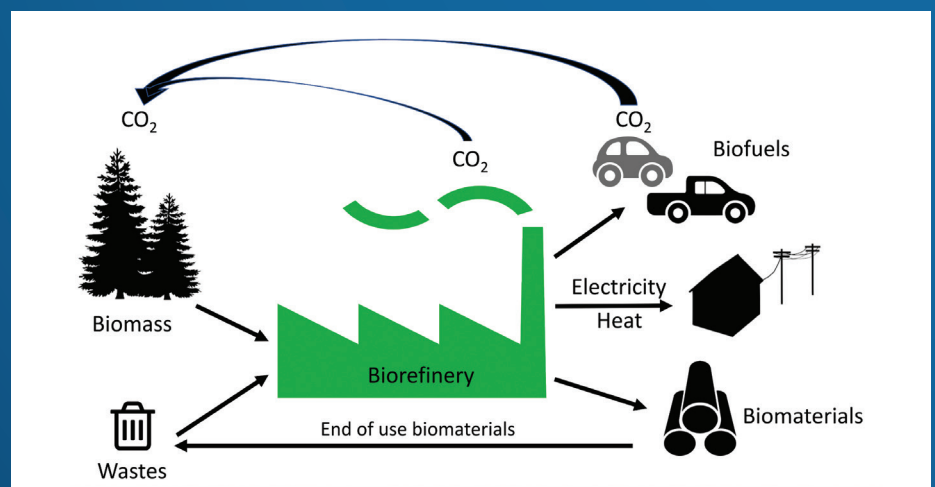
to the special feature section with all the latest from IBioIC.

## Wood Biorefining in Scotland

» One of IBioIC's key areas of focus over the next five years will be the development of supply chains, and one of the emerging supply chains for Scotland is wood biorefining

By Johan Belfrage, IBioIC Funding Manager

Wood biorefining holds the promise of creating a circular way to produce every day consumer products like feed, fuels, materials and everyday household chemicals used throughout our daily lives. By upgrading our forest resources to these higher value products, we have the opportunity to design new processes with zero net carbon dioxide emissions. In Scotland, we have enough forest residues that could be made available for biorefining to support a commercial scale biorefinery. The most viable ways forward to build the emerging forest based biorefining industry are to attract inward investment of commercial scale ready technology providers, and simultaneously work with the Scottish wood supply chain companies to expand their capabilities into this field through collaboration and partnerships with biorefinery technology providers.



In addition to the industrial activities, it is also vitally important to grow the academic expertise in both wood processing and the upgrading of the extracted wood components into high value products and applications. IBioIC is currently engaging

with academic groups, operators in the wood and forest residue supply chains, and state of the art biorefining technology providers to consult, support, finance, and facilitate the creation of this emerging industry in Scotland.

# Case Studies

IBiolC runs a significant number of projects with member organisations utilising the facilities at the FlexBio and RapidBio labs based at Heriot Watt University and University of Strathclyde. The following case studies demonstrate the value of these labs for organisations who need to either establish proof of concept or scalability for commercial production.

## Public Health England

Public Health England (PHE) has a target to reduce the burden of disease and improve the nation's health. PHE regularly initiate partnerships with industry and academia to forward these goals. This summer, FlexBio hosted a semi-pilot scale project for PHE in partnership with MicroPharm Ltd. The project investigated new therapeutic treatments for Clostridium difficile infection.

C.difficile can be treated with antibiotics. However, in light of growing concerns around overuse of antibiotics, PHE were keen to investigate an alternative antibody-based treatment. Therapeutic proteins can be isolated by downstream processing from

genetically modified E.coli which express the antibodies. The process has been shown to work as a concept, but for the treatment to be commercially accessible, demonstration at scale was required. A key part of the scale up process for isolation of the antibody involves the use of a different type of centrifugation from that employed at small scale. PHE needed to establish whether or not protein yield was conserved on process scale up.

