



QUEEN MARY BIOENTERPRISES

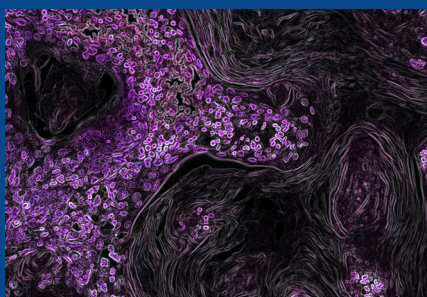
# Discovery

H2 2023

NEWS, VIEWS AND EVENTS AT QMB



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## Editor's Welcome

Hello and welcome to the Winter 2023 edition of QMB's Newsletter.

In this issue we speak to our sister organisation Queen Mary Innovation (QMI) about the exciting spin-outs emerging from Queen Mary University of London and Barts, including the development of new solar cells which are cheaper to produce than standard silicon solar cells.

We also look at the development of toothpaste in tablet form created by final year dental student, Florence Mai, which uses polygamma glutamate (PGGA), an edible, biodegradable, natural polymer that can be cheaply and sustainably manufactured from food bi-products. This innovation could see the end of spent toothpaste tubes in landfill, which could take 500 years to fully biodegrade.

And we look at how cancer treatment could be revolutionised through offering truly personalised medicine by using machine learning to rank drugs.

We also hear from hVIVO, which has hailed the success of an influenza human challenge study at its specialist facility at QMB, while Meta Materials walked away with two accolades at the 2023 International Hologram Manufacturers Association (IHMA) Awards for its QUANTUM stripe authentication product.

And finally, we have some analysis from global commercial real estate services firm Cushman & Wakefield, which recently released its Life Sciences Golden Triangle Lab Report for the third quarter of 2023.

We're eager to hear your views too, so please share your feedback. For more updates and the latest news from QMB, please visit our website.

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**BARTS LIFE SCIENCES**  
DISCOVERY / DIVERSITY / DELIVERY

## NHS Navigation Days, Masterclasses, and 1-2-1 Clinics for HealthTech SMEs in London

Free support is being offered by Barts Life Sciences for small to medium-sized enterprises (SMEs) and innovators that are active or registered in London.

The support brings in expertise on topics including developing NHS business cases, procurement, intellectual property, and health economics, with the aim of supporting scaling innovation alongside the NHS. Tailored guidance will also be offered to life sciences enterprises, with 'NHS Navigation Days', 'Masterclasses', and '1-2-1 Clinics' - all offered at no cost to eligible SMEs.

NHS Navigation Days are designed to support SMEs with their understanding of the NHS landscape, whilst the smaller-scale Masterclasses and 1-2-1 Clinics go into more depth on specific topics and provide bespoke support.

Dr Sarah Fothergill, the Healthtech Lead at Barts Life Sciences, said: "London has a vibrant and ever-growing life sciences innovation landscape, and we want to ensure that NHS staff, patients and our communities benefit from promising future innovations. This project starts with ensuring future HealthTech develops with Barts Health NHS Trust needs and the wider NHS in mind".

If you are a HealthTech SME/innovator active in London, sign up for the next NHS navigation Day to be held in January. Further information can be found at [bartslifesciences.org/HealthTech](https://bartslifesciences.org/HealthTech) or by reaching out to [healthtech@bartslifesciences.org](mailto:healthtech@bartslifesciences.org).

Barts Life Sciences is a partnership between Barts Health NHS Trust, one of the largest in the UK, and Queen Mary University of London, a research-intensive member of the Russell Group, consistently ranked highly for medical research citations.

Focussed on driving innovation "from bench to bedside," the Barts Life Sciences team focus on both Data Science and Healthtech innovation and have helped deploy numerous innovations across Barts Health Trust.

The Healthtech SME project is supported by the UK Shared Prosperity Fund, Levelling Up and the Mayor of London.

