BA2

THE MAGAZINE FOR ALUMNI AND FRIENDS OF THE UNIVERSITY OF BATH
ISSUE 29

THE FUTURE OF HEALTH

HOW WE'RE TACKLING GLOBAL HEALTH CRISES

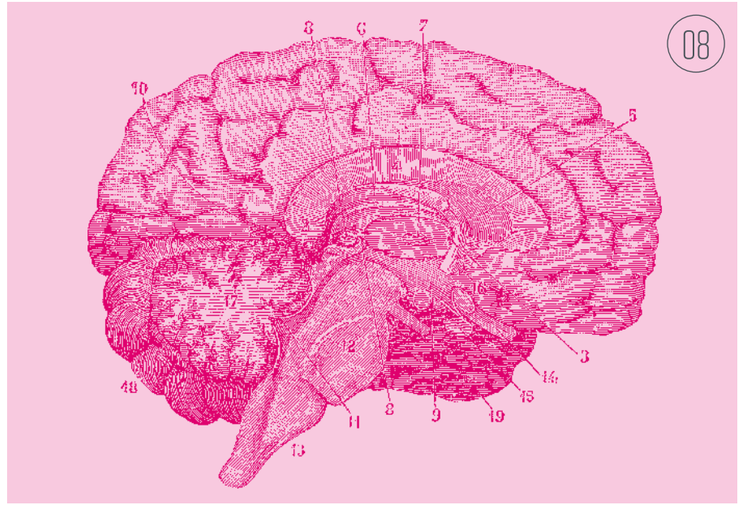
UNIVERSITY OF BATH

After a year's delay, coronavirus lockdowns and time away from training, this summer our athletes finally jetted off to Tokyo for the Olympic and Paralympic Games. And what an Olympics it was! We had 13 alumni, one student and a host of Team Bath-based sportspeople competing across a range of disciplines. Between them, they brought home a whopping 10 medals, nine of them gold.

We have a proud sporting tradition here at Bath and are one of the top 10 places in the world to study sports subjects. We were even the first UK university to introduce sporting scholarships for promising student athletes. You can find out about how a scholarship helps double gold-winning swimmer Tom Dean to balance the demands in and out of the pool on page 14.

Enjoy the issue! Let us know your thoughts by emailing alumni@bath.ac.uk.

At the time of going to press, we have eight University-based sportspeople and one graduate competing in the Paralympic Games, which are yet to take place.



BA2 Issue 29
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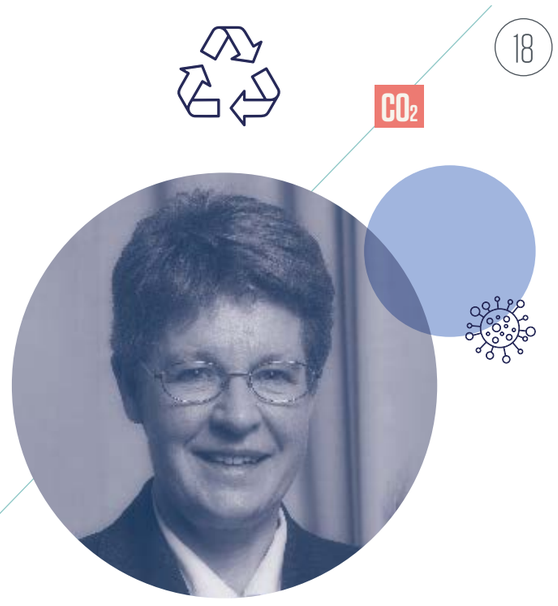

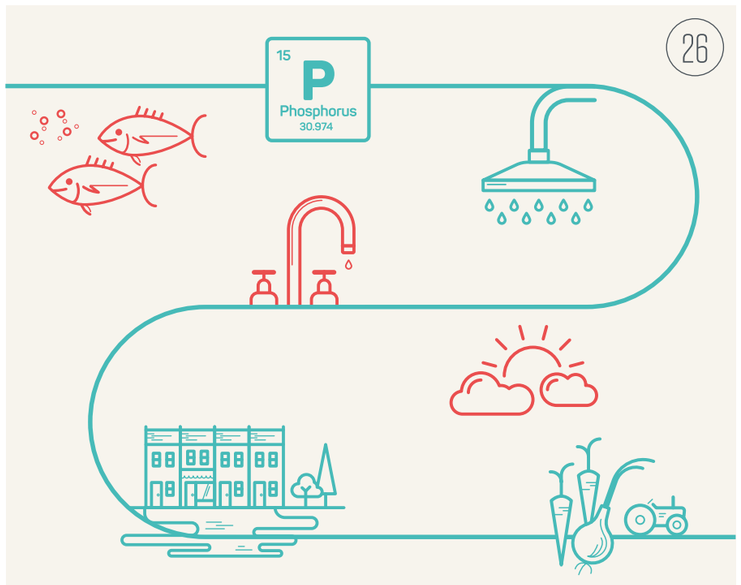

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ON PARADE

Highlights from the University of Bath

Welcome

Welcome to the latest edition of BA2

Reflecting on another year of considerable uncertainty, challenge and change, I am so proud of all that our University has achieved. It simply would not have been possible without the hard work, dedication and excellence of our staff and students, and the overwhelming support of our alumni community.

The impact of Covid-19 forced us to rapidly transform our delivery of teaching and assessment. We provided online and in-person learning as part of the 'Bath Blend', moved to online assessment, offered enhanced academic and pastoral support, and thanks to you, raised much-needed funding to support students experiencing financial hardship.

The majority of our first cohort of Gold Scholars graduated this summer; you can read about some of their experiences in this issue and find out more about the impact the scholarship has had on their time at Bath. Thank you to the many alumni and friends who support the Programme.

We had hoped to celebrate their hard work, and that of the classes of 2021 and 2020, in a series of socially distanced graduation ceremonies on campus in July. We were therefore very disappointed when, in spite of our meticulous planning, local public health advice led to these being postponed due to rising numbers of cases in the local area. Plans are in place to offer alternative dates as soon as possible.

We were, however, delighted to be able to offer our Summer at Bath programme in June, providing students with an opportunity to enjoy social and wellbeing activities once exams had finished, and offering staff a chance to reconnect safely with colleagues.

At the start of 2020, we asked you to help us shape our University Strategy for 2021–2026. Your feedback was invaluable, both in sharing strengths in terms of education, student experience and employability, and also formulating next steps in building for the future.

Our new Strategy, 'Our University, Our Future: Connected', has now been published and sets out our high-level ambitions across four pillars: driving excellence in education; driving high-impact research; fostering an outstanding and inclusive community; and enhancing strategic partnerships. Over the next five years, I look forward to finding new ways to work together and to building positively and with confidence for our future.

We have already begun to pursue new opportunities in research and have launched our Bath Beacons initiative, empowering our academic community to tackle major research challenges by building consortia for large-scale funding.

This year's introduction of two new senior posts – a Head of the Race Equality Taskforce and an Executive Chair of the Equality, Diversity & Inclusion Committee – will help us to take forward our commitment to creating an inclusive and welcoming community, recognising the strength that diversity brings to our University.

Finally, I would like pay tribute to alumnus Roger Whorrod OBE, one of the University's very first graduates, who finished his term of office as Pro-Chancellor this summer. Roger has been a great friend and donor to the University over many years, and we are very grateful to him for his significant contributions.

With warm good wishes,

Ian White

Professor Ian White DL FREng, Vice-Chancellor & President

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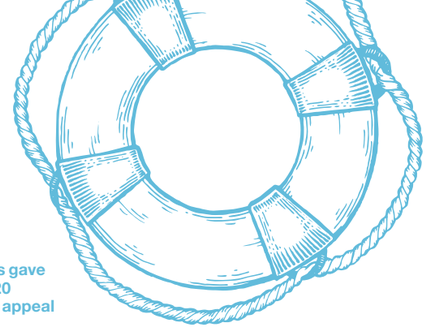
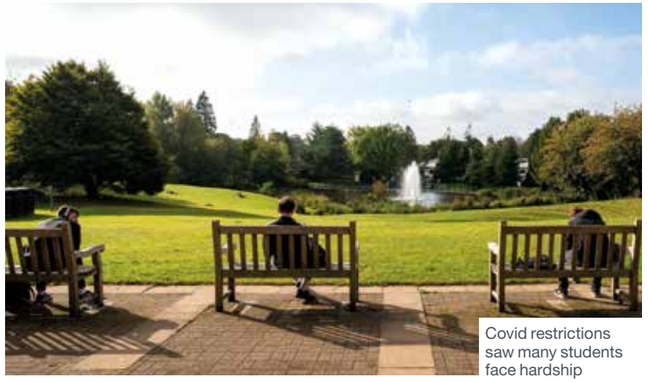
alumni and friends gave to our autumn 2020 Student Hardship appeal



Community



Covid restrictions saw many students face hardship

Supporting students through Covid-19

As semester one began last autumn, the coronavirus pandemic continued to have an impact on our students. Many of them had their safety net ripped away as families were no longer able to provide support, and by curbs on the hospitality and retail sectors that left them unable to work in part-time jobs alongside their studies.

As a result, the University's Student Hardship Fund saw a six-fold increase on the usual number of emergency grant applications received.

In response, we launched an incredibly successful second crowdfunding appeal. Thanks to the generosity of our alumni and friends, we raised £88,670 to support those in our University community who needed it the most throughout the last academic year.

"The grant meant that I was able to focus fully on my studies," explained one Fund recipient. "In doing so, I was able to get enough sleep, afford nutritious food, catch up on university work and ultimately relieve a huge amount of stress in all areas of my life."

The first £25,000 of donations were match-funded by alumnus Peter Harrison (BSc Business Administration 1988), who made a generous gift to get the crowdfunding appeal underway.

"As a proud alumnus of this great University, it is my pleasure to contribute to this vital appeal," he said. "Through no fault of their own, many Bath students now face serious financial hardship. They deserve the means and security to continue to learn and invest in their futures."

"The Student Hardship Fund can really make all the difference, enabling a student to focus on their studies without the nagging stress of money worries hanging over them," adds Catherine Bailey, Deputy Director of Student Services. "It really can make the difference between someone being able to stay on their course or not."

Community

A shared future for BANES

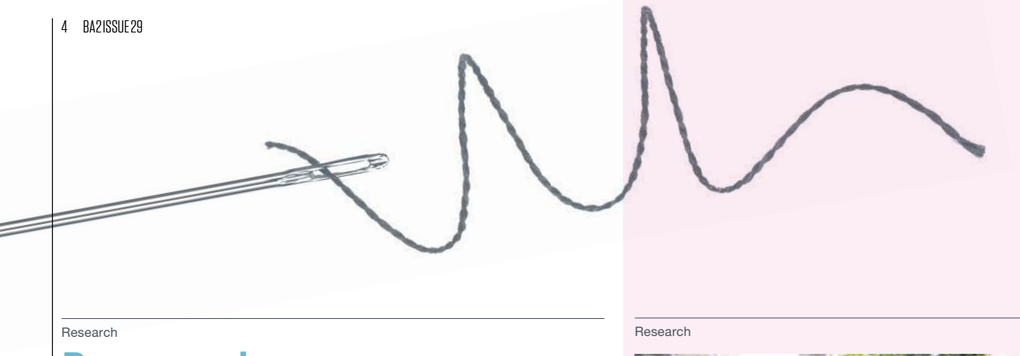
As part of the 'Our Shared Future' initiative, the University is working alongside Bath & North East Somerset Council to tackle the three priority areas of cohesion and inclusivity; infrastructure; and climate change. These key themes were identified through a series of workshops with University researchers, the Council and local organisations, including the NHS and voluntary sector.

One of the projects to tackle climate change, led by Dr Victoria Stephenson from our Department of Architecture & Civil Engineering, will look at reducing the energy footprint of heritage buildings around the city. Energy use in buildings makes up 68% of the region's carbon emissions, and heating is the biggest culprit.

Professor Bernie Morley, the University's former Deputy Vice-Chancellor and Provost, said:

"As communities in and around our city face such difficult times through the pandemic it is more important than ever for collaborations to rise to the challenge of finding solutions for the problems we face."

The rooftop view from Bath Abbey



Research

Buzzwords

What our researchers are talking about

Seams
Garment seams sewn with conductive thread can measure body movements that aren't picked up by fitness trackers, according to our Department of Computer Science.

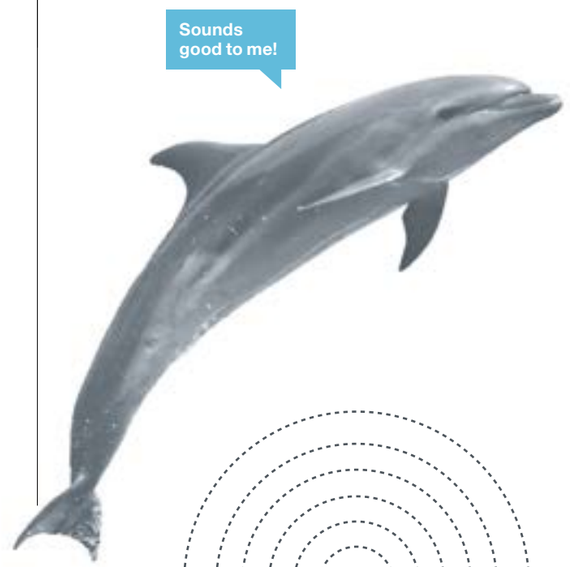
Soundwaves
Bath researchers can map underwater landscapes and avoid damage to marine life using seismic pulses.

