UNIVERSITY OF BIRMINGHAM

University of Birmingham Enterprise

ANNUAL REVIEW - 2020-21

Welcome to the Annual Review of 2020–21

University of Birmingham Enterprise enables businesses to use our intellectual property and expertise to develop new products and services. Some innovations have more immediate impact than others, as evidenced by the immediacy of the research response to the critical challenges posed by COVID-19 and climate change.

Our work starts with our academic community and the businesses we attract to work with us. Increasingly, our work involves connecting with the University's impressive collection of innovation assets, including Tyseley Energy Park and The Exchange, both of which opened in 2021, and supporting plans for new ones such as the Birmingham Health Innovation Campus.

It is essential for us to maintain this connectivity in order to capitalise on the opportunities that exist. While this necessity has placed huge demands on the team during the pandemic, each person has risen to the challenge, and we successfully transitioned to remote and hybrid working.

However, we recognise that to be truly effective, we need to be inclusive in everything that we do, and this will involve changing the way we think and operate. All of us have a role to play in understanding and dismantling barriers to creating a truly equitable innovation ecosystem. However difficult this work will be, we expect it will result in greater diversity amongst innovators and entrepreneurs, and enhance the prospects of ideas being adopted.

As challenging as 2020–21 has been, it was another successful year. I'm proud to present our highlights in this Annual Review, which, through a brief selection of the work, demonstrates the University's innovations, collaborations and the increased momentum in the Enterprise team.

If you would like to learn more about our innovations, training, investment, academic consultancy, or the space and facilities available in the Birmingham Research Park, please contact us – our details are on the back page.

David Coleman
CEO of University of Birmingham Enterprise

'The work done by the Enterprise team increases the University's impact, and enables both researchers and businesses to deliver more effectively. It achieves this through enterprise training, connecting needs to solutions, and facilitating the growth of companies. Despite periods when remote working was the only option, the team maintained its delivery ethos, they provided a consistently high level of service and added value to the projects they worked on.'

Professor Heather Widdows
Pro-Vice-Chancellor (Research and Knowledge Transfer)

Our highlights

Innovation

The University of Birmingham is characterised by a tradition of innovation, which continued to flourish in 2020–21.

The pandemic continued to inspire rapid invention and speedy translation, and selected highlights from this impressive array of activity are on pages 4–5.

Beyond COVID-19, the University now boasts a rich pipeline of intellectual property (IP), and a new wave of healthcare spinouts commercialising innovation in diagnostics, imaging and devices, which are presented on pages 6–9.

Birmingham researchers continued to develop new technologies in energy and sustainability, and a selection of these is presented on pages 10–13.

The Enterprise team now runs webinars that provide in-depth training in business and entrepreneurship, and a summary of our offerings is on page 16.

Birmingham Research Park remained open throughout the year so its tenants could continue to innovate and commercialise. Some of its success stories are shared on page 17.

Collaboration

Partnerships forged by the Enterprise team have delivered exceptional value for the University.

A prime example of this is the partnership with Cancer Research UK, featured on pages 14–15, which progressed cancer projects when university laboratories were closed.

The Midlands Innovation Commercialisation of Research Accelerator (MICRA), a collaboration between eight Midlands universities (Aston, Birmingham, Cranfield, Keele, Leicester, Loughborough, Nottingham, and Warwick), increased disclosures of inventions by 22%, training for academics by 76%, and funded 49 commercial development projects, which have generated 26 prototypes, 33 industry collaborations, and 8 spinouts.

MICRA is now establishing a project, advised by a senior venture finance professional, to rapidly develop a proposal for further improving the availability of investment for the region's university spinouts.

The University has also joined beLAB1407, a drug discovery collaboration with Evotec and Bristol Myers Squibb which launched in 2021 to accelerate drug discovery projects that will fast track research from lab to patient.

Momentum

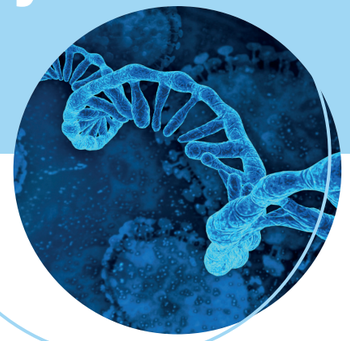
University of Birmingham Enterprise had a record year on many fronts.