# Positive results from influenza human challenge study conducted by hVIVO



hVIVO plc has hailed the success of an influenza human challenge study carried out at its specialist facilities at QMB in London.

Researchers were able to establish clinical proof of concept for Neumifil, a broad-spectrum antiviral candidate developed by Pneumagen, a clinical-stage biotech firm.

Involving 104 healthy volunteers, recruited through hVIVO's FluCamp volunteer recruitment platform, the phase IIa assessed the efficacy of Neumifil when administered as an intranasal spray. Participants were subsequently exposed to the influenza virus.

Neumifil demonstrated a clinically significant reduction in the incidence and severity of symptomatic influenza infections compared to a placebo. The antiviral candidate was also well tolerated, with no new emergent adverse events or safety concerns identified.

The study's positive outcomes and pre-clinical data have propelled Pneumagen to advance Neumifil into additional clinical trials, hVIVO said.

Specifically, these future studies will focus on the drug's potential to mitigate viral-induced exacerbations in patients suffering from Chronic Obstructive Pulmonary Disease (COPD).

Chief Scientific Officer at hVIVO, Dr Andrew Catchpole added: "We are delighted to see Pneumagen obtain these results clearly achieving clinical proof of concept for Neumifil, which has supported Pneumagen's decision to progress the candidate into further clinical studies, including in patients with COPD."

"This is another example of the value of human challenge trials in delivering clinical efficacy data and de-risking later clinical development."



DR ANDREW CATCHPOLE





## YAMIN 'MO' KHAN

It raised its 2023 revenue forecast after the healthcare company reported a 52% jump in sales in the first half as demand for testing of infectious and respiratory disease therapies increased.

Drugmakers are in a race to develop vaccines and drugs to treat respiratory diseases caused by multiple viruses, resulting in increased demand for clinical testing of products.

It said its weighted contracted order book rose 11% year-on-year to £78m as of June 30 2023.

Core profit more than doubled to £5.2m in the first half of the year, compared with £2.3m a year earlier.

The company said the significant uptake in the use of human challenge trials (HCTs) over the past 18 months has been fuelled by increasing real-world examples of their benefits over traditional field trials.

A few recent examples that have underlined the value proposition of HCTs include Pfizer's ABRYSV0, which was one of the first RSV vaccines to get FDA approval in May after receiving breakthrough designation on the back of data generated from its human challenge trial at hVIVO.

Meanwhile, Cidara received FDA Fast Track designation for its influenza antiviral candidate in June and SAB Biotherapeutics secured FDA Breakthrough and Fast Track designation for its influenza antiviral candidate in April.

# hVIVO reports surge in half year revenues as HCTs rise

hVIVO reported a jump in revenues and earnings for the six months to the end of June and said its outlook for the full year was "extremely positive".

Yamin 'Mo' Khan, the Chief Executive of hVIVO, said the first half of 2023 delivered another period of excellent growth and progress towards the company's goal of establishing a long-term sustainable growth model.

"The increasing number of trials, as well as the growing volunteer cohorts and expanding use cases, highlights that the human challenge market is experiencing a strong growth trend that we strongly believe will continue over the long term," the CEO said.

"The outlook for the business is extremely positive, as our new state-of-the-art facility sets us up to accelerate our growth over the long term. We are delighted to increase our revenue guidance and EBITDA margin guidance for 2023," he added.

The company said the outlook for the business remains extremely positive, with revenue for 2023 fully contracted and its orderbook providing excellent visibility over revenue into late 2024, as well as a new state-of-the-art facility equipped to accelerate growth over the long term.

The hVIVO board has increased its revenue guidance to £55m for 2023 as well as increasing its EBITDA margin guidance to 19% for 2023.

It is also the board's intention to pay a nominal annual dividend following the publication of the full year results for 2023.



# Meta Materials Receives Two International Hologram Manufacturers Association Awards

QMB tenant Meta Materials Inc., an advanced materials and nanotechnology company, walked away with two accolades at the 2023 International Hologram Manufacturers Association (IHMA) Awards for its QUANTUM stripe authentication product.