Aerogel
An ultralight meringue-like substance made from graphene, developed by our Materials and Structures Centre, can reduce aircraft engine noise.

Deep freezing
Bath physicists have discovered that cooling a material called RbEuFe4As4 below -258°C causes it to be both magnetic and a superconductor – two states rarely seen simultaneously.

Coke cans
Dr Kit Yates from our Department of Mathematical Sciences has calculated that all of the SARS-CoV-2 virus in the world could fit into one Coke can with room to spare.

Phishing
Analysis from our School of Management's Professor Adam Joinson has found that authority and urgency are the key factors that make us click malicious links.



Research

A farmer in Freetown, Sierra Leone

International award for Bath film

Green Island, a two-minute film made by Professor Roy Maconachie from our Department of Social & Policy Sciences and in-house videographer Simon Wharf, won top prize in the international 'Let's Talk About Water' film competition.

The film focuses on a female farmer in Freetown, Sierra Leone. Shot on location, it reflects on the impact that increased migration has had on access to the water that she and other farmers depend on. It is currently being edited into a longer piece that supports Roy's research on resources and food production in the region.

"Like no other medium, film has the power to reach a very wide audience," says Roy. "In my own work, it has become an essential part of my strategy to generate impact and translate my research into a format that is accessible beyond academia. I am really thrilled that this film is already receiving international attention."

Roy and Simon also won acclaim for their previous film, 2019's Voices of the Mine – which was funded by Humanity United, whose founding president and former CEO is alumnus and honorary graduate Randy Newcomb.

Watch Green Island by scanning the QR code.

13 of our subjects are ranked in the top 10 nationally by The Guardian University Guide 2021

Reputation

Bath remains high in rankings

The University moved up to 166th position in the QS World University Rankings 2022, up seven places from joint-173rd the previous year. This places us in the top 13% of universities globally.

We are also ranked in the top 10 of all three UK university league tables: 6th in The Guardian University Guide, 9th in The Times & The Sunday Times Good University Guide and 10th in The Complete University Guide.

Professor Ian White DL FREng, Vice-Chancellor and President, says: "It is pleasing to see evidence of our growing international reputation and profile shown in our improved position in this year's QS World University Rankings. This is the result of the sincere efforts of many people across our whole University community, for which we should feel very proud."

Campus

New Library membership for alumni

All Bath graduates are now eligible to apply for free membership of the University Library. Once you've signed up, you're able to borrow up to five books at a time, as well as access a range of online resources – including Sage Journals, MIT Press Journals and OECD iLibrary. Find out more at **bit.ly/uob-library-alumni**.

Research

In a nutshell

Nice car!

Thanks, it's a metaphor.

What do you mean?

Scientists from our Milner Centre for Evolution have been studying natural selection. According to them, if you think of human DNA as equivalent to a rusting old banger, then yeast's is more of a finely honed sportscar.

I feel like I've missed a turning here…

Let's reverse a bit. Researchers Professor Laurence Hurst and Alex Ho compared the genomes – genetic instructions used by cells to make proteins – from a wide range of organisms, from humans all the way down to algae. Each string of instructions ends with a 'stop codon' that tells the cell to stop reading. One of these, called TAA, works more efficiently than the others and is more prevalent in yeast's DNA than in ours.

Why hasn't natural selection got rid of the less efficient options? You wouldn't hit the motorway in first gear, would you?

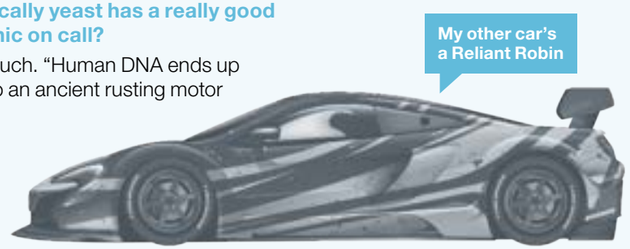
In humans and other mammals, reproduction is slow and population numbers are comparatively low. This means that 'chance events' causing the other stop codons to be used have more influence than they would amid other species. In yeast or bacteria, by contrast, populations are large and replicate fast – this puts less weight on chance events and means that less favourable mutations are more effectively weeded out. As a result, yeast cells are far more likely than ours to use TAA.

So basically yeast has a really good mechanic on call?

Pretty much. "Human DNA ends up similar to an ancient rusting motor car – just able to function, with all sorts of bad repairs and accretions built up over time," explains Laurence. "Yeast instead is more like an organism straight out of the showroom: the perfect machine."

Vroom vroom!

Steady now. The research hasn't just been handy for comparing species to vehicles in various states of repair. Now that we know how human DNA is prone to errors despite natural selection's best efforts, future gene therapies can be improved. Laurence adds: "It suggests when making new genes for gene therapy, we should do what yeast does and use the best stop codon: TAA."



Below: Albert Opoku was a Chevening Scholar during his time at Bath

Community

60 seconds with...

Albert Opoku (MSc Computer Science 2017) is co-founder of hapaSpace – a tech, entrepreneurship and collaboration hub in Kumasi, Ghana. In 2020, he was the global winner of the Study UK British Council Alumni Awards' Social Impact category.

How did it feel to be recognised by the Study UK Alumni Awards?

I was shocked; I had to read the email three times! It made me realise I've been successful in my mission to impact young people in my community. It has been a massive psychological boost, positively affected my own sense of self-worth and become a weapon in my constant fight with imposter syndrome.

You're an Alumni Expert and an Ambassador on Bath Connection – why do you think it's important to volunteer like this?

Most of the best moments of my life happened through people who gave up their time and resources for me. The only way I can 'pay back' is to give to others. Secondly, I strongly believe that it's my duty as an alumnus to assist the University in any way I can – after all, a candle loses nothing by lighting another.

What advice would you give to alumni thinking of signing up for Bath Connection?

It may sound time-consuming, but it really isn't. Whatever the question, the answers come from your experience at Bath or in your career.

Give and receive careers advice by joining our networking site Bath Connection at go.bath.ac.uk/bath-connection or by scanning the QR code.

Leadership

Meet our new Pro-Vice-Chancellors

This summer, the University announced the appointment of three new Pro-Vice-Chancellors. Professor Cassie Wilson took up the role of Pro-Vice-Chancellor (Student Experience) in August, having been our Vice-President (Student Experience) since September 2019.

Professor Julian Chaudhuri will be re-joining Bath from the University of Plymouth in December as Pro-Vice-Chancellor (Education). Julian was Associate Dean (Research) of the Faculty of Engineering & Design until January 2014.

Professor Sarah Hainsworth OBE FREng will also join us in December as Pro-Vice-Chancellor (Research). She is currently Pro-Vice-Chancellor at Aston University.

"It gives me great pleasure to be able to introduce the new Pro-Vice-Chancellor team," says Vice-Chancellor Professor Ian White DL FREng.

Research

CSCT to join a £20m research centre

The University's Centre for Sustainable and Circular Technologies (CSCT) will be a leading partner in the Industrial Decarbonisation Research and Innovation Centre (IDRIC).

This state-of-the-art research initiative has received £20m from UK Research and Innovation and will involve more than 140 partners as it works to cut industrial greenhouse gas emissions.

Its goal is to create the world's first net-zero emissions industrial cluster by 2040 and four low-carbon clusters by 2030.

"Decarbonisation is a crucial issue and £20 million is a sizeable investment from the government," says CSCT Co-Director Professor Marcelle McManus. "Coupled with the additional significant investment from industry, the potential impacts from IDRIC are huge."

£3.8 million

in funding from UKRI and Versus Arthritis will support a four-year project into the psychological and social factors that influence people's experience of chronic pain

Research

Carole joined the University in 2015

Prof. Carole Mundell named Hiroko Sherwin Chair in Extragalactic Astronomy

Carole Mundell, Head of Astrophysics and Professor of Extragalactic Astronomy, has been awarded a named Chair in recognition of her outstanding contribution to the international field of astrophysics research and her work to promote diversity in STEM.

The Hiroko Sherwin Chair in Extragalactic Astronomy also recognises Carole's contributions to the Department of Physics – which she headed from 2016 to 2018, before being appointed as Chief Scientific Adviser at the Foreign, Commonwealth and Development Office – and the wider University, which she represents at national and international levels.

The Chair was publicly launched at an online event in February, attended by over 150 participants from across the world.

It has been named in celebration of long-term supporters, Jim and Hiroko Sherwin, who have funded undergraduate scholarships and PhD positions in the Faculty of Science for over a decade.

"I am honoured and delighted to accept the Hiroko Sherwin Chair in Extragalactic Astronomy," says Carole. "I am deeply grateful to Jim and Hiroko Sherwin on a personal level, but also for their recognition of the importance of celebrating excellence in science, their understanding of the critical need for visible women role models in physics, and their sustained direct action to move the dial on gender bias in STEM."

Carole's research has been instrumental in advancing our understanding of cosmic black hole-driven explosions and the dynamic Universe. A recent gift from the Sherwins will support this research and enable Carole to continue to inspire and develop the next generation of young researchers at Bath.

Hiroko Sherwin says: "Carole is an outstanding role model for gender diversity in astrophysics and I am delighted to support her work."

Community

A blooming business: recycling India's floral waste

Retra, a start-up founded by Bath alumna and research associate Parimala Shivaprasad (PhD Chemical Engineering 2019), has received a funding award of £11,000 from the Royal Academy of Engineering to investigate the feasibility of upcycling discarded flowers.

The company aims to address the large amounts of flowers being disposed of after religious ceremonies and weddings in Parimala's native India. Retra is using these flowers as a source of essential oils, including scents such as rose and jasmine.

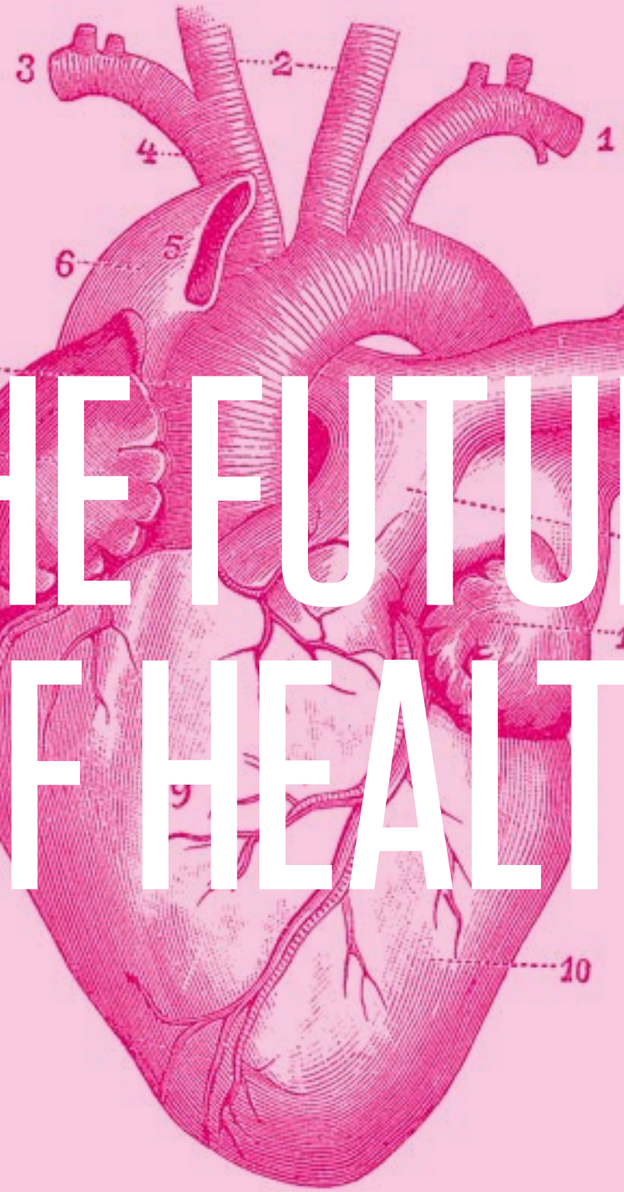
As a student, Parimala successfully pitched her idea to alumni funders in a Dragons' Den-inspired competition in 2016. She then went on to receive a Foulathi Innovation Award in 2019, as well as securing funding from Innovate UK.

She explains: "The possibility of creating a positive impact on the environment through my research activities and my start-up keeps me motivated through challenging times."