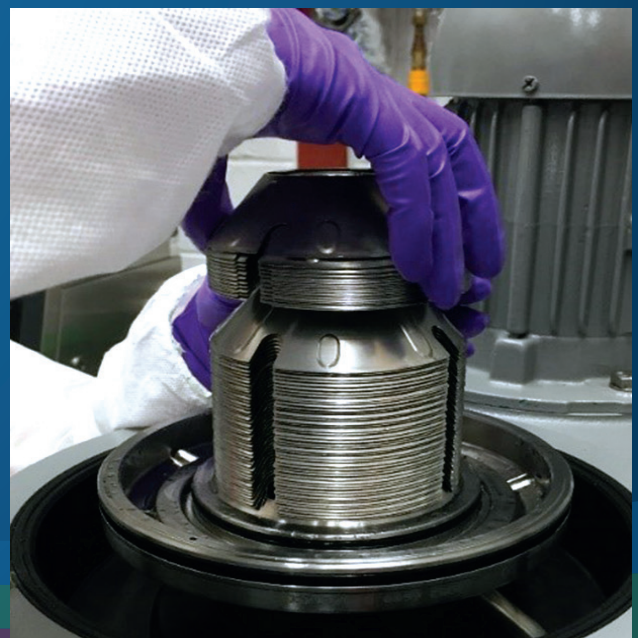
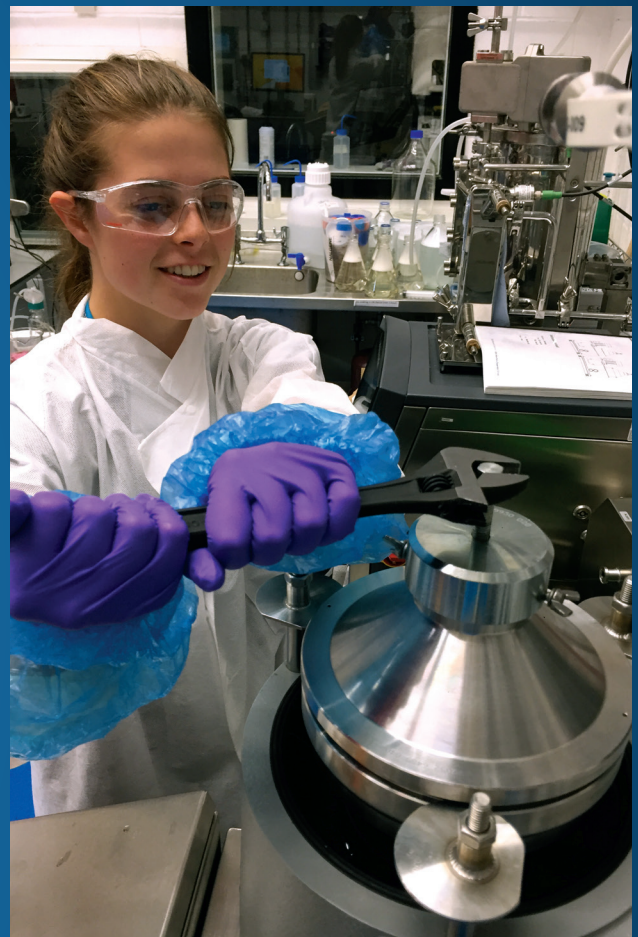
In partnership with the technical team at FlexBio, PHE were able to successfully validate process scale up, without compromising on the protein yield achieved at small-scale.

Scalability is an essential element of any successful new bioprocess. The IBiolC Equipment Centres are designed to provide clients with the necessary facilities to validate process scalability at minimal cost.

**For more information about the services the IBiolC Equipment Centres can offer, please contact [flexbio@ibioic.com](mailto:flexbio@ibioic.com)**



Public Health  
England



## Case Studies

3F BIO Ltd. is a biotechnology company that addresses the global need for sustainable high-quality food protein. They take sugars originating from cereal crops and use them to feed a protein-rich fungus which has been enjoyed by people the world over for nearly 30 years.

What's different about 3F BIO's technology is that anything that's not converted into protein is fed back into the refinery, in a patented zero-waste process which is 20 times more resource-efficient than beef production, and more efficient than any form of animal protein. It has ultra-low carbon intensity and needs minimal land and water - even compared to protein-rich plants like soybeans.

The end product, ABUNDA® mycoprotein, is a high-quality protein with a tiny environmental footprint.