The company won the Best Origination and Best in Show awards for QUANTUM, which is a revolutionary banknote security product based on META's award-winning KolourOptik® technology.

The innovative tech combines movement, 3D stereoscopic depth, and multi-colour effects in an ultrathin form factor. The technology also ensures next-generation security and authentication in banknote production.

"The IHMA board are looking for innovation, visual distinction, aesthetics and differentiation. It is clear to us all that the plasmonic developments by Meta are among a new range of optical technologies pushing the boundaries of anti-counterfeit security features and developments in recent years," said Dr. Paul Dunn, chairman of the IHMA.

META CEO, Uzi Sasson, said: "This award is a testament to the technology and quality of our products. QUANTUM is the latest release from the authentication product portfolio, with demonstrable industrial applications within banknote, ID and brand markets. Our other authentication products have already attracted large customers, including a confidential G10 central bank and similar organizations."

According to a Banknote Industry News survey of central banks conducted in 2023, the volume of banknotes in circulation in 2022 grew by 4.5% on a global basis compared with 2021, and 10 countries reported growth above 8%. What that equates to in design and currency printing is almost \$16.2 billion CAD in 2020, expected to reach nearly \$22.9 billion by 2027, according to a recent Verified Market Reports publication.

Alan Newman, Chief Product Officer for Authentication, Managing Director Banknote & Authentication Division at META, said: "META's unique, animated, nano-optic technology represents an important new tool in the fight against counterfeiting and brand piracy, as institutional customers demand new, more effective and durable authentication solutions."



# Horizon Europe boosts demand for Life Sciences real estate

The UK's readmission into the EU's Horizon programme from 2024, albeit as an associate member, is good news for a life sciences sector that is only starting to recover from higher borrowing costs and increased risk aversion.

The Cushman & Wakefield Life Sciences Golden Triangle Lab Report for the third quarter of 2023 says that while the immediate impact on real estate demand might be subtle, the funding from Horizon Europe will act as a catalyst for broader growth within the UK life sciences sector.

The global real estate giant argues that as universities engage in high-calibre research, the innovations and spin-offs that come from this will fuel an expanded ecosystem, leading to increased demand for space.

Even though the Brexit agreement had secured the UK associate membership for the Horizon Europe project from 2020, when it eventually left the EU ongoing arguments over Northern Ireland's trading rules meant that it could only take this up from next year. The current programme started in 2021 and runs through to 2027.

Horizon Europe has a membership of 40 countries and a budget of €95.5 billion. It is the European Union's key funding program for research and aims to tackle global challenges such as climate change, sustainable development, and digital transformation, while boosting competitiveness and job creation.

The program supports a wide range of activities, including research, innovation, and training. UK academic institutions had flourished under the Horizon 2020, which began in 2014, receiving over €2 billion collectively.

Oxford University was the UK's biggest beneficiary in terms of academic institutions, but Queen Mary University also benefitted greatly from the scheme, receiving grants to fund research across a broad range of disciplines including biological and behavioural sciences, mathematics, and engineering and material sciences.

Professor Andrew Livingston, Vice-Principal (Research and Innovation) at Queen Mary University of London welcomed the UK association to Horizon Europe, saying that it "offers a brighter future to carry out high quality collaborative research, enables easier movement, shared resources and ease of communication with our European colleagues."

## YET SUPPLY CONSTRAINTS AND JITTERY INVESTORS HINDER THE TAKE UP OF LAB SPACE

Take up of lab and office space in the Golden Triangle – the world's leading life sciences hub which stretches from London (and the south east) to Oxford and Cambridge – is plagued by limited supply, with availability in Cambridge and Oxford being particularly acute.

The Cushman & Wakefield Life Sciences Golden Triangle Lab Report for the third quarter of 2023 says that 81,260 square feet of space was taken up, 38% above the previous quarter but 38% below the five-year quarterly average.