Research

Bath engineer wins prestigious award

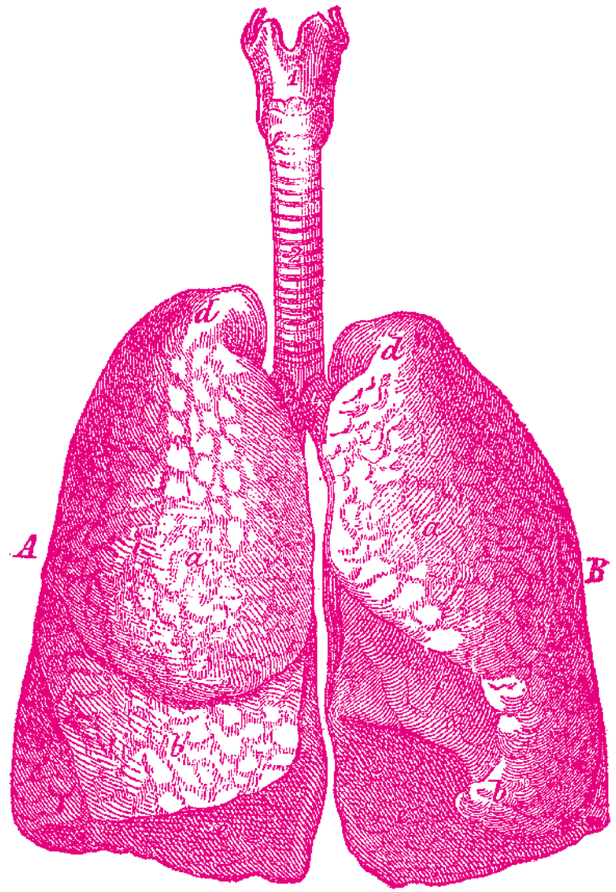
Debbie Janson, senior lecturer in our Department of Mechanical Engineering, was named as one of 2021's top 50 UK women in engineering. The award from the Women's Engineering Society came in recognition of her work to improve personal protective equipment for women – which is usually designed to fit men.



THE FUTURE OF HEALTH

DISCOVER HOW BATH RESEARCHERS ARE FINDING NEW WAYS TO TACKLE GLOBAL HEALTH CHALLENGES

Words **Emma Davies**



Health is a concern that touches all our lives – whether we're suffering from an illness or simply hoping to keep our bodies in top condition. In the UK, one in two of us will be diagnosed with cancer at some point in our lifetime; an estimated 1.13 billion people worldwide have high blood pressure; and 463 million people worldwide are estimated to be living with diabetes. With the average age of the global population on the rise, our health is more important than ever before.

It's also an area that invites innovative research, whether that's using 3D printers to create orthopaedic implants or looking inside cells to work out what's going wrong. Read on to find out about how researchers from across the University are helping to shape the future of health, from cancer treatment through to personally tailored surgical techniques.

"We can resynchronise the heart rate to biological rhythms" Professor Alain Nogaret

Pacemakers that listen to your breathing

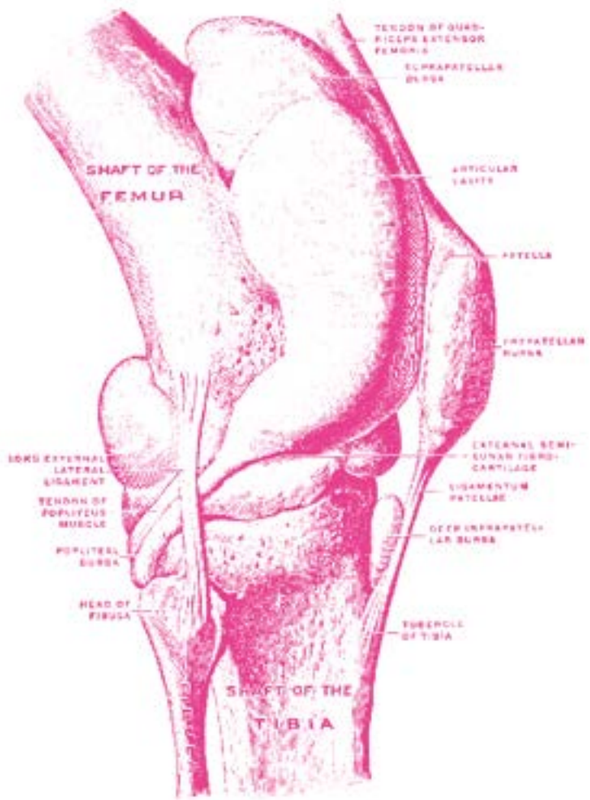
Of course, you know that exercise affects your heart rate, but did you know that even breathing has an impact? When you inhale, your heart beats slightly faster, slowing down again when you exhale. However, conventional pacemakers keep the heart beating at a fixed rate.

Professor Alain Nogaret from our Department of Physics is using artificial nerve cells – otherwise known as neurons – to create a 'smart' bionic pacemaker, which will help the heart to beat in a more natural rhythm by listening to signals from the body. This will enable the cardiac muscle to work more efficiently, addressing the symptoms of heart failure.

The artificial neurons are created by studying the signals sent by nerve cells in the brain. These parameters are then programmed to a silicon chip, which will replicate what nerve cells do naturally. "This allows us to resynchronise the heart rate to biological rhythms – in particular to respiration and blood pressure, but also oxygen and carbon dioxide concentration in the blood," says Alain. "As a result, the heart saves energy and as it works more efficiently it is able to repair itself."

Amazingly, the pacemaker has been shown in the lab to improve cardiac output by 17%, and to actually reverse the decay of cells in the heart muscle, says Alain. This is particularly promising because there is currently no cure available for heart failure, a condition that can ultimately prove fatal. Human studies are set to take place later this year in New Zealand.

Alain continues: "We have proven the principle and, beyond any doubt, that restoring heart natural rate variability has major benefits for heart failure."



3D printing parts for knee surgery

Osteoarthritis is the most common type of arthritis, with the knee joint often affected. Currently the main treatment is a knee replacement, but this is only available to those with end-stage disease – meaning sufferers face up to 20 years of pain and impaired mobility.

The need for a replacement can be delayed by a high tibial osteotomy (HTO), a procedure where a surgeon makes an incision into the shin bone to realign the joint then stabilises it with a metal plate. In their current form, HTOs are lengthy, complex procedures, and also carry a risk to structures such as ligaments within the knee.

TOKA, a new treatment created by Professor Richie Gill from our Department of Mechanical Engineering and Centre for Therapeutic Innovation, aims to change this. It uses CT scans to create a computerised 3D model of the patient's anatomy, which acts as a digital guide for the procedure. Crucially, it's also used to design and 3D-print a plate that precisely fits the recipient.

This tailored technology has been tested on 25 patients in Italy, with incredibly promising results. "The doctors have said that the surgery is much better," Richie explains. "The alignment they achieve is excellent, they can do the surgery in less than 30 minutes and, most importantly, all the patients have recovered quickly."

The project is about to enter a randomised clinical trial in the UK, and the team are hopeful that TOKA will be widely available in the next few years. "The Italian patients all now, within six months of their surgery, want their other knee done with the same technology," says Richie. "That's a remarkable result, because the pain of the recent surgery usually makes people wait at least a year before considering further operations!"

Skin cancer treatments with fewer side effects

Non-melanoma skin cancers are one of the most common cancers, and cases have rocketed since the 1990s. They originate when DNA in stem cells of the epidermis – the outermost, protective layer of the skin – is damaged by the Sun's radiation. Stem cells create copies of themselves through cell division, but also replenish mature cells as they die off. Issues arise when the balance between these two processes goes awry and stem cells divide more often than they should.

"Most of the work in our cells is done by proteins, and the instructions for how to make proteins come from genes," says Dr Gernot Walko from the Department of Biology and Biochemistry and Cancer Research at Bath. "The process by which the information in a gene is turned into a functional protein is called gene expression. Only a fraction of the genes in a cell are expressed at any one time."

He continues: "YAP/TAZ work in the cell's nucleus, where they interact with many other proteins to promote the expression of genes that allow cells to divide. The problem comes when YAP/TAZ are more active than they should be, enabling normal cells to become cancer cells."

"The problem comes when proteins are more active than they should be"
Dr Gernot Walko

Gernot's team – including PhD scholar Jodie Bojko, who is supported by alumnus Raoul Hughes (BSc Business Administration 1987) and his wife Catherine – are working on identifying the proteins that interact with YAP/TAZ specifically in cancer cells to cause this harmful overactivity. He continues: "We hope to identify proteins where drugs already exist or are in development, which can be used to treat YAP/TAZ-driven tumours."

Targeting these proteins rather than YAP/TAZ directly also means that their normal function of repairing and renewing the skin won't be inhibited. These treatments could offer hope for a cure for various YAP/TAZ-driven cancers that avoids many of the unpleasant side effects of current therapies.

Timing your caffeine fix

If a cup of coffee is the first thing you reach for when you roll out of bed, you're not alone. However, according to our experts, you're not doing your metabolism any favours.

Research overseen by Professor James Betts from our Centre for Nutrition, Exercise & Metabolism compared blood sugar levels of three groups of participants. The control group had a normal night's sleep followed by breakfast; a second had broken sleep and then breakfast; and a third also had a bad night's sleep but were given a cup of strong black coffee 30 minutes before their breakfast. Glucose levels in the latter group spiked by around 50%.

"Put simply, our blood sugar control is impaired when the first thing our bodies come into contact with is coffee, especially after a night of disrupted sleep," explains James. "We might improve this by eating first and then drinking coffee later if we feel we still need it. Knowing this can have important health benefits for us all."

Speedy Spice identification

Use of the human-made street drug Spice has risen steeply in recent years – particularly among homeless people and in prisons. It's also potentially deadly, causing psychosis, seizures and even strokes.

At present, testing for Spice takes days, which makes treating overdoses particularly difficult. "There is no way of knowing if Spice has been taken if someone presents with psychosis or intoxication symptoms that could also be due to other reasons," says Dr Chris Pudney from our Department of Biology & Biochemistry.

Chris and his team are working to create a machine that uses saliva samples to give results in just five minutes. They developed a successful prototype in 2019 and were recently awarded a research grant of £1.3 million to turn this into a portable device – which they hope will be in use in just a few years' time. Chris is positive about the impact that on-the-spot Spice testing will have: "Our ultimate aim is to save both money and lives."

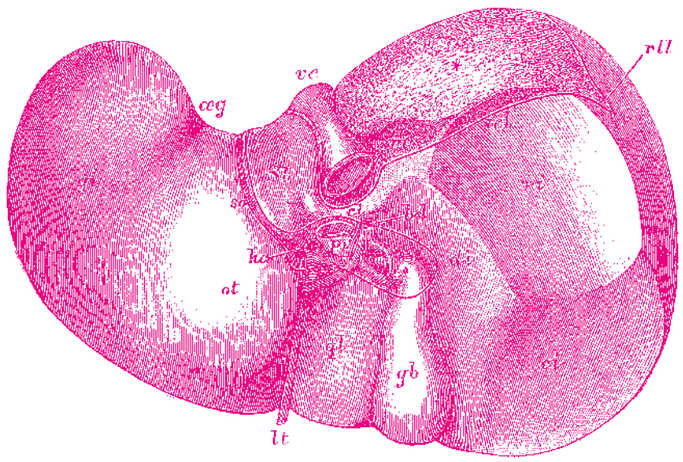
Keeping chemo running smoothly

"Chemotherapy day units operate with extremely limited resources and under tight schedules, so the design of that schedule is crucial for the most efficient use of resources," explains Dr Melih Çelik from our School of Management.

His team compared the actual running times for over 200 patients' drug infusions to the estimates used by doctors when setting the schedules. They found that the two often failed to match up, with shorter infusion durations being underestimated, and longer ones being overestimated.

"To overcome the inefficiencies in patient appointment scheduling due to this mismatch, we built a simpler approach that provides 'near-best' schedules in only a few minutes," adds Melih. The result is an algorithm that improves patient waiting times by 80% and reduces nurse overtime by over 30% compared to current practice.

"Chemotherapy units operate with extremely limited resources"
Dr Melih Çelik

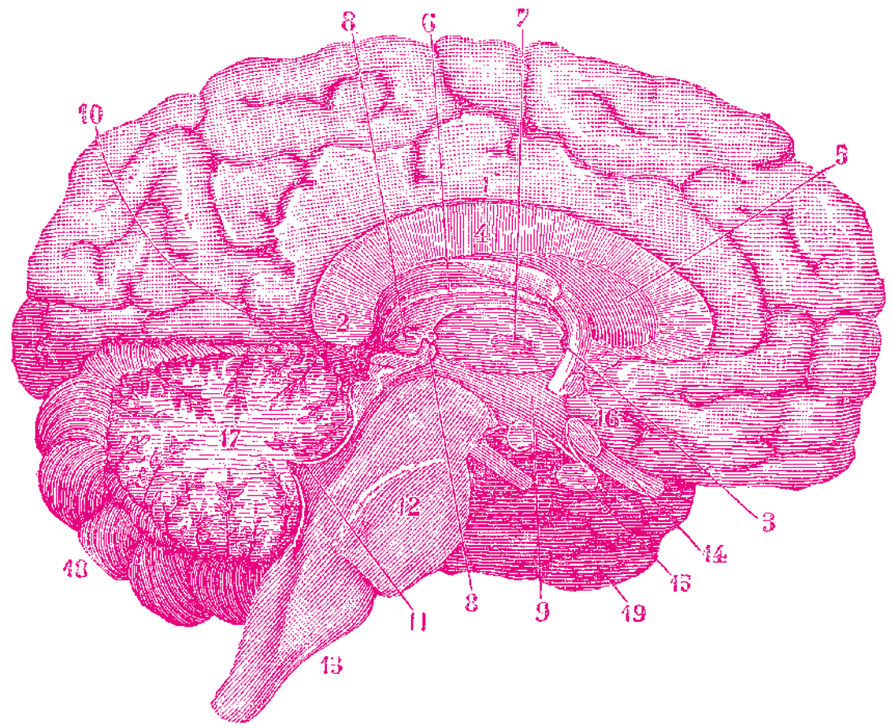


Using liver cells to cure diabetes

Type I diabetes is an autoimmune disease where the body destroys the insulin-producing beta cells found in the pancreas. In some cases, it can be cured by a transplant of beta cells, but a shortage of organ donors is a major hurdle.