Academic consultancy reported its highest ever turnover, and the Birmingham Research Park reported its highest income yet. Spinouts raised £60m new equity, of which £4m was in very young spinouts, and for a third successive year, we celebrated a successful exit event.

We also found development partners for new technologies, formed three new spinouts, and have a record number of spinout candidates under advanced development.

'We are working to significantly improve access to investment for start-ups in the Midlands.'

COVID-19 response: rapid innovation and speedy translation



You're in the middle of a pandemic, and in the middle of your PhD write-up, and you have an idea for a rapid COVID-19 test. What do you do?

Jake Carter from the University of Birmingham was in just this position when the first England lockdown forced him to leave the lab and stay at home.

At the time, the gold standard COVID-19 test was the RT-PCR, which detects viral RNA that can be present in extremely low levels in swabs taken from the mouth and nose. RT-PCR tests use a reverse transcription enzyme to convert this RNA into DNA, and then 'amplifies' the material many times over by heating and cooling the sample so it can be detected. This process can take more than an hour in the laboratory.

Jake's doctoral training had included a placement at spinout Linear Diagnostics Ltd to better understand the practical aspects of assay development. The team reasoned that a single-step, simultaneous conversion of RNA to DNA and amplification could deliver significant advantages over RT-PCR, and may even result in a test that could be processed without specialist laboratory equipment.

His supervisors, Professor Tim Dafforn from the School of Biosciences and Professor Jim Tucker from the School of Chemistry set up a group to brainstorm ideas, and these meetings strengthened the Birmingham team's resolve to develop a new and faster assay.

The result was a novel single-step approach for converting RNA into DNA, which the researchers combined with a known technique called Exponential Amplification Reaction (EXPAR), which amplifies DNA concentration to detectable levels at a constant temperature. They called the new method Reverse Transcription Free EXPAR (RTF-EXPAR).

University of Birmingham Enterprise rapidly patented the method, and executed a publicity drive in January 2021 that resulted in global trending news, which caught the attention of potential industry partners.

By the summer of 2021, the researchers had conducted a comparison study with Professor Andrew Beggs from the Institute of Cancer and Genomic Sciences, which confirmed that RTF-EXPAR was just as sensitive, but faster than the RT-PCR tests that are currently used in hospital settings. Their findings were published in the Proceedings of the National Academy of Sciences, and a second burst of publicity brought further collaborators to the table.

University of Birmingham Enterprise is now negotiating licence terms for rapid product development by industry.

The test was mentioned in the UK Research and Innovation (UKRI) Annual Report for 2020-21 as a COVID-19 highlight.

Genome sequencing

University of Birmingham Enterprise have been assisting the development of a service-based offering based for the analysis of COVID-19 variants through the CLIMB-COVID project headed up by Professor Nick Loman from the School of Biosciences.

Over the course of the pandemic, the University has been working with the Department of Health and Public Health Agencies across the UK to test, sequence, and analyse samples from COVID-19 positive patients across the country. Set up rapidly in March 2020 to support the COVID-19 Genomics Consortium (COG-UK), CLIMB (Cloud Infrastructure for Microbial Bioinformatics)-COVID has been central to COVID-19 research in the UK and contributed to our world-leading reputation for genomic surveillance.

CLIMB-COVID at the University of Birmingham has so far received more than £2m capital investment from the UKRI, the UK Health Security Agency (UKHSA), and the Department for Health and Social Care (DHSC) to continue expanding its supercomputing services in order to continue to track the spread and evolution of the COVID-19 pandemic.

The service will continue to play a major role in the coming year to monitor and understand how viral evolution affects COVID-19 vaccines and treatment.

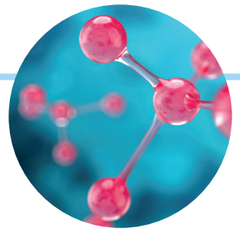
Customised PPE

University researchers developed a method to improve the comfort and fit of filtering respirators using device customisation. A wide-ranging collaboration of industry partners has utilised these methods to produce a medical grade facemask, meeting the exacting requirements of front-line health and social care workers.

Last year, University of Birmingham Enterprise filed patent applications on a customisable mask seal enabled by 3D facial scan data. The customisation technology was developed by Dr Sophie Cox, Dr Luke Carter and Professor Liam Grover from the School of Chemical Engineering with Professor Owen Addison from King's College London.