3F BIO is a spin out company from the University of Strathclyde in Glasgow which has been supported in its development with the use of IBiolC's Rapid Bioprocess Prototyping Centre (RapidBIO) as well as IBiolC and Scottish Enterprise

grants which have facilitated the initial proof of concept in the laboratory. In 2018 after a successful Series A funding round, 3F BIO transitioned into pilot scale trials with the Belgian based open access centre BioBase Europe Pilot Plant (BBEPP) additionally supported by the SuperBIO European Union voucher scheme. This allowed the company to produce the first 'food-grade' material and created the opportunity to produce great tasting development products such as protein noodles, hybrid burgers and sausages as well as vegetarian and vegan friendly meat substitutes.

The global market for protein spans multiple categories including meat alternatives, meat hybrids, protein ingredients, dairy and pet food. Plant based protein is forecast to account for >20% of this growing market by 2050.

3F BIO's business model is to supply ABUNDA® mycoprotein as a B2B ingredient.

**For more information, contact 3F BIO at:**  
 - [info@3fbio.com](mailto:info@3fbio.com)  
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Burgers with ABUNDA @ mycoprotein



Sausages with ABUNDA @ mycoprotein



Protein noodles with ABUNDA@ mycoprotein



# IBioIC & the ICT-BIOCHAIN project

» IBioIC has recently teamed up with eight partners from across Europe on a project to increase the efficiency of biomass supply chains by using Information and Communications Technology

The ICT-BIOCHAIN project is a coordination and support project working across multiple value chains and instigated by The Bio-Based Industries Joint Undertaking (BBI JU), whose mission is to develop a strong European bio-based industrial sector to significantly reduce Europe's dependency on fossil-based products, help the EU meet climate change targets, and lead to greener and more environmentally friendly growth.

The main objectives of the project are to:

- Establish multi-actor digital innovation hubs for biomass supply chains
- Improve the efficiency of biomass supply chains within the Model Demonstrator Regions by producing a feedstock specific database of best practices, and new opportunities for digitisation.



- Establish a user friendly online platform to allow for wider exploitation of ICT, the Internet of Things and Industry 4.0 tools for improving supply chain efficiency.

- Pave the way for the replication of the Digital Innovation Hubs in other EU regions
- Disseminate and exploit ICT-BIOCHAIN Results.

The project will run until June 2020, and the expected impacts will be an increase in biomass supply of 10%, ensuring 20% of Europe's chemicals and materials production

will be bio-based, guaranteeing a secure and sustainable supply of biomass feedstock for European biorefineries and an increase in currently unused resources of 15%.

Additional impacts will include the creation of new jobs in valorisation, supply chain and ICT development fields and an improvement in public awareness, acceptance and trust in sustainable biomass generation.

[ictbiochain.eu/about-ict-biochain](http://ictbiochain.eu/about-ict-biochain)  
[www.bbi-europe.eu/about/about-bbi](http://www.bbi-europe.eu/about/about-bbi)



# Clean Growth Opportunities

## for Scotland

» The UK government announced on 13th December 2018 a world-first carbon 'net-zero' hub of heavy industry to help the UK seize global economic opportunities for clean growth

By Ian Archer, IBiolC Technical Director

The government announcement included funding of up to £170 million to help heavy industries like steel, ceramics, cement, chemicals, paper and glass to share expertise and innovative low-carbon solutions to clean up the air as we move to a greener, cleaner economy. The announcement also noted the value of the low carbon economy, indicating a potential worth of up to £170bn by 2030 with the potential to support up to twomillion jobs.

This announcement shows that the UK government is aligned with the principles of decarbonisation and this is potentially good news for Scotland.

### How do you de-carbonise the economy?

'Decarbonisation' is a wheel with many spokes –many of which can be addressed by adaptation of the bioeconomy including:

- Finding alternative, local sources of materials, thereby reducing transport costs and emissions
- Using alternative, 'green' fuels where transporting materials cannot be avoided
- Using renewable sources of power
- Developing new materials which require



fewer resources to produce or acquire

- Developing new processes to utilise materials which would otherwise be waste.

### How is Scotland placed to capitalise on this?

IBioIC is involved in a number of projects running in Scotland already which use Scotland's natural resources, including its existing industries, its geography, and its abundance of renewable power sources.

#### The ASLEE project

A £2million, two-year project to explore ways to grow algae on an industrial scale using excess renewable energy. The project developed a novel internally-lit photobioreactor to provide the light needed by algae to grow, and also demonstrated that algae growth was not affected by intermittent light.