Sebastian Wild, a Biochemistry PhD student in the Centre for Therapeutic Innovation, is aiming to address this by developing a method of converting liver cells – which are plentiful, as the liver can regenerate – into pancreatic beta cells.

Sebastian, whose studentship is supported by alumnus Nick Hynes (Executive MBA 1991), says: "It is a privilege to work on a project with such a clear medical application and obvious benefit to people's lives."



Targeting the causes of Parkinson's

Tragically, around 10 million cases of dementia are diagnosed worldwide each year. A team led by Professor Jody Mason from our Department of Biology & Biochemistry have discovered a series of protein structures that are highly relevant to the onset of Parkinson's disease.

The protein – alpha-synuclein (αS) – is abundant in all human brains, and the scientists are examining how they can form toxic deposits. These kill cells, causing dementia symptoms – and preventing their formation could help to keep brain cells healthier for longer.

"Sometimes, when these proteins are produced, instead of getting to the right structure, they go rogue, 'misfolding' and ending up in the wrong place," says Jody. "Rather like plates stacking, they grow into very long toxic chains, which we call αS fibres."

He is carrying out research to identify proteins that can bind to αS and prevent this toxic misfolding from occurring. The team are doing so by introducing millions of peptides – microscopic proteins just 10 amino acids (the building block of proteins) long – to αS inside living cells, and observing whether fibres form. This will also allow them to check if the peptides kill off cells – an obviously undesirable side effect.

"We've also been making step by step changes to the amino acids within the peptides; this involves going through the molecule to establish which of the 10 amino acids are talking to the target," Jody explains. "If you can do that, then you can start to rationally design the peptide's sequence to make it more effective and drug-like."

It's hoped that this research will lead to future treatments for a disease that currently has no cure.

Giving feeling back to amputees

While advances in prostheses have changed the lives of thousands of individuals with limb differences, they still do not yet relay sensory information to the user. Without that sensation of touch, how can you tell how much pressure you're exerting or how tightly you need to grip something? This challenge in prothesis development leaves many users frustrated, relying on their remaining limb and risking painful 'overuse syndrome'.

Using electrical currents to stimulate nerves can produce a 'feeling' that is perceived as originating from the prosthesis, but so far, the method requires electrodes to be implanted into the arm. Not only is this invasive – and has the potential for infection – it also means that users aren't able to test out the system before committing to it.

Electrical & Electronic Engineering PhD student Leen Jabban is developing a non-invasive system by attaching electrodes to the skin around the arm to target specific nerves. So far, she has achieved sensation in the 'hand' through electrical currents to the forearm, and is working on localising the stimulation.

"I aim to create a simple, cheap system that a user could fit themselves," says Leen, whose scholarship is supported by alumnus Eur Ing Dr Brian Nicholson QC (PhD Electrical & Electronic Engineering 1998; Hon DEng 2018), Tony Best (Hon DEng 2013), and the Esther Parkin Trust. She is also the recipient of an Alumni Fund grant. "I'd like my research to be available to as many people as possible, so even those in the remotest parts of the world can access technology to help them live easier and healthier lives."

"I'd like to help people worldwide live easier and healthier lives"
Leen Jabban

LIFE AS AN ELITE

FOR SOME, COMPETING AS A TOP ATHLETE WHILE ACHIEVING ACADEMIC AMBITIONS IS AN IMPOSSIBLE BALANCING ACT. AT BATH, WE HAVE THE WORLD-LEADING FACILITIES, SUPPORT AND SCHOLARSHIPS TO ENSURE A WINNING COMBINATION

Words **Jodie Tyley**

"I'm training for the biggest two minutes of my life," says Tom Dean, elite swimmer and mechanical engineering student. We're speaking to him in the build-up to the long-awaited 2020 Olympic Games where he'll be making his debut for Team GB. "I remember watching the Olympic trials when I was 11 and thinking 'that's the dream', so it's a real honour to be selected," he says. "I hope I can make everyone proud." Two months later in Tokyo, he was on the podium with two gold medals – our 200m freestyle and men's 4 x 200m relay Olympic champion.

Covid-19 impacted every athlete's preparations, but Tom had to deal with two bouts of the virus within six months, costing him weeks of training. That was on top of the UK lockdown restrictions in 2020, which resulted in ten weeks out of the water. "It's an unheard-of amount of time for a swimmer and an athlete, unless they're retired," he says. "We're really fortunate at Bath to have an amazing support team. The coach, physio, nutritionist and psychologist all played a part in helping me stay positive and focused during isolation and coming to terms with the fact the Olympics had been postponed."

Tom had to dive back into training as soon as possible. By the end of a typical week he has swum over 60,000 metres; smashed three gym sessions; completed four hip and shoulder mobility workouts; as well as physiotherapy, soft tissue work, and Pilates to maintain peak physical condition. "It's a full-on, demanding schedule, but well worth it," he grins. His winning performance secured a new national record of 1min 44.22sec.

Competing demands

For elite athletes, physical skill alone is not enough to cope with the demands of training and competing. Psychological preparation is key to managing the stress of a big event. Dr Rachel Arnold, a sport psychologist from our Department for Health, works with athletes, teams, and organisations to create effective performance environments and cultures. Her research ranges from examining leadership and management styles in sport, to the organisational stressors that can place strain on athletes, such as travel and accommodation logistics; injury and financial support; and coaching.

However, student-athletes have the added challenge of balancing their studies alongside their sport, and Bath's Dual Career Programme is designed to help them excel at both. In addition to free use of the gym and facilities, there's academic flexibility and access to both a psychologist and a lifestyle advisor. The latter provides support with health and wellbeing, as well as assistance with personal development and preparation for life after sport.

Bath was the first UK university to offer sports scholarships in the mid-1970s, and today there are 40 student-athletes benefiting from this support. "Doing a part-time job at the same time as studies and sports would be out of the question, so the scholarship has been invaluable," says Tom, a Bill Whiteley Sports Scholar.

Left: Tom Dean won double Olympic Gold

"We're really fortunate at Bath to have an amazing support team"

Tom Dean

Tom has taken two years out from his mechanical engineering degree to focus on his Tokyo dream, but has no doubt he has made the right decision by studying in Bath. "When looking at where in the UK ticks the boxes of elite sport and an excellent education, there was never any doubt in my mind it was going to be Bath," he continues. "I've always had a passion for engineering – I think the analytical side of my brain helps me with my sport as well. It will open up so many doors for my career post-swimming."

Playing the long game

Someone who understands the value of combining studies and sport more than most is Iestyn Lewis (BSc Structural Engineering 1995). He played for Bath Rugby alongside his degree, and later became a chartered civil engineer and set up his own business. "You don't know how long a sporting career is going to last," says Iestyn. "My career finished as a result of injuries – both of my shoulders and my knee were reconstructed – so getting a qualification is extremely important."

Since hanging up his boots, Iestyn has kept close ties with the University – coaching the rugby team and supporting student-athletes through scholarships. "I was fortunate enough to be provided with that opportunity myself at Bath and I wanted to give something back," he explains.

"My wife Nicky and I felt it was important to help someone try to achieve their sporting ambition, because you're only young once and you don't get a second chance."

Iestyn's company Rengen also sponsors Team Bath, as well as wider recreational activities at the University's Sports Training Village (STV). He adds: "They're facilitating a fantastic environment for everyone, from Olympic athletes and Bath Rugby Academy players, right through to children taking their first steps in sport and the general public." The STV accommodates more than 50 sports and hosts major international competitions, such as the Invictus Games trials and Modern Pentathlon European Championships, as well as school sports days and college tournaments.

> "The STV hosts more than 50 sports, as well as international competitions"

Belonging at Bath

It was a visit to Bath for a netball match that made a lasting impression on alumna and England player Imogen Allison. "As soon as I got onto campus, I knew it was where I wanted to go to university," she recalls. "The excellent reputation for my course (sport and exercise science), as well as netball, meant it was a great opportunity for me to grow as a player while getting a degree." In 2021, Bath was named one of the top 10 places in the world to study sport in the QS World University Rankings, and enhanced its offering with a master's in sport management for those interested in leading organisations.

Imogen was awarded a King Scholarship, which offered security beyond the financial. "I'm from Yorkshire and it was daunting moving so far from home," she explains. "Knowing that someone wanted to support me in my dual career felt amazing." Since graduating in 2020, Imogen is focusing fully on her netball career with both Team Bath, reaching the finals of the 2021 Vitality Netball Superleague, and as a full-time member of the England senior squad. The Roses are training towards the 2022 Commonwealth Games, where they'll be defending the gold medal on home soil.

Playing alongside Imogen for both club and country is Sophie Drakeford-Lewis, a former Bill Whiteley Sports Scholar who graduated this summer. She made her England debut during freshers' week in 2017, and continued to balance a stellar career on the court with her degree in integrated mechanical and electrical engineering.

"Academia is just as important to me as sport, so to be able to combine both at one of the top universities in the country was an opportunity I couldn't miss," she says. "They complement each other, too – the discipline that you develop within sport and dealing with pressure have definitely helped with my studies."

Like Imogen, Sophie will continue playing for Team Bath Netball as well as England. It's been a childhood dream of hers to play in the Blue and Gold since her 10th birthday when she came to watch them in a Superleague game. To any youngsters with similar Blue, Gold and academic ambitions, she has some words of advice: "Embrace it all. It is possible to combine them both. Reach out and speak to your Director of Studies and the people involved in your sport – they are all so supportive and willing to be flexible so you can succeed in everything you want to do."

Team Bath's Hall of Fame can attest to that fact. Upon walking through the doors of the STV, you're greeted by the likes of Olympic silver medallist, swimmer Michael Jamieson; double Olympic rowing champion Heather Stanning OBE; Paralympian silver and bronze medallist, sprinter Ben Rushgrove; gold medallist for skeleton Amy Williams MBE, and many more alumni who have turned studies and sports into a winning combination. We look forward to seeing our current and future student-athletes building on their success – both at Bath and on the world stage.

Left: Imogen Allison

Right: Sophie Drakeford-Lewis

50
Students' Union Sports Clubs

~1,500
students represent Bath in British Universities & Colleges Sport competitions

England and Bath Rugby star signs for MBA

THIS YEAR WE WELCOMED ANTHONY WATSON TO OUR SCHOOL OF MANAGEMENT

Why did you apply for the Executive MBA?
It's a no-brainer to do the EMBA while I'm playing. The lads at Bath who are already studying have said the University is as accommodating as possible and that learning from the other people on the course, and their diverse backgrounds, experiences and perspectives, is what makes it such a good experience. It also helps having a Nigerian mother who insists on us being as educated as we can be.

How does broader learning benefit your performance?
It makes you think about things from a different perspective. It helps off the pitch with contract negotiations and making investments outside of rugby. On the pitch, understanding different leadership styles and how to deal with different individuals is interesting.

Businesses need resilience to succeed. How has your career helped you build resilience?
Being a professional rugby player is full of ups and downs, and the highs can be ridiculously high and the lows can be pretty terrible so, for me, resilience is about trying to manage that as best as possible. The main thing I've learnt is to try and be consistent with your emotions and your thought processing – that's the key to building resilience.

What have your coaches and team captains taught you about leadership?
The most important thing I've picked up is leading in an authentic way. Trying to be a traditional leader or a stereotypical literature-led leader takes away from the authenticity of you and what you're trying to achieve. People will see through it. Be true to yourself and lead how you feel is best for you. I've never been the loudest person, so I try to lead in a way that is more appropriate to me.

What advice would you give to aspiring athletes on achieving their dreams?
I left it quite late to start my undergraduate degree, and the biggest piece of advice I would give to any young rugby player is to start as soon as you can because you don't know when it will all end. There was every possibility that I couldn't have come back and played after I tore my Achilles twice. I would have been in a much more disadvantaged position had I not had a degree than I would now, and particularly after I've finished the EMBA too. I think it's massively beneficial if you have the time and the discipline to get it done.

Right: Anthony Watson

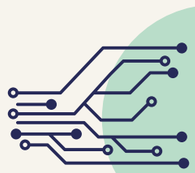
FEWER THAN 30% OF THE WORLD'S RESEARCHERS ARE WOMEN, ACCORDING TO UNESCO

<30%

49%

THERE WAS A 49% INCREASE IN WOMEN ACCEPTED ONTO STEM UNDERGRADUATE COURSES BETWEEN 2010 AND 2020

SUPERWOMEN OF STEM



24%

WOMEN MAKE UP JUST 24% OF THE CORE STEM WORKFORCE IN THE UK

FROM ENVIRONMENTAL CRISES TO VIRAL OUTBREAKS, SOME OF TODAY'S BIGGEST CHALLENGES ARE BEING TACKLED IN THE FIELDS OF SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS. THESE FIELDS ARE MOSTLY OCCUPIED BY MEN, LEAVING A 'GAP' OF FEMALE ROLE MODELS TO INSPIRE YOUNG GIRLS. HERE ARE SIX WOMEN LEADING THE WAY

Words **Jodie Tyley**

Fewer than 30% of the world's researchers are women, according to UNESCO. The same report says that too many girls and women are held back by biases, social norms and expectations that limit their education choices and career options.

The gender gap is particularly noticeable in science, technology, engineering, and mathematics (STEM). In the UK, women make up just 24% of the core STEM workforce, and it's a sadly similar story the world over.