MyMaskFit is now commercialising the patents into products. The company has orchestrated collaborators including Swansea University, Sheffield University's Advanced Manufacturing Centre (AMRC), computer software company Autodesk, industrial automation company Plyable, manufacturing company RS Components, silicone rubber manufacturer Primasil, and Birmingham-based injection moulding company Cameron-Price.

The result is a custom-fitted, transparent, reusable facemask that exceeds the DHSE technical specifications, which were updated in July 2021 and includes a transparent frontpiece, biocompatibility, filtration efficiency, and splash resistance.



Novel therapeutics

Professor Mike Hannon from the School of Chemistry had already designed a new approach to treating cancer and other diseases using molecules known as rotaxanes. These dumbbell shaped molecules have the remarkable ability to bind to Y-shaped junctions or forks in DNA or RNA, which stops cancer cells, bacteria and viruses from replicating.

Working with researchers from Oxford and Birmingham, including Dr Zania Stamataki from the Institute of Immunology and Immunotherapy, Professor Hannon has now shown the cylindrical part of the rotaxane molecule could be effective against the viruses SARS-CoV-2 and HIV, raising the possibility of broad-spectrum anti-viral drugs. The research has resulted in novel compounds that are the subject of a patent application filed by University of Birmingham Enterprise.

Dr Stamataki also worked with Professor Liam Grover and Dr Richard Moakes to demonstrate that a nasal spray formulation, engineered at the Healthcare Technologies Institute, can inhibit infection at a cellular level. Further, Dr Stamataki's virology team contributed to the Birmingham-led study that showed licensed drug fenofibrate could reduce infection caused by the SARS-CoV-2 virus by up to 70%.

A rich pipeline of medical innovation

Professor Zubair Ahmed from the Institute of Inflammation and Ageing gained a PhD in Plastic Surgery, where he investigated a tissue engineering approach to repairing nerves, before moving to Birmingham to look at why nerves in the brain and spinal cord fail to regenerate after injury.

The question is not academic. Spinal cord injury affects over 15 million people a year – and the consequences can be devastating. Many of these injuries involve spinal cord compression rather than complete severance, and in these cases, secondary damage expands around the epicentre of the original injury and contributes heavily to disability.

He has been working in this field since 2002, and last year he celebrated three patent filings. All three relate to approaches that may ultimately address the huge unmet need for therapies that support recovery from neurological injury.

For the first two patents he worked with Dr Richard Tuxworth from the Institute of Cancer and Genomic Sciences to show that a drug in development as a cancer therapy can foster nerve regeneration and preserve nerve function after trauma. Their studies showed greater effects than any other experimental treatment to date. In fact, the recovery of nerve function improved by more than 80%, leading to full recovery of function within three weeks of trauma.

For the third, he collaborated with AstraZeneca and studied the effect of an existing drug, showing that it completely ablated injury-induced swelling of the spinal cord, reduced the formation of cavities, suppressed neuropathic pain, reduced scarring at the lesion site, promoted nerve regeneration and thus preserved up to 80% nerve function following spinal cord compression injury. This is the only drug that is currently available which targets more than one of the major pathophysiological processes after spinal cord injury.

University of Birmingham Enterprise is now supporting the research team in its search for collaboration partners, investment, commercial development, and licencing.

Professor Ahmed said: ‘Re-purposing existing drugs to treat diseases is an extremely attractive proposition. Our work in the injured spinal cord is a game changer since the ability to re-purpose them not only reduces R&D costs but also drug development timelines. By patenting re-purposed drugs, we hope to attract pharmaceutical companies to help us translate these therapies to the clinic for patient benefit.’

New perspectives on blood clotting

Birmingham scientists have described a potential new target and strategy for anti-thrombotic therapy, in research that provides a new perspective on how blood clotting works in infectious, cardiovascular, and inflammatory diseases.

Dr Martina Colicchia and Dr Julie Rayes from the Birmingham Platelet Group at the Institute of Cardiovascular Sciences identified the novel mechanism for platelet activation in blood drawn from COVID-19 patients in intensive care, who are known to have a high risk of thrombosis.

Their research pointed towards a mechanism that has not previously been described as a target for anti-coagulant therapies, and a pathway that is resistant to classical anti-platelet drugs.

University of Birmingham Enterprise has filed a broad-based patent application covering agents that target the mechanism and pathway for the treatment and prevention of inflammatory and thrombotic diseases. The researchers are continuing their work on basic mechanisms and the pathway.