#### The ENBIO project

Built on the ASLEE project by deploying a large scale algae growing facility on the Ardnamurchan Estate. The ENBIO project uses the novel photobioreactor developed in the ASLEE project to provide artificial light for

growing the algae. The light can be externally turned on or off as grid requirements demand, meaning that the system is ideally placed to absorb excess power generated by renewable sources such as wind farms.

#### The Building Innovative Green Hydrogen Systems in Isolated Territories (BIG HIT) project

BIGHIT uses renewable energy generated on the islands of Eday and Shapinsay to produce hydrogen from water, which can be stored as a high-pressure gas and is a clean-burning fuel.

#### How will Scotland benefit?

All of these projects are based in rural areas because that's where the resources are; whether timber or whisky co-product, or excess electricity generated from renewable sources. Rural communities often have a reduced infrastructure and fewer employment opportunities, making them vulnerable to a number of external forces. Facilities sited in rural areas not only make the most efficient use of available resources, but they can also offer a stable base upon which a more reliable infrastructure can be built.

If Scotland can maximise on the UK government's announcement via

these projects and others like them, then we have the opportunity to be global leaders in many areas.

A few years ago, the US chemical industry saw a financial boom as a result of access to cheap shale gas, delighting its leading figures: "It's a phenomenal opportunity. This is a gift to American entrepreneurs, the wildcatters, the oil and gas drillers, have given the country: 100 years of natural gas supply. There's no country on the planet that wouldn't love to get that, and then use it." Andrew Liversis, Chief Executive, Dow Chemical –quoted in the FT. This bonanza was a double-hit for the industry in supplying both cheap raw materials and cheap power and generally powered a substantial upswing in the economy of the entire country. However, the terrible environmental consequences of such an "opportunity" is suffered by the rest of the world.

Scotland has the capacity to achieve exactly the same outcome -but without the awful environmental cost-using clean, carbon neutral, renewable power, making us a World-Leader with thriving industries and accelerated innovation in exactly the sort of low-carbon and circular economies targeted by the Scottish and UK governments. It is clear that the installation of more and more renewable capacity in Scotland will give us a competitive, and green, advantage.



By Ian Archer

# Training & Education

» Courses and open days introduce IB to a wide and varied audience and are key to bridging the gap between education and industry and vital for engaging young people in the industry

**A**t a two-day Skills School Downstream Processing Masterclass recently hosted at FlexBio. MSc and PhD students were invited to Heriot Watt University, where speakers from member companies presented the roles of IB in industrial applications. Through lab tours and demonstrations, the students witnessed the extraction of foaming proteins from beer using different downstream processing equipment in the lab, from cell isolation, filtration and chromatography.

An 'Introduction to Fermentation course' was also held at the facility and allowed students to explore the different options available when conducting fermentation. A tour of the lab gave the students a chance to see various pieces of equipment in action, including a sterilisation-in-place of a 30L fermenter.

*IBioIC would welcome further interest in future practical courses, whether on the subjects listed or bespoke. Please email [Flexbio@ibioic.com](mailto:Flexbio@ibioic.com) for further information.*

IBioIC runs skills programmes from HND to PhD level, and has recently delivered its first CPD course to industry. The Skills programme works closely with industry to deliver workplace-ready graduates at all levels.

## The HND Programme

IBioIC's HND programme was developed in partnership with industry and FE education providers to meet the demand from industry for workforce entering the sector at junior lab technician level. Now in its second year, the programme has just welcomed a new cohort of 16 students into Year 1 and is already offering units from the programme on a part time and CPD basis.

Five HND students currently in Year 2 are

**“We find having new people in the lab is always positive, getting access to expertise and knowledge and finding out different perspectives to research problems. The results that the MSc students have provided have been very useful for our business.”**

due to graduate in June 2019 and will either move into industry as Laboratory Technicians, Research Scientists, Process Operators or Production Scientists, or continue on to Year 2 or 3 of a degree course.