Progress may be slow, but change is coming. Between 2010 and 2020, the number of women accepted onto STEM undergraduate courses UK-wide increased by 49%. Here at Bath we're narrowing the gender gap with help from J.P. Morgan, Atkins and Schlumberger, who fund scholarships for female students studying STEM subjects, as well as providing industrial placements and supporting outreach opportunities within the community.

We're also fortunate to have so many amazing academics and alumni making huge contributions to their fields – more than could ever fit into this magazine.

Over the next few pages, you'll meet a few of the inspirational women within our community. They discuss how they turned adversity into achievement, the changes in attitudes they've seen over the years, and their advice for future generations of women and girls.

PULSARS

DAME JOCELYN BELL BURNELL

Photo: Royal Society of Edinburgh

The astrophysicist

Dame Jocelyn Bell Burnell DBE FRS

It was 1967 and a 24-year-old student named Jocelyn Bell had just discovered pulsars, a previously unidentified type of star. It was a discovery worthy of a Nobel Prize – however, this was presented to her male PhD supervisor instead. Just over 50 years later, Jocelyn was officially recognised for her achievement with a $3 million Special Breakthrough Prize in Fundamental Physics. She donated her winnings to create scholarships for under-represented groups to study physics.

"I reckoned that it was because I was in a minority and working very hard that I spotted the pulsars," Jocelyn explains. "So I thought that if we can get more people from diverse backgrounds involved in physics, it might well be good for physics research and it would certainly be good for those individuals."

As a student at Cambridge, Jocelyn was one of the few women among men who were "entirely confident in their abilities and right to be there". Her way of coping? "I made sure I did my very best work, so I didn't let the side down."

Jocelyn was part of a research group looking for quasars – the brightest and most distant known objects in the Universe. It was her job to analyse the data from a telescope, which churned out hundreds of metres of chart paper every day. Analysing every inch by eye, she spotted a tiny anomaly that led to her discovery.

"My peers were very cross that I didn't get the Nobel Prize. They called it the No-Bell," she recalls. "But I was actually pleased that the committee had finally recognised there was good physics in astronomy." Jocelyn received some media attention, but unfortunately for the wrong reasons. "They wanted to know my measurements and how many boyfriends I had, and photographers would ask me to undo more blouse buttons."

The day she wore her engagement ring to the lab, her colleagues assumed her career was over. But she had fought for her future – ever since school, when she insisted on being taught science with the boys instead of knitting and cooking. Societal pressure worsened once she became a mother, but Jocelyn persisted, taking part-time positions to continue studying the stars.

As she ascended through the ranks in academia, however, it became obvious how few women occupied senior positions. These days, the Athena Swan awards exist to promote and support gender equality. Jocelyn was a founding member. "Things have changed hugely in my lifetime," she reflects. "Now it's normal for women to advance in their professions and there's more childcare, although still not enough… Covid-19 has shown us that it's still not equal. There's still some way to go."

Jocelyn is renowned across the globe, but we're proud to also know her as our Dean of Science from 2001 to 2004, and a member of our honorary graduate community. Today, Bath's astrophysics group – led by Professor Carole Mundell – are building on her scientific research and work to support diversity in STEM.

The chemist

Dr Asel Sartbaeva

Growing up in Kyrgyzstan, part of the Soviet Union until 1991, Asel Sartbaeva was told that science was not a 'female profession'.

"I knew I wanted to be a scientist but there were very limited opportunities, particularly in research," she recalls. "However, when the Iron Curtain collapsed, I was so happy. It meant I could dream of going abroad to study, otherwise my life would have been very different." After her country's independence, Asel was finally free to pursue her dream. She was awarded a scholarship to study for a PhD at Cambridge in 2001, where she also met her future husband.

The couple welcomed their first child in 2010 and it was while taking her baby daughter for routine jabs that Asel had her 'lightbulb moment'. She noticed the vaccines had to be kept refrigerated and used immediately to avoid spoiling. "I was shocked at the amount of vaccines being wasted, and how many children die every year from vaccine-preventable diseases," she explains. "I thought, what if I could make vaccines stable at room temperature?" After maternity leave, it became her mission.

Asel joined Bath's Department of Chemistry, and with support from our alumni, the project got off the ground. Now, she and her team have successfully developed a way to stabilise the diphtheria and tetanus vaccines up to 100°C, by encasing the protein molecules in a silica shell. The aim was initially to tackle vaccine-preventable diseases for children, but the technology also holds great potential for the Covid-19 vaccine rollout.

In early 2021 she was named Woman of the Year, becoming the fifth Bath researcher celebrated at the FDM everywoman in Technology Awards. Being a role model is something Asel is very passionate about and she is a UNICEF Ambassador for the Girls in Science programme in Kyrgyzstan, where women are still oppressed and bride-kidnapping is widespread.

"I want to reach as many girls as possible," she explains. "I'm mentoring a group who are trying to build the first Kyrgyz satellite, and I help the group who are translating lessons into the Kyrgyz language for schools where they don't have science equipment or STEM teachers."

Representation matters, says Asel. "In my home country, they don't see Asian females succeeding in STEM or talking about a work-life balance," she continues. "I always make a point of talking about it. One father told me his daughter wanted to be a scientist for many years but he was really against it. Then they watched an interview I gave, and it made him see that it was possible to be successful, have a family if you want, and be happy.

"I want to show girls and their parents that this is a path where women can achieve their potential."

DR ASEL SARTBAEVA

The chemical engineer

Professor Semali Perera

Across her 30-year career, Semali Perera has successfully balanced family life and work, as well as academia with industry. “You’ve got to work really hard to achieve what you want, especially as a woman,” she says. “There are times when work takes over and you need to redress the balance, but making sure you’re passionate about what you do will help you get through that.”

Semali joined the University in 1992 and recalls being the only female academic in chemical engineering here at the time. “It’s very different now,” she says. “There are so many inspirational women at Bath, and in senior roles as well. Currently both our head of department and director of teaching are women. It’s so important to have role models,” she adds. “When I speak to my students, they say ‘wow, you achieved that’, and they realise they can too.”

As well as a professor of chemical engineering, Semali is a chartered engineer and Fellow of the Institute of Chemical Engineers. In 2007 she was awarded the Royal Society’s Brian Mercer Award for Innovation for her patented pollution control technology, which led to a University of Bath spin-out company. Six years later, n-psl had created 24 jobs and boasted an annual turnover of more than £1 million. “To see your research in the marketplace is a dream,” she says. “It’s one of my biggest achievements. The technology is now used in trains all over the world.”

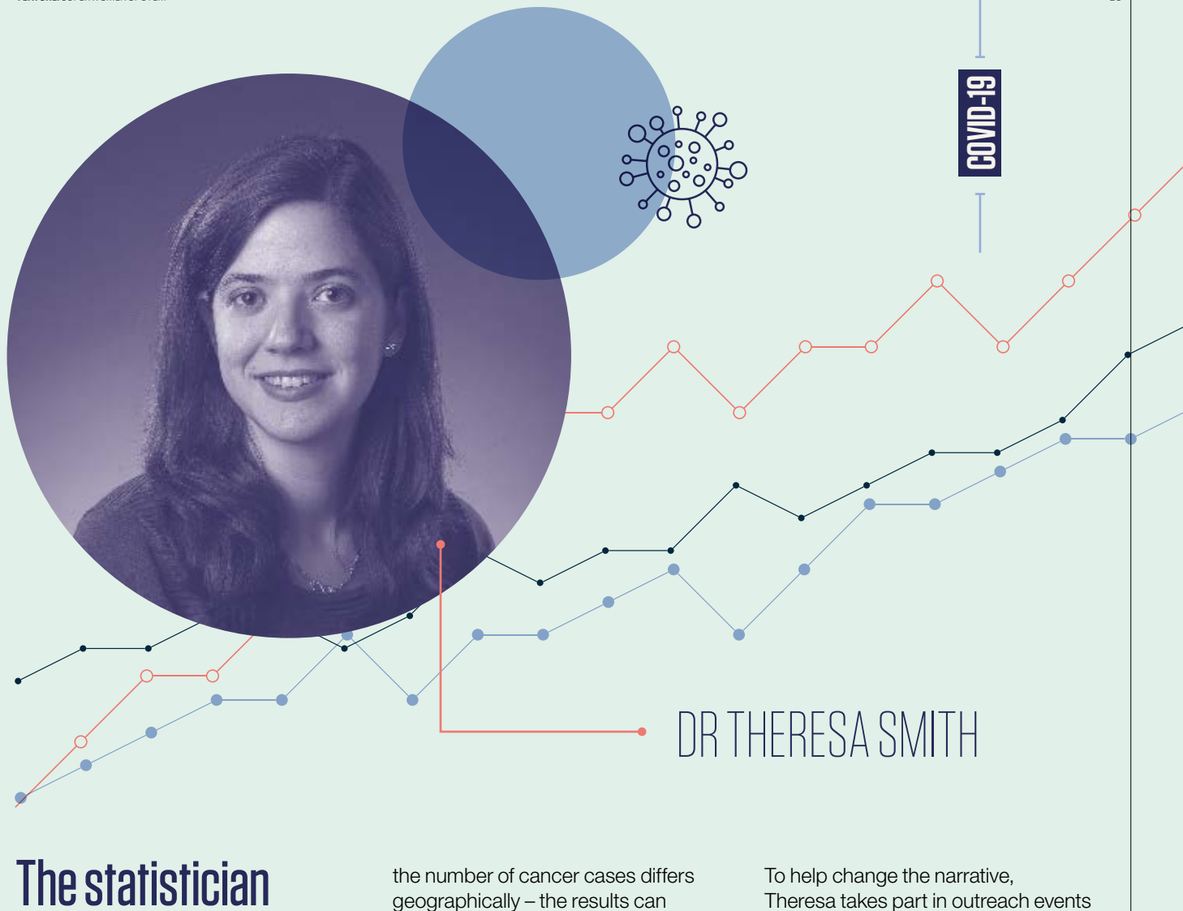
Semali is now developing a filtration system for enclosed spaces, such as vehicles and offices, to remove viruses, bacteria and volatile organics, and reduce carbon dioxide build-up. She also led a team in delivering a sustained chemotherapy treatment to cancer patients with fewer negative side effects. Her contributions to the field were recognised in 2017’s FDM everywoman in Technology Awards.

Recent years have seen an increase in women choosing careers in engineering. Retention, however, proves an ongoing issue. A 2015 survey of female engineers showed that 60% felt there were barriers preventing their return after maternity leave or a career break. “I remember when I had twins, I had to build my research back up again quickly to progress,” she says. “It’s a time when women need some space and support. In our department, we’re providing mentors and additional time for them to return, settle in and start their research.”

Her daughters are now studying law and computing respectively. It was important to Semali to ensure they kept their options open. “Sometimes students apply to Bath without doing the appropriate A-level subjects, and that really narrows down their opportunities,” she says. Together, University staff and the student group Women’s Engineering Society (WESBath) undertake a great deal of outreach to provide aspiring engineers with information and support.

For anyone thinking of following in her footsteps, Semali has some simple advice: “You can do it if you put your heart and mind to it. The beauty of any engineering subject is it opens up so many opportunities.” Semali smiles, “And the starting salary is good, too.”

> “You can do it if you put your heart and mind to it”



The statistician

Dr Theresa Smith

“I tell my students: it’s important for you to know about statistics because someone, somewhere, is making decisions that affect your life based on them,” says Dr Theresa Smith. “After the vital role mathematical models played throughout the pandemic, I think they actually believe me.”

Theresa is from our Department of Mathematical Sciences, where she works on projects you wouldn’t usually associate with sums. “Statistics is useful in many fields,” she explains, “so you’re sought out to work on projects that are really diverse in the way they use data to answer questions about the real world. That’s part of the attraction for me.”

Most recently she’s teamed up with colleagues at the University to track Covid-19 through wastewater in Africa. The aim is to create an early warning system of the disease’s potential spread. Health is a running theme in Theresa’s work. A previous project examined how the number of cancer cases differs geographically – the results can indicate a lack of healthcare or a deeper cause that needs investigation.

“I always knew I wanted to do something related to health, but originally I wanted to become a physical therapist,” she says. “As part of my degree, I had to take a statistics class and I was surprised by how much I liked it, since I didn’t enjoy maths at school.” Studying in her home country of the United States, Theresa was able to change her degree major in order to pursue her newfound interest.

“I felt like there was a good mix of men and women on my undergraduate course, but it became very male-dominated in postgraduate,” she recalls. “I was the only woman in my cohort to complete a PhD.” The lack of role models within maths is one of the barriers to gender equality, says Theresa: “Fundamentally people want to go into something where there’s a chance they’ll enjoy it and be successful, and one way to know that is to see people like you who have made it. There’s a representation issue.”

To help change the narrative, Theresa takes part in outreach events in schools – along with colleagues from different departments such as chemistry and psychology – to show how maths can open many avenues and that women are successful.

“It might not be easy to see representative people, you might have to do a little bit of work to seek them out, but there are a lot of women doing amazing work in STEM,” she adds. “Just reach out to people and ask for advice. Finding a good mentor is invaluable, especially in male-dominated industries.”