Quantum healthcare

The University is a key partner in three quantum technology projects awarded funding from UK Research and Innovation (UKRI). The funding is part of a £31 million investment to demonstrate how quantum technologies could solve some of the greatest mysteries in fundamental physics.

The projects will involve researchers from UK and US universities and aim to solve the enigma of dark matter, the novel physics of the early universe, and understanding the 95% of unaccounted energy content of the universe.

However, the whole idea of the National Quantum Technologies Programme is not to be purely academic science, but to be engaging with industry to create technology with real economic benefits – and patenting is often essential to attract the interest from industry.

Patented quantum technologies have already attracted industrial collaboration in the detection and mapping of underground structures and voids such as tunnels and QT Hub academics are working closely with industry partners to implement map matching technologies that use gravity to pinpoint location precisely.

In the last year the QT Hub has awarded partnership funding to the Centre for Human Brain Health to develop a new sensor to measure weak magnetic signals in the brain. The sensor, developed by Dr Anna Kowalczyk from the School of Psychology, has the potential to increase understanding of connectivity in the brain, and detect signs of traumatic brain injury, dementia, and schizophrenia.

University of Birmingham Enterprise has filed seven patent applications based on quantum research, including one covering the design of the new sensor and its use in medical diagnostic equipment. The QT Hub is now working with University of Birmingham Enterprise on further exploration and development of commercialisation opportunities.

Improved maternity care

University of Birmingham Enterprise is handling licence agreements that allow maternity units around the world to access digital training for the Birmingham Symptom Specific Triage System (BSOTS).

BSOTS assesses women presenting with unexpected pregnancy related problems or concerns, and then allocates a colour code, so hospital staff can see at a glance who needs to be prioritised.

Developed by Dr Nina Johns, Consultant Obstetrician at the Royal Wolverhampton NHS Trust, and Sara Kenyon, Professor of Evidence Based Maternity Care at the University of Birmingham, BSOTS is the first standardised triage system for maternity care.

The resources and training materials are now digitised, and available through the Meridian Health Innovation Exchange. To date, BSOTS has been adopted by over 40 maternity units in the UK, and is now under consideration by two maternity hospitals in Australia.

New spinouts in diagnostics, medical imaging, and devices

It's been a good year for 4D Biomaterials. The spinout was created in 2020 to commercialise a new class of patented liquid resins engineered by Professor Andrew Dove from the School of Chemistry, which can be custom-printed into 3D tissue scaffolds for use as medical implants.

Following pre-seed investments from Innovate UK, the company established a self-contained independent laboratory and office space, and made several senior appointments to advance its product development and operational capabilities, and ended the year with an over-subscribed funding round that raised £1.6m.

The funding will be used to develop a range of products through partnerships with medical device companies.

Recently published research has shown the 3D printed tissue scaffolds have 'shape memory' which means their structure is retained when the scaffold is implanted into tissues, where they show highly promising tissue-healing performance, including the ability to support cell migration, the 'ingrowth' of tissues, and revascularisation (blood vessel growth).

Professor Dove continues his research with long-standing collaborators in the US. He has recently succeeded in fine-tuning a new type of polyester, which is the subject of international patent applications, for use in soft tissue repair or flexible bioelectronics.

Tagomics

A new spinout, Tagomics, has been created to develop and commercialise a novel epigenetic profiling technology that originated from two research groups run by Dr Robert Neely and Dr Francisco Fernandez-Trillo in the School of Chemistry.

Epigenetic changes, which alter how genes are expressed without altering the underlying DNA sequence, are of considerable interest in the biotechnology sector.

The technology developed by the researchers provides unique perspectives and insight into epigenetic changes and extracts this clinically relevant information in a more sensitive, straightforward, and economical way than the current gold standard approaches.

University of Birmingham Enterprise has filed several patent applications on the technology, which has potential applications in disease detection, diagnosis and monitoring, as well as in the drug discovery process.

The Enterprise team supported Jack Kennefick, at the time a PhD student in Dr Robert Neely's group, through two intensive training programmes. These are the Innovation to Commercialisation of Research (ICURe) programme which provides training and coaching, and funds a rigorous, global, customer discovery journey that enables academic innovators to 'road test' the value of their ideas, and The Royal Society of Edinburgh's Enterprise Fellowship, a prestigious business and entrepreneurship programme that also provides funding in support of the start-up/ spin-out process.