Along with the usual summer slowdown, Q3 transactions were limited by ongoing supply pressures, constraining activity across all three markets. Over 2023 so far, take-up has totalled 405,607 sq feet, which is 28% below the same period last year, with a further 2.2 million square feet under construction.

The global real estate giant says that despite cautious business sentiment regarding the economic outlook, high interest rate environment and significant cost pressures, demand for more space in the life sciences sector is very strong.

Active requirements for science and innovation space in the Golden Triangle totals 2.7 million square feet, far outweighing the existing supply as well as the space under construction.



PROF ANDREW LIVINGSTON



## Queen Mary Start-up: new innovation involving 100% biodegradable toothpaste tablets

It takes 500 years for a toothpaste tube to fully biodegrade in landfill, meaning that every tube you have used in your lifetime still exists.

According to the British Dental Journal, this plastic waste from toothpaste tubes produced is enough to circle the globe twice yearly as result of us cleaning our teeth. The UK alone uses 300 million tubes of toothpaste every year which, spread end-to-end makes about 75,000 km of plastic.

Common toothpaste ingredients e.g. polyvinylpyrrolidone does not biodegrade and can be eco-toxic, harmful and lethal to marine wildlife a major cause of their extinction (Samuelsson, 2014)

Researchers at Queen Mary University of London led by final year dental student Florence Mai and supported by Professors Wong and Hill have developed an alternative toothpaste in tablet form named “Nattura”, which uses polygamma glutamate (PGGA), an edible, biodegradable, natural polymer that can be cheaply and sustainably manufactured from food byproducts.

The team’s research proves that PGGA boosts the activity of fluoride, providing better cavity prevention than fluoride alone. It also acts as a binder in the tablet replacing the non-biodegradable polymers used currently.

It is already on the INCI register for safe-to-use cosmetic ingredients and it is incorporated into foodstuffs in Japan making it easy to take to market.



**Founder: Florence Mai** has raised significant seed funding for her project turned early phase start-up which went on to win the Junior Colgate Research Prize.

### FLORENCE MAI

When combined with fluoride, PGGA enhances the performance of the fluoride. It also acts as a binder in the ingredient formulation making it perfect to replace some of the other ingredients that go into toothpaste tablets.

Ben Golland, Senior Commercialisation Manager at Queen Mary Innovation Ltd, said the institution was looking for partners interested in licensing the intellectual property or in helping to bring the technology to market.

He said that the formulation was 20 times more effective than fluoride alone at reducing demineralisation/tooth decay of tooth-like material when tested in the lab. The university had completed formulation testing and had positive feedback from consumers and was currently exploring the best options to get the technology to consumers.



# Ranking drugs using machine learning

What if we could predict which cancer drugs would be well received before giving them to the patient?

Too many patients suffer needlessly through being given drugs their body won't respond well to. Every tumour and patient is different – so people can react dramatically differently to the same treatments.

By using machine learning to rank drugs, cancer treatment could be revolutionised through offering truly personalised medicine.



**PEDRO R. CUTILLAS**

Invented by Pedro R. Cutillas, Professor of Cell Signalling & Proteomics at the Barts Cancer Institute, DRUML (Drug Ranking Using Machine Learning) is a methodology for building and integrating machine learning models, using ensembles of proteomic, phosphoproteomic and transcriptomic features to generate lists of ranked drugs based on their efficacy.

Proteomics is the study of all the proteins in a cell, while phosphoproteomics is the study of all the proteins in a cell that have been modified by phosphorylation (a biochemical process that involves the transfer of a phosphate group from a donor molecule to an acceptor molecule), and transcriptomics is the study of all the RNA molecules in a cell. Ensembles are groups of things that are used together to achieve a common goal.