*To find out more about hosting a summer placement for a Year 1 student in summer 2019, to invite applications from our Year 2 graduates, or to request more information on part time and CPD opportunities, contact our Skills Team on 0141 574 5376 or email: [Skills@ibioic.com](mailto:Skills@ibioic.com)*

## The MSc Programme

The MSc programme continues to flourish with a total of 123 students having signed up since the programme started. Part of the reason for the success of the programme is the Industrial Placement scheme, which places MSc students within one of IBioIC's member companies for a minimum of 10 weeks between May and July each year. Many of our MSc students have gone

on to employment with their placement company after graduation, and both students and companies recognise the value of the experience:

*“We find having new people in the lab is always positive, getting access to expertise and knowledge and finding out different perspectives to research problems. The results that the MSc students have provided have been very useful for our business.”*  
Cellucomp, IBioIC Industrial Partner

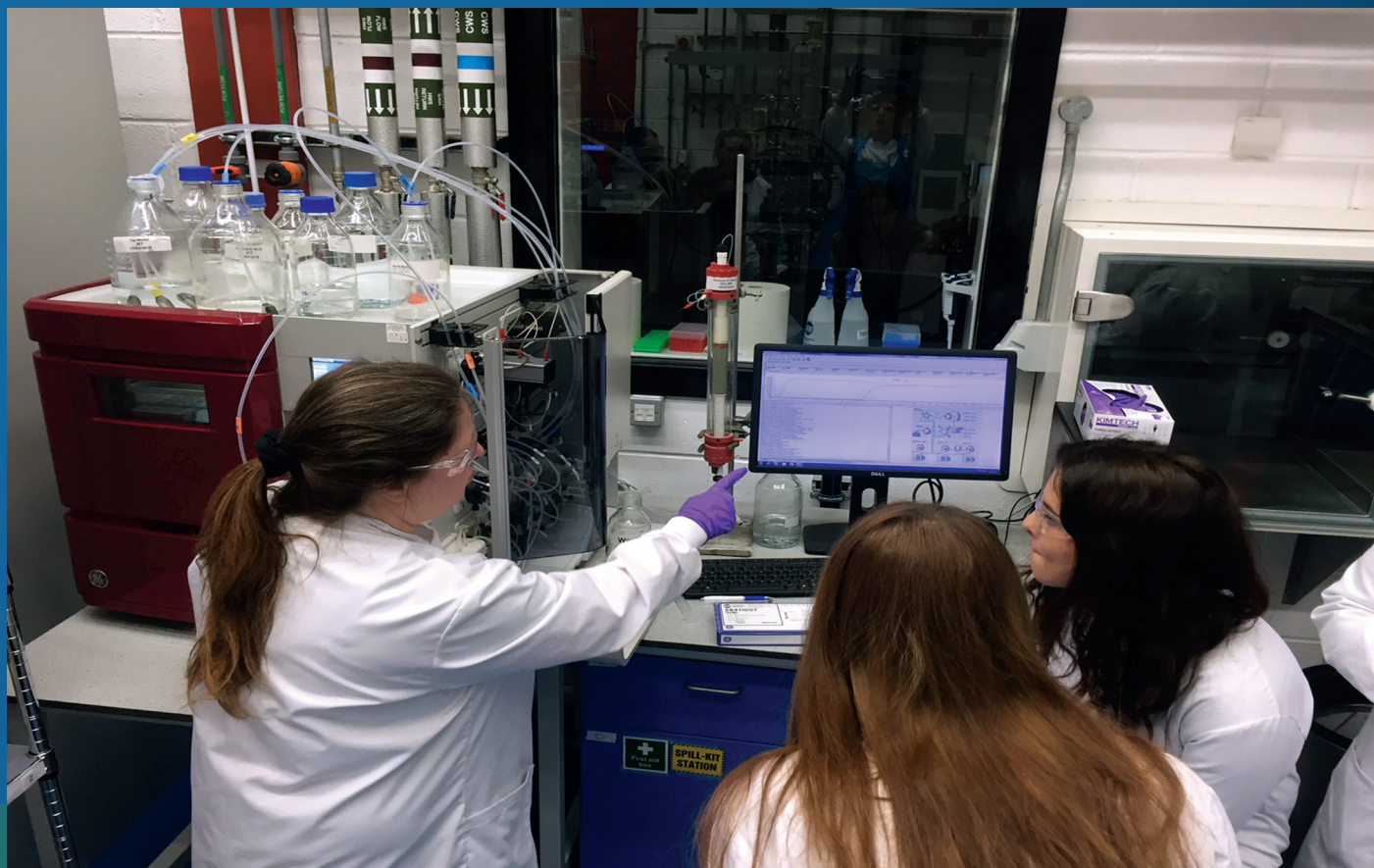
*“All this experience and knowledge that I gained this year helped me in my career path in the science field and right after the end of my placement I had a job offer by one of the world's largest clinical laboratory services provider.”*