Dr Jack Kennefick is now the CEO of Tagomics, which has been supported and funded by the Cambridge-based accelerator Start Codon and IQ Capital, and is focused on applying its pioneering epigenetic platform technology to provide greater clinical insight and advance disease monitoring and early diagnosis.

Nirvyu

New spinout Nirvyu is working with NLC, a European health technology venture builder to commercialise a desktop imaging system that will inform treatment decisions for people with rheumatoid arthritis (RA).

The system was developed by Professor Hamid Dehghani from the School of Computer Science and uses near-infrared light to show changes in inflamed joints, allowing real-time assessment of disease severity and response to treatment.

Professor Dehghani's approach provides a cost-effective alternative to the current approaches for RA diagnosis and monitoring, which are either invasive or require highly specialised equipment and trained staff.

Effective management of RA relies on early diagnosis and continuous monitoring, and the first few months of symptoms provide a narrow window of opportunity where aggressive therapy can improve long-term outcomes for patients.

NLC's vision is to produce a device that will deliver fast, objective, non-invasive imaging that will support earlier diagnosis and personalised treatment.

Empower Therapeutics

Empower Therapeutics, a new spinout created jointly by the University of Birmingham and the University of Maryland Baltimore is commercialising a simple, reliable electroencephalography (EEG)-based biomarker for pain sensitivity. The company has set its sights on reducing pain 'chronification', which happens when acute (short-term) pain becomes chronic, or long-lasting.

The biomarker was described and validated by neuroscientists from Maryland and Dr Ali Mazaheri from the University's Centre for Human Brain Health, and the universities filed a joint patent application covering the methods and use of the biomarker.

Empower Therapeutics has acquired the worldwide, exclusive rights, to the patent and will leverage this and their own technology to develop a wearable device for pain management.

Dr Mazaheri will continue his research and is currently collaborating with surgical units in Birmingham to apply this biomarker to screen lung surgery patients and detect those most vulnerable to developing chronic pain following surgery.

New technologies for energy transmission and storage

Energy storage

Energy storage company Aceleron started life in a University of Birmingham Enterprise business incubator as the brainchild of two people with a passion for batteries, Birmingham graduate Dr Amrit Chandan and Carlton Cummins.

Their initial business idea was more along the lines of a social enterprise - they wanted to upcycle used electric car batteries to provide affordable energy storage in the developing world.

However, Amrit had attended the Medici Enterprise training while studying for his PhD in Fuel Cell Technology.

Medici is designed for researchers who want to explore the commercial potential of their research, and this training, coupled with a subsequent residency at the incubator encouraged the founders to explore other avenues and identify funding streams while they further researched and validated their business plan.

During their residency, the pair literally disassembled thousands of lithium batteries to work out a better way to build them and design a new manufacturing process from scratch.

This intensive period of research resulted in a design for a battery that completely removed the use of permanently bonded or fixed components, and they developed a unique patented technology so that each part of the battery can be accessed to repair, replace, or upgrade, giving it an endless lifespan.

This modular approach to building batteries allows easy scalability and servicing, and functional and performance upgrades that reduce through-life costs and raw material use in the long run.

Aceleron launched its first product in 2018, and now has a range of products based on circular economy principles.

The founders have received numerous accolades for this work, and remain committed to maximising the social impact of their technology. The company has a base in Kenya from which it partners with social enterprises to repurpose waste lithium-ion battery cells into repairable, affordable and reusable batteries that has had a net positive impact on 150,000 people around the world supporting activities in 8 different African countries, the UK, Caribbean, and India.

Battery recycling

In 2018, the Faraday Institution, the UK's independent institute for electrochemical energy storage research, announced £42m government funding for application-inspired research into battery technologies. Research topics were chosen in consultation with industry, to ensure it produced solutions that meet the needs of business.

A project led by Professor Paul Anderson from the School of Chemistry was chosen for funding. ReLIB (Recycling and reuse of EV Lithium-ion Batteries) had been set up to address a challenge that is far from straightforward – to devise and develop alternative recycling routes that could provide UK businesses with a competitive advantage.

To date the researchers have developed several novel methods for battery disassembly and recycling, and three of these have resulted in patent applications filed by University of Birmingham Enterprise.

A boost for wind power

The UK government has set an ambitious target for offshore wind generation. However, connecting large volumes of renewable generation into a grid is challenging, and the grid is becoming less stable, as evidenced by a blackout in the UK on 9th August 2019.