> “I was the only woman in my cohort to complete a PhD”

BEHAVIOUR CHANGE

PROFESSOR LORRAINE WHITMARSH

"There's always more that can be done for diversity"

The environmental psychologist

Professor Lorraine Whitmarsh

"We used to think technology alone was going to fix climate change. Now we know it's not enough – we also need behaviour change." Professor Lorraine Whitmarsh is an environmental psychologist within our Department of Psychology and was recently named one of the world's top climate scientists by Reuters. Her work focuses on how to get more people to accept low-carbon measures and engage them in the issue.

Lorraine is also the director of the Centre for Climate Change and Social Transformations (CAST) – a global hub of researchers whose work informs policymakers on how to better communicate the issue and to bring about behavioural and organisational change. There are certainly lessons to be learnt from the societal upheaval of Covid-19. "The pandemic and climate change are both global issues with linked causes – in terms of the destruction of natural habitats and global travel," she observes. "But most would see Covid-19 as being a more immediate threat.

"What we can take away from the handling of the pandemic is that the messaging needs to be clear on what people are being asked to do," Lorraine continues. "We need to show how the issue might start to affect you, either directly through its impacts, or through government policies. And we also need to highlight the benefits of being low-carbon – how it's often a healthier, cheaper and more sociable way of living."

They say change starts at home, and on campus Lorraine is helping to reduce the University's carbon impact through our Climate Action Framework. "That also involves working with students from different year groups and subjects to find solutions," she explains. "They have such enthusiasm and brilliant ideas – it gives you optimism for the future."

Lorraine was once a Bath student herself, while studying for her master's and PhD. "Part of the reason I was drawn back was because there's a really strong commitment to making a difference, and a tradition of problem solving," she says. "That's why I got into doing research in the first place."

Finding solutions to global challenges will require innovation, and research shows that diversity improves a team's problem-solving abilities. Psychology is unusual among science subjects in that it's dominated by women, at least at undergraduate level.

"Interestingly, the more senior you get, the more you lose the female majority," Lorraine points out. "Initiatives such as Athena Swan have been really positive in helping organisations to put practical measures in place, and at a basic level, things like ensuring meetings are held in core hours and being sensitive to family demands make a big difference. I think a key part of it is monitoring and being aware of how diverse a community is when it comes to gender and ethnicity. There's always more that can be done."

Find a mentor or volunteer to become one on Bath Connection: **go.bath.ac.uk/bath-connection**

The computer scientist

Dr Özgür Şimşek

At Bath, we're training the next generation of specialists in Artificial Intelligence (AI), its applications and its future implications.

Özgür Şimşek is a senior lecturer in machine learning; deputy head of our Department of Computer Science; and leader of the AI research group. Until recently, she served as Deputy Director at Bath's Institute for Mathematical Innovation and is now a Co-Investigator of the UKRI Doctoral Training Centre for Accountable, Responsible, and Transparent Artificial Intelligence.

Shortly after joining the University in 2017, Özgür developed a new computer science and AI undergraduate course. She says: "Now students can study AI at Bath at every level. I really enjoy teaching people and empowering them to make their own contributions to the field."

One aspect of her research is reinforcement learning. "Humans learn through interacting with the environment, and a reinforcement learning agent works in a similar way," she explains. "Take a computer game, for instance. Initially, the agent plays by choosing actions randomly. Every time it wins a game, it receives positive reinforcement. Over time, it learns how to play so that it wins as often as possible."

Reinforcement learning has many practical applications, from autonomous vehicles to healthcare. Özgür is currently working with Bath's Royal National Hospital for Rheumatic Diseases to optimise the flow of patients through the hospital while providing the care they need.

AI is a fast-growing field that's built on the foundations of traditional STEM disciplines, as Özgür points out. In fact, she studied engineering first, back home in Turkey. She then moved to the United States to gain a PhD in computer science, and later became a research scientist in Germany. It's one of the benefits of research, she says: "You can go anywhere, because the language is universal."

From her experiences, however, it's not the only thing that's universal. "There still isn't gender equality in computer science," she adds. "Simple things can make a difference, though. In the US, one university found that changing the name of a unit from 'programming' to 'creative problem-solving using programming' attracted a more diverse group." Another change, she says, was to separate classes according to the students' existing level of knowledge in technical subjects such as coding, which helps build confidence.

"As a department, we're putting in a lot of effort to increase diversity," Özgür continues. We were awarded an Athena Swan Bronze award for good practice in gender equality; and the staff ratio in our AI group, for instance, is 50:50. At a broader University level, there are more women on the executive board, such as Alex Butler, who's our Chief Digital and Information Officer and also the Executive Chair of the Equality, Diversity and Inclusion Committee.

"I believe role models have a large impact," she concludes. "If there's enough representation at the higher levels, this trickles down. The question is: how do we get there? I don't think there's one answer."

DR ÖZGÜR ŞIMŞEK

ARTIFICIAL INTELLIGENCE

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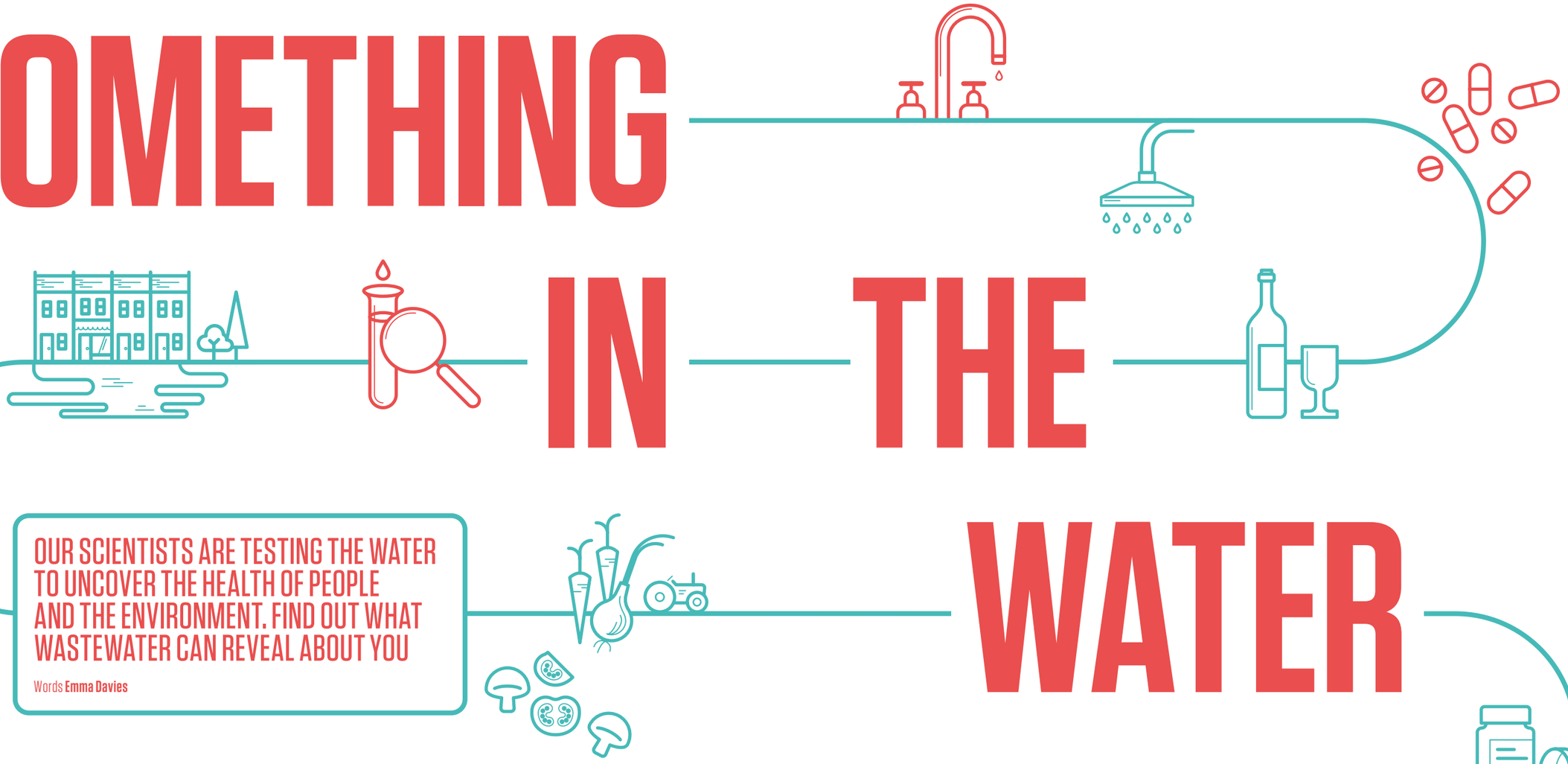
SOMETHING IN THE WATER



OUR SCIENTISTS ARE TESTING THE WATER TO UNCOVER THE HEALTH OF PEOPLE AND THE ENVIRONMENT. FIND OUT WHAT WASTEWATER CAN REVEAL ABOUT YOU

Words **Emma Davies**

The average person in the UK uses 149 litres of water per day – but what happens to it once it goes down the drain? Our wastewater can reveal far more than you'd expect.

You may not be surprised to hear that sewage shows high levels of antihistamines in the spring, antibiotics in the winter and illicit drugs such as MDMA at weekends, but how about the fact that alcohol also spikes on Wednesdays?

"It's really surprising to see that no matter where we live, as a society we do really similar things," says Professor Barbara Kasprzyk-Hordern from our Department of Chemistry. "We think we are all different, and I'm sure we are when we look at individuals, but as communities we are alike."

Barbara's research focuses on wastewater fingerprinting, where samples of water from rivers and treatment plants are tested using a process called mass spectrometry. This can detect levels of chemicals at incredibly low levels, giving an overview of what's going on in our bodies and households at a town or city level.

For example, Barbara has found that weekends yield more of a chemical called 3-PBA, which is made when the body breaks down certain types of pesticides. She attributes this to the fact that people are more likely to cook from scratch and eat more vegetables on weekends.

> "Sewage shows high levels of illicit drugs at weekends"

Far from just being a source of interesting facts, though, Barbara's research has a strong environmental and public health angle. "While the goal is always to make water cleaner, this requires an input of energy – and competing with that is the climate change dimension, which ideally requires the water utility process to be less energy intensive," she explains.

"This gave us an opportunity to look at treating the source. So instead of investing in new technology for treating wastewater, how about we influence when pharmaceuticals are actually used?"

Flushing it out

The water testing carried out by Barbara's team is sensitive enough to pick up when people have flushed excess medication down the toilet to get rid of it – something that can prove hazardous to the environment. Observations such as this could indicate a need for a public education

campaign about how to safely dispose of unused prescriptions.

Barbara is also working with a team from across the University in a bid to change how GPs prescribe medicines for non-infectious diseases, such as diabetes and mental health conditions. This could mean a move to 'green prescribing' – spending time outside has been shown to help in mild cases of depression – or recommending medicines that have less of an impact on our ecosystems.

She adds: "I think people tend to forget that they are part of the environment – they think the environment is here and public health is there, but the simple truth is that we are part of it, and if we affect the environment it will fire back."

Wastewater can also provide us with more than just information: it can act as a source of materials, enabling us to recover and reuse resources rather than look for or produce new ones. When the water we discard is treated, it is first sieved and filtered to remove any solid matter, and is then treated using a 'sludge' of helpful bacteria that break down dissolved organic material.

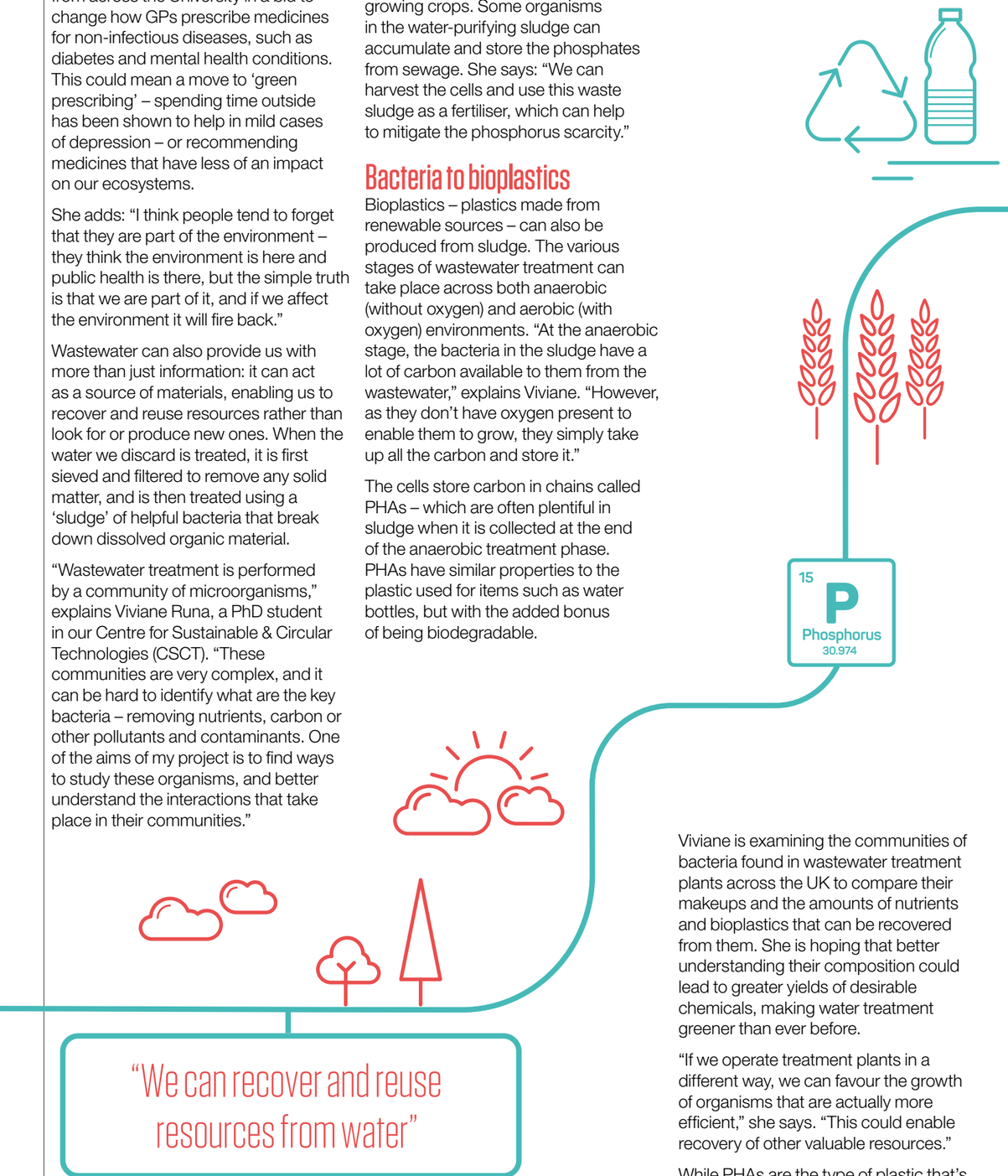
"Wastewater treatment is performed by a community of microorganisms," explains Viviane Runa, a PhD student in our Centre for Sustainable & Circular Technologies (CSCT). "These communities are very complex, and it can be hard to identify what are the key bacteria – removing nutrients, carbon or other pollutants and contaminants. One of the aims of my project is to find ways to study these organisms, and better understand the interactions that take place in their communities."