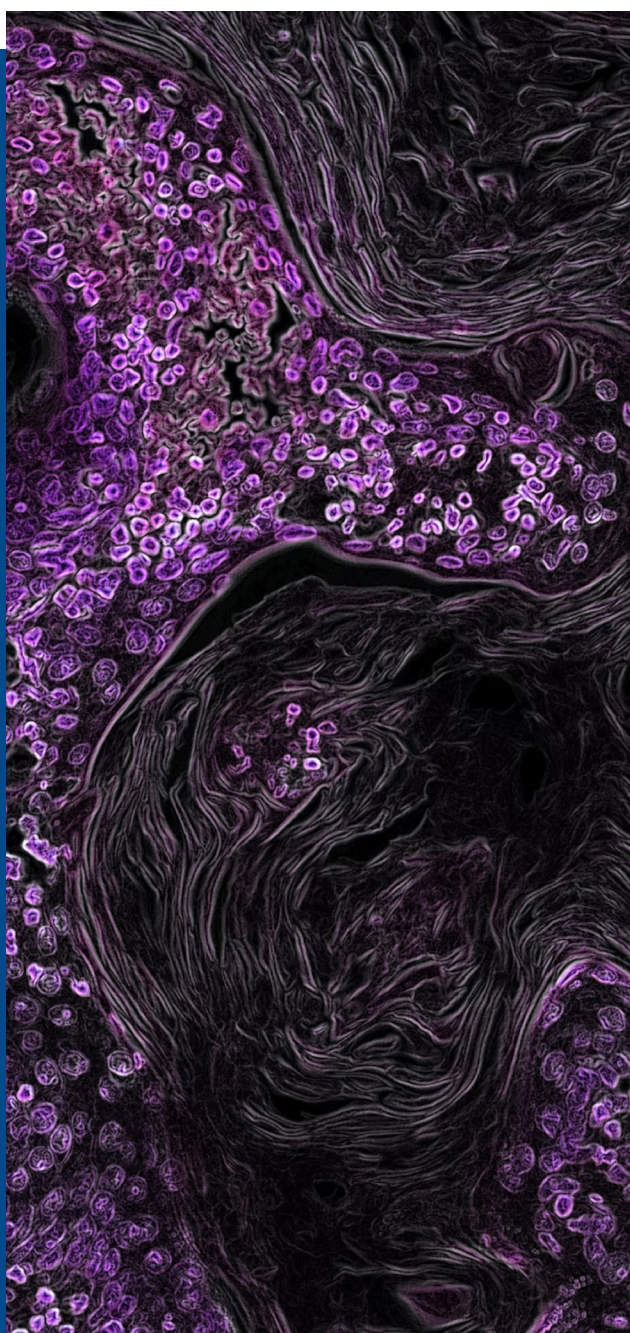
This gives us information about how a patient might respond to therapeutics.

Using large-scale proteomics and phosphoproteomics in machine learning has never been systematically applied before. But recent advances in proteomic techniques and a greater number of drug response profiles means we can now feed this data into machine learning models of drug response – advancing the field of precision medicine and bringing hope to the millions of people diagnosed with cancer around the world each year.

We think this AI technology could greatly advance the field of precision medicine – thereby helping millions of people diagnosed with cancer around the world each year.

The technology can also help with selecting patients for clinical trials in a way that will reduce risks and increase successes because researchers will be able to predict who is most likely to respond. This could mean drugs getting to market more quickly and at a lower cost.

Monika Kraszewska-Hamilton, Senior Commercialisation Manager at Queen Mary Innovation, said: “we are exploring partnerships in an evolving market.”



# Shedding new light on affordable solar energy



PROF JOE BRISCOE

In any drive towards net-zero, solar cells will be a vital part of the renewable energy mix.

Research by Queen Mary University Professor in Energy Materials & Devices Prof Joe Briscoe and his team have developed innovative ways of making perovskite solar cells more efficient and stable.

This will offer extraordinary possibilities for cheap, flexible solar cells in a range of applications.