Professor Xiao-Ping Zhang and Dr Ying Xue from the Department of Electronic, Electrical and Systems Engineering invented an adaptive smart wind generation control system to underpin this transition. The system is expected to significantly increase the stability of a renewable-dominated grid and increase the amount of wind power that can be safely integrated into it.

The system is protected by a patent application filed by University of Birmingham Enterprise, and was subsequently supported by the UKRI Engineering and Physical Sciences Research Council (EPSRC) follow-on fund. The researchers are now building a demonstrator at their laboratories in Birmingham to test and showcase the solution.

Globally, the wind power market is expected to grow to near £130bn by 2024.

Ultra-wide area energy grids

The wide-scale adoption of renewable energy requires ultra-wide area energy grids, to transmit energy between countries and continents.

While local electricity transmission is most commonly managed by alternating current (AC) systems, the bulk transmission of electrical power uses high-voltage, direct current (HVDC) systems. These have fundamental and long-standing reliability problems including inefficiencies caused by line failures and power loss.

Professor Xiao-Ping Zhang's team invented a next generation technology to address these issues, while retaining the advantages of previous systems. The technology is protected by a portfolio of patents filed by University of Birmingham Enterprise.

The University of Birmingham has now signed a contract with a high-tech enterprise owned by China Electric Power Research Institute to build the first industrial scale prototype.

Translating research to deliver sustainability

Professor Philip Davies from the School of Engineering has a long-standing research interest in water stress and desalination systems that remove salts from water, making it good for drinking or agricultural use.

The established technique for this type of water purification is reverse osmosis, which uses a partially permeable membrane to separate water from ions and molecules. It took over a decade's research to re-engineer reverse osmosis to produce a system that approaches the theoretical limits for energy efficiency and water recovery.

During this time, Professor Davies built five prototypes which were tested in four field trials over three continents. He was also joined by an undergraduate student, Tim Naughton, who was looking for a thesis project for his mechanical engineering degree – and Philip's work had captured his imagination.

In 2018 University of Birmingham Enterprise filed its first patent application for the technology. By this time Tim was working as a Research Associate, and the Enterprise team supported him through the Innovation to Commercialisation of Research (ICURe) programme, which provides an unparalleled opportunity for early career researchers to develop business skills, make contacts with industry and test their ideas in the market. Tim also attended the Medici programme, provided by University of Birmingham Enterprise to deliver business skills, knowledge and confidence to engage with business and industry, and Spinout Basecamp, a detailed business support programme for spinouts who are close to launching the business.

University of Birmingham Enterprise supported the application for a £200k grant for development of a full-scale second generation prototype. This was built by Tim, who approached Clean Engineering, which offers a unique combination of funding and support for sustainable engineering businesses. By 2021, Clean Engineering had invested in the technology. University of Birmingham Enterprise licensed the patented technology to a newly formed Birmingham spinout, Salinity Solutions, and Tim Naughton is the Technical Director of the company.

Salinity Solutions has developed Philip Davies' original technology to enable them to improve the efficiency of extracting minerals dissolved in water. They are currently engaged in field trials of their brine concentration system for lithium extraction from geothermal groundwater in Cornwall.

The company will ultimately pursue Philip Davies' long-held ambition to deliver a solar-powered portable desalination unit that can be used to irrigate crops in water-stressed regions of the world.

Recycling aluminium

Research by Dr Biao Cai from the School of Metallurgy and Materials has resulted in a novel technology to improve the quality of recycled aluminium by removing iron from molten alloy in a simple, inexpensive process that uses magnets and a temperature gradient.

University of Birmingham Enterprise filed a patent application in 2019 and undertook a comprehensive campaign to test the market need and find out what kind of prototype will confirm the technology works, and is applicable in industrial settings.

Funding from the Midlands Innovation Commercialisation of Research Accelerator has enabled Biao to scale up a technology that processed 1.5mm samples to a large-scale prototype that processes 10 kilo ingots. This will be showcased to industry in early 2022, with the aim of finding industrial collaborators willing to run tests in foundry settings in combination with existing production lines.

Alternative raw materials

Recycling company Phoenix Carbon has licensed know-how from Professor Gary Leeke from the School of Chemical Engineering.

The company aims to take carbon fibre recycling techniques from the laboratory into a large-scale industrial process that recuperate carbon fibre from composites. The techniques were assessed by the European Regional Development Fund project ARLI (Alternative Raw Materials with Low Impact), which found the recovered carbon fibres have the same properties as pristine ones.