Viviane is focusing on a process to remove phosphorus from our wastewater. Phosphorus is a scarce resource, but one that is vital for growing crops. Some organisms in the water-purifying sludge can accumulate and store the phosphates from sewage. She says: "We can harvest the cells and use this waste sludge as a fertiliser, which can help to mitigate the phosphorus scarcity."

Bacteria to bioplastics

Bioplastics – plastics made from renewable sources – can also be produced from sludge. The various stages of wastewater treatment can take place across both anaerobic (without oxygen) and aerobic (with oxygen) environments. "At the anaerobic stage, the bacteria in the sludge have a lot of carbon available to them from the wastewater," explains Viviane. "However, as they don't have oxygen present to enable them to grow, they simply take up all the carbon and store it."

The cells store carbon in chains called PHAs – which are often plentiful in sludge when it is collected at the end of the anaerobic treatment phase. PHAs have similar properties to the plastic used for items such as water bottles, but with the added bonus of being biodegradable.



"We can recover and reuse resources from water"

Viviane is examining the communities of bacteria found in wastewater treatment plants across the UK to compare their makeups and the amounts of nutrients and bioplastics that can be recovered from them. She is hoping that better understanding their composition could lead to greater yields of desirable chemicals, making water treatment greener than ever before.

"If we operate treatment plants in a different way, we can favour the growth of organisms that are actually more efficient," she says. "This could enable recovery of other valuable resources."

While PHAs are the type of plastic that's a positive to find in our wastewater, there are others that aren't so welcome.

250,000

tons of microbeads make their way to the oceans each year

Microbeads are tiny spheres of plastic often measuring less than 0.5mm in diameter, even smaller than a grain of sand. Their use is incredibly widespread – from cosmetics, through to paints and agricultural products. It's estimated that a whopping 250,000 tons of these particles make their way to the oceans each year, and into the food chain.

"The challenge with plastic microbeads is related to their size," says Davide Mattia, Professor of Chemical Engineering. "They're too small to be captured by wastewater treatment plants, so they end up in the oceans or in soil. Fish eat them or plants absorb them via their roots, so then we eat them. Microbeads are found in the fat tissue of our bodies; we are full of microplastics because of this cycle. The only way to address this problem is to stop using them."

A partial ban

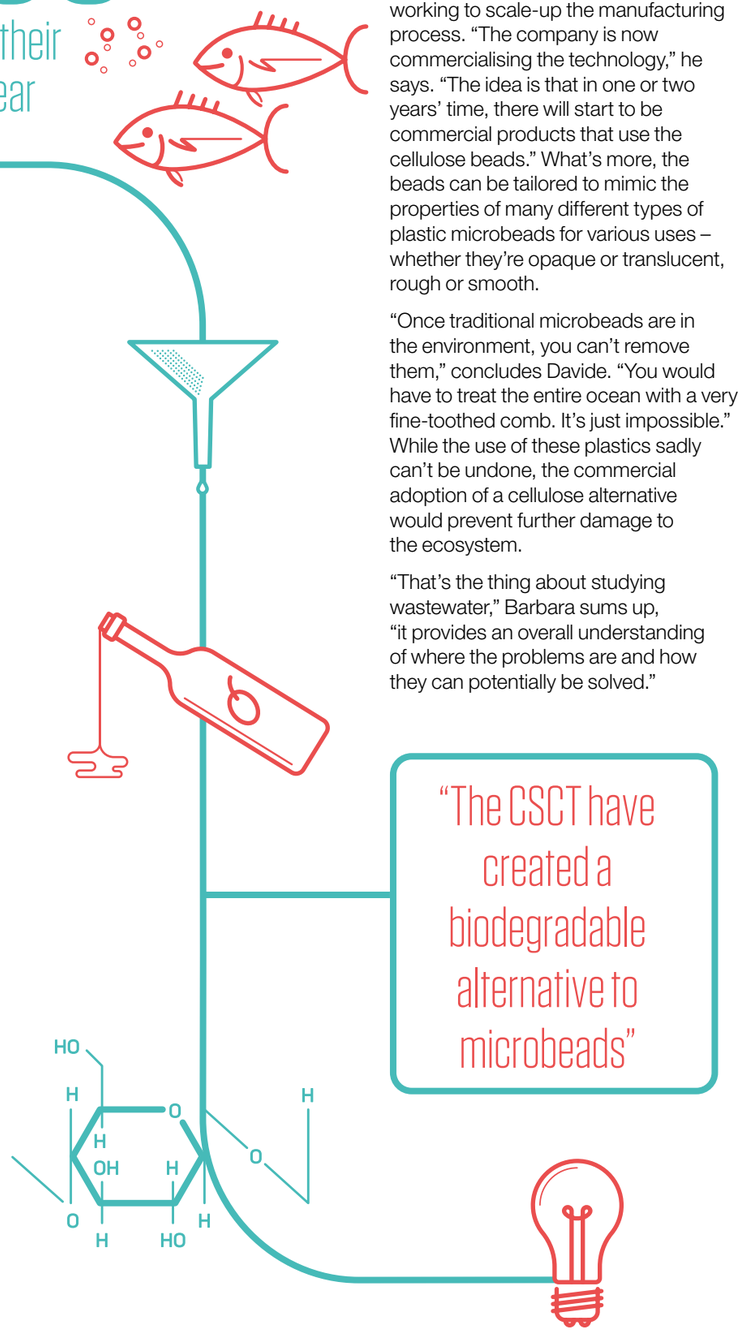
Unfortunately, the reality isn't as straightforward. Although the UK government has banned the sale of 'wash-off' products such as shower gels and toothpastes containing plastic microbeads, their use is still permitted in many other products, including those that are left on the skin. There are also only a handful of other countries across the world who have implemented similar legislation. "The legal definition for what is banned is very narrow at the moment," Davide observes.

A team, led by Professor Emeritus Janet Scott and including Davide and Professor Karen Edler, developed a method for creating a biodegradable alternative to microbeads by forcing a solution of a sugar called cellulose through a membrane. These beads are then washed off using vegetable oil before being fixed in an antisolvent solution. As cellulose is what plants are made of, it is a renewable, sustainable resource – offering further advantages over plastic.

In 2018, the spin-off company Naturbeads was founded, which is working to scale-up the manufacturing process. "The company is now commercialising the technology," he says. "The idea is that in one or two years' time, there will start to be commercial products that use the cellulose beads." What's more, the beads can be tailored to mimic the properties of many different types of plastic microbeads for various uses – whether they're opaque or translucent, rough or smooth.

"Once traditional microbeads are in the environment, you can't remove them," concludes Davide. "You would have to treat the entire ocean with a very fine-toothed comb. It's just impossible." While the use of these plastics sadly can't be undone, the commercial adoption of a cellulose alternative would prevent further damage to the ecosystem.

"That's the thing about studying wastewater," Barbara sums up, "it provides an overall understanding of where the problems are and how they can potentially be solved."



"The CSCT have created a biodegradable alternative to microbeads"

GOLDEN FUTURES

AS OUR FIRST COHORT OF GOLD SCHOLARS GRADUATE, DISCOVER THE DIFFERENCE THE PROGRAMME MAKES TO OUR STUDENTS AND THE WIDER BATH COMMUNITY

Words **Emma Davies**

SHERIFAT ADENIYI (BSc ECONOMICS 2021)

"I got accepted on to a Bath master's programme to study international development with economics," beams Gold Scholar Sherifat Adeniyi, who graduated this summer with a degree in economics. "I'm hoping to work abroad for a few years, and at some point I'd like to work for a big international body like the UN or the World Bank."

You may remember Sherifat from our short film about the Gold Scholarship Programme back in 2018. She spoke about how, as a young carer from a single-parent family, the scholarship offered her a new sense of independence, a space of her own for the first time and freedom from financial pressures.

Launched in 2017 as part of the University's 50th Anniversary celebrations, the Gold Scholarship Programme (GSP) offers up to 50 bright young people per year from disadvantaged backgrounds a £5,000 bursary for each year of study, as well as skills workshops, pastoral support and access to a pool of Gold Mentors. These scholarships are supported by alumni and friends – through individuals, like Sherifat's sponsor Stephen Kelly (BSc Business Administration 1984; Hon DBA 2016), and collectively through the Alumni Fund.

"Getting on to the scholarship felt incredible," Sherifat said in our video. "The best thing about my life right now would be my independence. I've never had my own room before and having my own space has been really empowering."

She continued: "I see many things for my future. I see me growing into myself further, becoming even more independent, discovering who I want to be as a career woman." Thanks to the scholarship, Sherifat has not only decided on an ambitious career path, but also gained the skills to help her achieve it.

Since joining the Programme as part of its first cohort, Sherifat has flourished at Bath, building her confidence and undertaking a placement year at the Home Office. She credits the GSP with providing a community of like-minded people: "It's fostered opportunities for me to volunteer and do outreach work, which has really helped me to feel part of the University and part of Bath on a wider scale, as well."

Smashing targets

One of the outreach activities she's been involved with is Target Bath. This free initiative offers Year 12 students of Black African and Caribbean heritage from across the UK the opportunity to find out more about studying at Bath, as well as support with their application.

"I remember when I was applying for university, I went to a bunch of summer schools and Saturday schools to get a feel for everything, so I think outreach is really important," Sherifat explains. "I know from experience that it helps you get into the right frame of mind for coming to university."

This focus on volunteering is one of the key elements of the GSP, with each scholar expected to complete 50 hours of volunteering, fundraising or outreach work per year. It's also something that George Cooper, who graduated this year with a degree in mathematics, found hugely beneficial in broadening his horizons.

RIGHT: GEORGE COOPER (BSc MATHEMATICS 2021)

87% of first-year scholars feel that the GSP has improved their sense of belonging at Bath

A keen musician and songwriter, George is initially planning to follow a career in music after graduation, but also found himself inspired by a maths tutoring scheme he set up last year in a local secondary school.

"I thought the planning would be the easy bit, but in fact the implementation was the most rewarding – because you're actually seeing the difference being made," he says. "I never really wanted to pursue a career in teaching, but this opened my eyes to the idea that it might be a good job in the future."

George believes that the soft skills he's picked up during his time at Bath will be key to any career path, admitting that even the word 'networking' was enough to make his hair stand on end before he joined the GSP. However, the Programme's regular networking sessions with Gold Mentors, donors and industry professionals have helped him to reach a point where, "if I was ever put in that scenario where I needed to network in a professional way, then I'd be very confident doing it, whereas a lot of my peers who aren't on the Gold Scholarship feel that's still a barrier for them."

The ripple effect

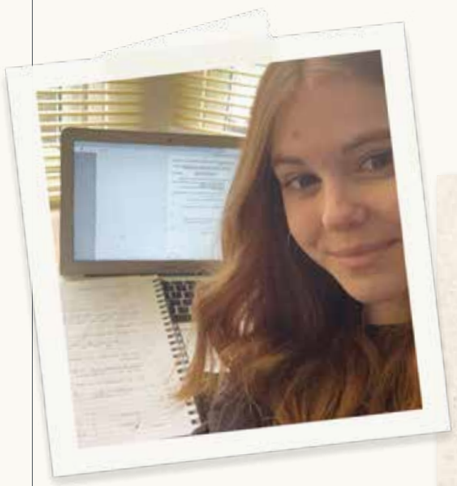
The positive effect of a Gold Scholarship on its recipient can't be underestimated. It provides the financial stability for them to concentrate fully on their studies, a support network if they lack industry contacts, and encouragement to get fully stuck into a range of extracurriculars. But they aren't the only ones to benefit from the Programme.