Currently, more than 90% of solar cells are made of silicon but these have shortcomings. Perovskite solar cells can mitigate many of these. Unlike silicon, which has to be melted at over 1,000 degrees C, perovskites have a crystalline structure which can be formed from a chemical solution at a much lower temperature of around 100-150 degrees centigrade. They are therefore far cheaper to produce.

Perovskite solar cells were initially much less efficient than silicon, but with development, they have shown great improvements. They can now convert around 25% of solar energy into electricity, which is very close to silicon.

However, their crystalline structure means that perovskites often show a high number of flaws after the manufacturing process and they can decompose when they react with moisture and oxygen.

These flaws greatly reduce efficiency, especially when the material is used over large areas.

Prof Briscoe has investigated a new method called aerosol-assisted solvent treatment. This technique passes an aerosol over a surface in a controlled manner. The aerosolised solution passes from a misting bottle through a reactor, containing the heated perovskite sample. This takes no more than five minutes and can also facilitate processing at a lower temperature.

Perovskite cells treated with this process show substantial grain growth and local defects are almost completely eliminated, with cells showing an overall improvement in uniformity.

This has led to an increase in efficiency and stability across a wide range of perovskite compositions, device structures and areas.

Results have been promising so far and it is looking like the aerosol can improve perovskite material that is printed onto sheets of plastic, which will mean they can develop cheap, flexible/ lightweight solar cells.

These could potentially be used in many innovative ways, including indoor locations, self-powered consumer electronics, on car ports and on the sides of buildings. They could even be integrated into electric vehicles.

It will also be possible to use perovskites in tandem with existing silicon solar technology. This could be done at little extra cost, boosting the overall efficiency of these cells.

Prof Briscoe's team has launched a spinout company, AeroSolar, which was awarded £50,000 by Innovate UK to build a large-scale reactor. The company is already actively engaging with perovskite solar cell manufacturers who could be potential customers for their process and products, and other investors have shown interest in the project.





SIMON CARTER

Demand for laboratories in the UK is growing fast, with lab vacancy rates of just 1% in Cambridge and London, and 7% in Oxford, according to a report by British Land, one of Britain's biggest property developers, and the upmarket estate agency and advisory firm Savills.

Across these areas, projects to construct 11.6m sq feet of labs are waiting for a planning decision or are in the pipeline and need to be speeded up.

Simon Carter, chief executive of British Land, said that despite demand, the UK was lagging well behind more mature US markets.

"Boston, San Francisco, San Diego and New York are home to 113m sq feet of laboratory space, over 20 times the equivalent space in the UK's Golden Triangle of London, Oxford and Cambridge," he said.

Projects awaiting the green light include Oxpens in the centre of Oxford, expansion of university labs at West Cambridge and a site around the Royal London hospital in east London, while the government has halted contentious plans for a new life sciences hub in Royal Street in London, which included the demolition of two postwar buildings near Waterloo.

## UK needs more lab space if it wants to be science superpower, ministers told

The UK needs to build more laboratory space, improve transport links and offer more tax breaks to achieve Rishi Sunak's ambition of becoming a science superpower, according to two leading property firms.

Construction is under way that will increase the supply of lab space by 5.2% a year in Oxford and Cambridge, compared with 8.9% a year in Boston, the report found.

If the life sciences hubs in Cambridge, Oxford and London kept up with their counterparts in the US, by 2035 there would be 67,000 more high-skilled, high-wage jobs, £4bn more economic output a year and £1.1bn extra tax revenue a year, the report said.

Completed projects include British Land's Regent's Place in central London, where tenants include Relation Therapeutics, which uses machine learning to aid drug discovery.

The developer also built modular labs in south London within nine months. On the other side of the Thames, Canary Wharf Group has voiced ambitions for a life sciences cluster, and has planning consent to build a 23-storey tower with 60% lab space, where it hopes to attract small biotech firms.

Carter has urged government to set clear targets to expand economic output from Britain's life sciences sector by at least a quarter, and to double the value of overseas investment by 2035.







PLEASE CONTACT OUR MANAGEMENT TEAM  
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