Professor Leeke is no stranger to know-how and IP discovery. He previously invented a new route for reducing bacterial contamination and spoilage in the dairy and beverage industries. This invention, which allows treatment for food products that cannot be heat-treated, was patented by University of Birmingham Enterprise.

Monitoring the environment

Professors Mark Viant and John Colbourne help chemical companies detect hazards in their products through Michabo Health Sciences, an Operating Division of University of Birmingham Enterprise Ltd.

The Operating Division is a unique model for knowledge exchange. It was developed as a 'start-up lite' model so researchers don't get bogged down in paperwork and company processes, but are able to test their idea and its market readiness, and their appetite for business, at a level that is determined by them.

To the outside world, Michabo Health Science looks like a standalone business, but the researchers did not have to form a new legal entity, and the back office activity such as contracting with customers, invoicing, and credit control, is handled by the Enterprise team.

The continued contact with University of Birmingham Enterprise has also ensured professional support and advice on business development and Intellectual Property, including know-how that results from interactions with other organisations.

Michabo Health Sciences started trading in 2018. In 2021, University of Birmingham Enterprise supported John Colbourne and Mark Viant through Spinout Basecamp training, a programme for spinouts that are close to launching their business that includes business planning and strategy, building an IP portfolio, and structuring investment.

The team is now poised to spinout as an independent company in which the University will retain a shareholding.

Keeping cancer research working throughout the pandemic

The partnership between Cancer Research UK (CRUK) Commercial Partnerships Team and the University of Birmingham provides specialist staff to develop IP and deliver support to all cancer research, regardless of how it is funded.

It provides an overview of Birmingham's cancer research portfolio, and CRUK staff working with University of Birmingham Enterprise have access to CRUK's specialist oncology network and support services to progress these projects.

The closure of University laboratories to all but essential COVID-19 research created a pressing need to audit active research projects, and the number of cancer projects reviewed tripled in 2020/2021. This yielded cancer projects that could be progressed at CRUK's central laboratory services, such as the Functional Genomics Centre at Cambridge, which remained open when other research facilities were closed.

It also revealed work that could be repurposed towards virus research and COVID-19 infection mechanisms, and knowledge exchange teams at CRUK and the University worked together to ensure both funding and facilities were in place to expedite this research.

CRUK also backed the UK Coronavirus Cancer Monitoring Project. Initiated by researchers in Birmingham, London, Leeds, and Oxford, and coordinated by Birmingham's Centre for Computational Biology, this tracks cancer patients who have tested positive for COVID-19, generates daily updates for individual cancer centres, and continues to inform clinical decision-making throughout the UK.

This sense of urgency also extended to licensing negotiations, and the pace of licence agreements actually quickened during the pandemic.

In the last year, the Birmingham CRUK pipeline has increased significantly, as has the variety and quality of the projects entering it. CRUK intends to continue an efficient licensing process and engagement for all projects, including those that are not CRUK-funded.

A new alliance

Professor Andrew Beggs and Professor Gary Middleton from the Institute of Immunology and Immunotherapy and the Institute of Cancer and Genomic Sciences have partnered with Cancer Research UK in one of the first target identification projects for the Immuno-oncology Alliance, which translates discovery science into new therapeutics for cancer patients.

The Alliance forms an extended project team including scientists and drug discovery experts from Cancer Research UK, antibody engineering and translational research charity, LifeArc, and resources from the Ono Pharmaceutical Co, Ltd., which has a considerable track record in developing cancer immunotherapies.

The Alliance won the Scrip Award for Best Partnership Alliance in 2019.

Professor Beggs commented: 'It's exciting to work on discovery science that is backed by an alliance committed to rapid translation, and resourced to deliver it.'

A new partnership

The University of Birmingham and BioHub tenant Nonacus have partnered to develop a non-invasive test for bladder cancer, which is the seventh most common cancer in the developed world.

The test is expected to be available by mid-2022. It will diagnose the disease from urine samples using a highly sensitive liquid biopsy technology developed by Nonacus and a panel of biomarkers validated by Dr Rik Bryan and Dr Douglas Ward from the University's Bladder Cancer Research Centre.

Recent growth

Ximbio is a business unit of Cancer Research UK, and partners with universities to manage the commercialisation of research tools so they are widely available to scientists throughout the world.