Vasiliki Georgaki, IBioIC MSc student 2017-18

## The benefits to companies include:

- Free of charge access to the energy and enthusiasm of a highly motivated MSc student looking to learn about your company;
- The opportunity to undertake that investigative piece of work that's still waiting to get started using the student's knowledge, skills & experience;
- Motivating employees by involving them in the industrial placement to act in a management role;
- Identifying potential future hires and helping to support a pipeline of talent for the IB industry.

*IBioIC is currently recruiting companies to join the placements scheme for 2019. To find out more, contact our Skills Team on 0141 574 5376 or email: [Skills@ibioic.com](mailto:Skills@ibioic.com)*



**T**he circular economy model is an alternative to the unsustainable linear model in which we live. In the current linear model we take resources, produce, consume and waste. In a circular economy, waste becomes a resource to produce something else. But it is not only about having a good waste management system in place, it is about designing products so that we do not generate waste in the first place. It is about thinking systemically about the effect of every product and service in the bigger picture.

The Circular Economy Club (CEC) is the international network of 3,100 circular economy professionals and organisations in over 100 countries. CEC was founded in London by the Spanish Anna Tarí. CEC's activity is non-profit, global and open, anyone can join the club online for free. The club exists to spur collaboration by connecting professionals, because together we can have a higher impact.

Earlier this year, the CEC launched the largest open-source database on CE-related initiatives in the world. Using input gleaned from CE supporters worldwide, the database currently showcases more than 3,000 CE-related initiatives around the globe from more than 100 cities and 60 countries.

Anna Tarí believes this database will help create

# Circular Economy & Biotech

by the Circular Economy Club



a unified community of CE proponents who have a vast array of skills and represent nearly every industry. "To make this transition, it is essential we understand what is already being done and by whom," said Anna. One of the key interests upon building the database, was trying to understand the solutions in one of our major areas of concern: plastics.

In this light, CEC Members are revolutionising the way we look at plastics, just to name

some examples of leading organisations: Skipping Rocks Lab is an innovative sustainable packaging start-up based in London. They have created Ooho! - a sustainable flexible packaging for liquids made from seaweed-extract. This solution is a 100% natural alternative to plastic bottles, cups and sachets. The Ooho! material degrades in a natural environment in an average of 6 weeks and is also edible.

Another example and

CEC Member, Ioniga, is a technological organisation that offers a profitable solution for all kinds and colour of PET Polyester waste in the world. (eg plastic found in water bottles). At Ioniga they suggest the following solution: Mixed PET waste is shredded into small flakes and then dissolved in an ionic liquid with its Magnetic Smart Materials-catalyst.

The mixed fluid is then heated to a relatively low temperature (< 200 °C) at atmospheric pressure, then the PET waste starts to 'depolymerize' to its original building blocks – pure monomers – the raw materials for new PET.

After this chemical process, the colourants and other contaminants are magnetically separated. What remains is the end-product of Ioniga: 'virgin-grade' PET monomers (individual molecules that can be bonded to other identical molecules to form a polymer). The monomers are sold as raw materials to PET producers to create new virgin PET.

With the yearly 80% of unrecovered materials from the \$3.2 trillion worth that are used only in consumer goods (McKinsey Quarterly, 2014), the circular economy is the world's largest opportunity.

If you are willing to play your part, you can now open a CEC chapter in your city, university, hub or company and be the face of the transition towards a circular economy.

[CircularEconomyClub.com](https://CircularEconomyClub.com)



The international network of circular economy  
professionals & organizations



CIRCULAR ECONOMY  
CLUB

Free SIGN UP

## UPCOMING EVENT



During 4-10 March 2019, the Circular Economy Club (CEC) will be screening "Closing the Loop" in 46 cities globally.

"Closing the Loop" is the world's first feature-length documentary film on the circular economy.

Sign up and be part of this CEC Global Event by organize a screening or joining a session.

[www.CircularEconomyClub.com](http://www.CircularEconomyClub.com)

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