The Ximbio-Birmingham partnership had a record year in 2020–21. Birmingham provided the most reagents from any UK university, and second-most worldwide. The portfolio invented by researchers from Birmingham now includes small molecules, antibodies, cell lines, and animal models.

These are promoted to Ximbio's global network of researchers and companies, and in 2020–21 delivered nearly £130k licence income to Birmingham's research groups – an increase of 90% on the previous year.

Our services and our location

We protect ideas and find a market for them

The Enterprise team works in partnership with researchers to protect IP, copyright, trademarks or software and delivers this service at no cost to inventors, who reap the benefits of licensing deals or spinout formation.

The team also includes experts and advisors who assess whether there is a market for an invention, product or service, and search for companies that are interested in licensing patents, collaborating, or funding further research.

We deliver training, manage funds, and support investment

The Enterprise team delivers introductory training on entrepreneurship and business skills, and advanced training programmes for researchers with emerging commercial ideas, or those who are potential founders of future spinout companies.

The team also manages university funds that support translation, cultivates relationships with investors throughout the UK and overseas, provides training on how to pitch for investment, and convenes the right expertise to build balanced business teams and grow new businesses.

We manage academic consultancy

Academic consultancy contracts vary from the short-term, such as sitting on scientific advisory boards, reviewing film scripts, or evaluation of client technical or scientific specifications, to longer-term assignments such as design and analysis of systems for manufacturing processes.

The Enterprise team provides a full range of support for academics engaging in consultancy with external organisations.

The service includes negotiating fee rates and contracts, arranging indemnity insurance, and invoicing.

The Enterprise team is based at Birmingham Research Park in the heart of the Edgbaston Medical Quarter. The Park provides high quality office and laboratory facilities to a thriving cluster of early stage biomedical companies, including several Birmingham spinouts.

The team includes a unit of specialist staff who manage 60,000 square feet of office accommodation and 10,000 square feet of biomedical incubation space within The BioHub Birmingham. The Park management team is proud to have maintained a fully operational site throughout the pandemic, not just by delivering 'business as usual' but also by innovating in new facilities to support tenant companies in their response to new ways of working. The Research Park team is proud to share some of the many successes the Park has seen in 2020–2021.

'We want to extend a heartfelt thank you to the Research Park Team who have worked tirelessly to ensure that the practicalities of our operation at the BioHub have not been hindered by the pandemic.'

Jennie Law
Head of Operations for spinout MicrobesNG

Key COVID-19 successes

Clinical trials company Synexus continued its operations throughout the year, and recently recruited patients for clinical trials for COVID-19 vaccines. Recruitment and dosing was handled by the Midlands 'super clinic' at the Birmingham Research Park. The clinic is run as a COVID-19 SMART facility, which means the company uses best practices to reduce virus exposure.

BioHub tenant Nonacus pivoted its business to COVID-19 PCR testing, processed over 0.5 million samples in its own right and manufactured testing kits for government-approved laboratories. The company expanded considerably, hiring 50 new employees since August 2020, and is now fully ISO 15189 accredited by The United Kingdom Accreditation Service (UKAS), the only national accreditation body recognised by the government to assess against internationally agreed standards.

Spinout growth

Birmingham spinout and BioHub tenant Marker Diagnostics UK Limited received wide interest from the publication of a study of top-flight UK rugby players which confirmed a method of accurately diagnosing concussion using saliva. Results from the three-year study, which was carried out in collaboration with the Rugby Football Union and Premiership Rugby among others, pave the way for the first non-invasive clinical test for concussion for use in sport and other settings.

Spinout Linear Diagnostics secured £800k funding to develop rapid point of care diagnostic devices. The company has shown strong technical progress and achieved clinical levels of accuracy in tests within its lab environment. Linear's initial focus will be on sexually transmitted infections. The test will be capable of detecting multiple infections in the same sample in around 15 minutes.

MicrobesNG is an innovative value driven microbial sequencing service based in the BioHub Birmingham that was spun out of the University two years ago. The past year has seen the company processing its highest number of samples yet, and the team could not be more proud of its achievements. Jennie Law, Head of Operations, said 'We have ambitious growth plans for year three and 2021/22 looks set to be another fantastic year for MicrobesNG. We look forward to sharing our successes with the wider Research Park community in the months ahead'.

University of Birmingham Enterprise works with researchers, businesses, and investors to deliver successful commercialisation for the University of Birmingham.

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