"I hope the Gold donors know that the money they give doesn't just impact us: it also impacts the wider community," says Hannah Eustice, whose Gold Scholarship is funded by alumna Christine Gibbons (BPharm Pharmacy 1978) and her husband Mike. "For example, if I wasn't on the Gold Scholarship Programme, I'd never have been able to set up the Letters to the Elderly project properly."

In 2020, second-year Pharmacology student Hannah tasked her fellow students with writing letters to care home residents to boost morale during the coronavirus restrictions. Writers were urged to include information about their hobbies and passions in their letters, so that they could be matched to recipients who shared their interests.

The project was initially local in its scope, with the first letters going out to care homes in Bath – but as interest grew, Hannah ended up sending around 350 letters to care homes UK-wide.

"The reason I wanted to lead the project was because I've been shielding during the pandemic," she explains. "During



HANNAH EUSTICE (MPHARMACOL PHARMACOLOGY 2023)

RACHEL STONES (MPHARM PHARMACY 2021)

76%

of eligible Gold Scholars took a placement year in 2019–20

the first lockdown I went home, so I was lucky enough to be with my family. But people in care homes literally couldn't see theirs – they weren't allowed any visitors at all. I wanted to do something that showed them there were still people thinking about them."

Onwards and upwards

It's a project that Hannah hopes will continue to grow, thanks to her role as a V Team project leader – the volunteering group within the Students' Union. While the first batches of letters were sent as one-off missives, next year the plan is to implement safeguarding training for student participants, so the correspondence can become a two-way conversation. With lockdown restrictions easing, Hannah also anticipates that students may also be able to pay visits to their pen-pals in future.

"I feel like the skills and the volunteering make me stand out a bit more," adds Gold Scholar Rachel Stones. "During the pandemic, I trained as a Covid-19 vaccinator with the St John Ambulance. Unfortunately, I haven't actually been able to vaccinate anyone yet, but I've been stewarding at vaccination centres such as the one at Bath Racecourse and a couple of places closer to home. As someone studying a health-related course, I felt that I needed to do that bit more, even if it was out of my comfort zone."

Rachel has also done plenty of work for Bath Marrow – a student group that works with blood cancer charity Anthony Nolan – raising money and persuading people to register as stem cell donors. It's a cause particularly close to Rachel's heart, after her then-partner was diagnosed with leukaemia during her second year.

Her dedication to her studies during this period, despite the challenging personal circumstances, led her to receiving the Royal Pharmaceutical Society's Student of the Year Award. Having graduated this summer with a degree in pharmacy, she's now beginning her training as a hospital pharmacist in Bristol and is eventually aiming to specialise in intensive care medicine.

Like Sherifat, Rachel was not only among our first intake of Gold Scholars but also featured in our promotional videos, where she explained that university simply wouldn't have been financially feasible without the support. And now? "I feel like I'm a completely different person to first-year me, in a good way – as clichéd as it sounds," she says. "I've learnt more about myself and who I am."

She continues: "I'm hoping that now I've graduated the Gold team will recruit me as a mentor, so I can offer guidance to the future students coming on to the Programme!"

How 50 Gold Scholarships are funded per year

33 from individual donors

10 from Alumni Fund donations

4 from corporate partners

3 from legacy gifts

1965: Facilities at the University have come on in leaps and bounds over the decades – back in the day, this was what our state-of-the-art biological sciences labs looked like!

The Preliminary Building, shown here, was officially opened by the Mayor of Bath, Mrs Elsie Hanna, on 14 October 1965. The building is now known as 4 South and is home to our Department of Biology & Biochemistry.

Share your memories of campus by emailing alumni@bath.ac.uk

BA2 Extra

THE FIRST YEAR ON CAMPUS

Graduating in 1969, John Connolly was one of the very first students at the University. He shares his memories of a one-building campus, favourite pubs and photos in the days before selfies

Words **John Connolly**

Claverton Down campus opened its doors to students for the first time in September 1965 and Bath University of Technology received its Royal Charter in 1966. It was one of several ex-Colleges of Advanced Technology that were turned into universities at that time. There were about 1,600 students at the Bristol College of Science and Technology campus, and some of their second-year students joined the freshers at the only Claverton Down building which existed at that stage. In total, there were about 220 of us students on campus and the first-year subjects (all BSc degrees) were Economics and Administration (which I studied), Sociology, Applied Biology, Biochemistry and Horticulture.

Doing the maths

There were originally about 20 students starting my course, from all sorts of backgrounds. The oldest of our group was about 29, married and with children; the youngest was only 17 and straight out of public school. I was 21, a grammar schoolboy from the West Riding of Yorkshire and sponsored by United Steel Companies. By the time we graduated, our number had been whittled down to about eight – in those days students could be failed and asked to leave!

City life

There were no halls of residence so first-years were staying all over the city in guest houses, small hotels and 'digs'. The result was that if there was a party or any sort of social gathering, it was just announced on the notice board outside the common room and we all turned up.

The city made us very welcome and soon the University scarf could be seen in all the pubs and bars. The Saracen's Head on Broad Street soon became a regular meeting place, and we economists often went to the tiny Old Green Tree on Green Street.

In those early days, the Students' Union wasn't very radical, although I do remember we gave Enoch Powell a rowdy reception when he visited Bath. The SU tried to work closely with the University to improve conditions and facilities at Claverton Down but the main action was still in Bristol, which continued to operate until about 1970.

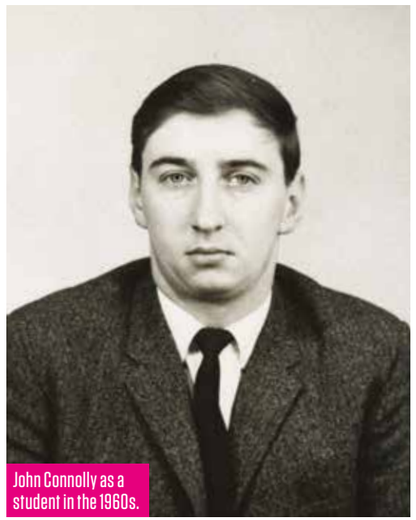
Snap happy

There were no digital cameras, and the mobile phone was decades away. You had to load a film into a camera, take your pictures and then have the film developed by Boots the Chemist, never knowing how they would come out. Obviously, there were no such thing as selfies. The result is that there are very few photos of what we did, except at graduation and the annual formal ball. My daughter takes more photos in a week than I took in four years at university!

Both academically and socially, I learned an enormous amount at Bath. It stood me in good stead, both in my career in banking in the UK and then Spain, and subsequently in my second career as a university lecturer in corporate finance in Barcelona.

I still feel very privileged and proud to have been one of the first students at the University and have never once regretted my choice to study there or what to study.

How it started versus how it's going: Claverton Down campus in 1967 (above) and 2018.



John Connolly as a student in the 1960s.

Read more stories on the alumni blog, On Parade. Visit blogs.bath.ac.uk/on-parade

Did you know...?

◀ Campus was designed around the Parade

The original 1963 concept for campus looked a bit like a giant amoeba. It was based on the idea that academic and social life would be closely linked along a central pedestrian parade, enabling the University to expand while keeping the community feel of a town centre.

▲ The lake nearly didn't happen

Plans for a lake were rejected by the University Grants Commission for being a 'decorative' feature. After discussions with the City of Bath Fire Prevention Officer, the plan was redrawn showing an area of static water 'required for fire-fighting purposes' and no further difficulty arose.

▲ The coat of arms honours our historic connections

The coat of arms was designed in 1966 and references the arms of the cities of Bristol and Bath. A Watt governor represents technology and governance, while the images of the Sulis head signify learning and wisdom. The motto, generatim discite cultus, may be translated as 'Learn each science (or art of culture) according to its own nature'.

▲ A lesson in brutalist architecture

Influential post-war architects Alison and Peter Smithson designed a series of buildings at the University during 1978-90, including the brutally charming 1 West North and 6 East, which used to be the home of our Department of Architecture & Civil Engineering. Peter also taught here.

ALUMNI SPOTLIGHT

From applied biology student to comic book writer and creator: Kieron Gillen reflects on his time at Bath

Interview by **Tom Mason**

What's the best thing about being a comic book writer?
The magical thing about writing comics is when you see the artwork. You get the chance to be the audience of your own work, something that's yours and not yours simultaneously – that's the shiny sugar rush of the job.

You've worked on Marvel Comics' biggest books, from *Avengers* to *X-Men*. What's your favourite character to write for?
My favourite character to write for is always someone I've made up. I think my own work is most important to me because that's what I've created from scratch. If we're talking about Marvel, the characters I think were the most iconically 'me' are Loki and Namor. I made Loki a conflicted and desperately heartbreaking figure who's also very manipulative. Namor is the Sub-Mariner who's an absolute ego-based monster,

who literally doesn't care if people are mocking him. Clearly, as both are awful people, my wife understandably gives me a lot of side-eye.

How did you go from studying applied biology to journalist and comic book writer? Is there a parallel universe where you run a lab?
There's probably an alternate universe where I was sacked from working in a lab, certainly. I chose applied biology because I was good at the sciences, and I feel like you don't get a chance to really understand science until you've done a degree. I come from a working-class background and was one of the few people in my extended family to go to university, so I wanted to do a practical course.

The year I spent in industry made me realise being in a lab was just too repetitive for me, and at the same time I was already writing for *Amiga Power* magazine to pay my way through university. In the final year I knew I wanted to be a writer, so I worked for the student paper and magazine, and made my own fanzines.

Bath Abbey makes regular appearances in your comics, such as *Once & Future #3*. What are some of your fondest memories of the city?
I came from Stafford and moving to Bath was startling – the Jane Austen opulence of the city. I remember drinking in Bath during freshers' week and how wrong it felt. I love that it's this Rivendell-esque town and we get to be here as human beings. The fantasy I write is about transforming your environment and seeing the magic in the places you live, and I lived around Bath and Bristol until I was 30.

> "There's probably an alternate universe where I was sacked from working in a lab"

I was really into the music scene, so I'd go to clubs like Moles, Fusion, and Swamp, which is now Po Na Na. It was a gloriously messy hole in the ground where I was first offered work as a journalist because the DJ worked for Future Publishing. That's my 'do you want to come to Narnia?' moment.

You're a supporter of Bath's Alumni Fund. What motivates you to donate?
When I went to university [in the nineties], I was given a grant. I'm very aware that there are all sorts of people in situations who need the support, and university was so good to me I think that opportunity should be given to as many people as possible.

BATH'S BEST WALKING SPOT

Sasha Johnson
(BSc Psychology 2023)

When the Covid-19 lockdown hit, there wasn't much to do apart from walking. At first, this didn't seem the most exciting prospect – especially as a student. Wasn't university life meant to be all about wild nights out, action, adventure? Surely the only walking I should have been doing was the obligatory Saturday night trip to McDonald's in pursuit of a Happy Meal?!

It soon became apparent that this was narrow-minded. Slowly but surely as I started walking through Bath, the stereotypical student in me was replaced by an avid explorer, with the rucksack and camera to match. The city has so much to offer, and not just in terms of quality pictures for Instagram!

Whether you know Bath well or still find yourself getting lost in its cobbled streets, chances are you've heard of Alexandra Park. Located at the peak of Beechen Cliff, the park is *the* place to go to if you want a bird's-eye view of the city in all its glory. I can't believe it took me until three-quarters of the way through my second year to visit! However, it was well worth the wait.

The view from Alexandra Park

Just to add to the romantic allure of Bath, it so happened that my first excursion to Alexandra Park occurred while on a date. If you've ever been there yourself, you'll be well aware it's a long, fairly intense walk up a steep hill to get there, so you'll likely end up red-faced and sweaty by the time you reach the summit – not the best look when you're trying to make a good first impression! Nevertheless, when I finally laid eyes on the vista that greeted me, any worries about my dishevelled appearance faded away.

I felt like I was on top of the world – or, at the very least, on top of Bath! The buildings that seemed so large at ground level now looked like something from a model village. Even the Abbey appeared like part of a toy town! To add to the atmosphere, each time a train passed below, I couldn't help but be reminded of the train sets I had owned as a child. It was nostalgia and novelty, all at once.

That day marked the start of my love affair with Alexandra Park (but not, sadly, my date!). Since then, I've visited multiple times and, thankfully, my breathlessness after the hill climb has steadily improved. While the magic of Alexandra Park is in full force no matter when you go, one of my most memorable visits was during a sunset stroll. As the sky transitioned from gold to orange to indigo, and the city lights twinkled into life along with the stars, I knew I'd found my happy place.

It just goes to show, Happy Meals aren't the only thing that can bring joy to a student!

Do you agree? Let us know!
alumni@bath.ac.uk
@UniofBathAlumni
@bath.alumni.community

48 SUCCESS STORIES, THANKS TO YOU

CAN YOU MAKE MORE?

So far, 48 Gold Scholars have graduated from Bath. That's 48 bright young people who have overcome adversity to gain a first-class education and a dazzling future – all thanks to you. Will you help create more golden opportunities for Bath students?

"Through the Gold Scholarship Programme, I've really come out of my shell and gained loads of skills and experiences."

Gold Scholar Sheripat Adeniyi (BSc Economics 2021)

Support Gold Scholarships by visiting
go.bath.ac.uk/giving

UNIVERSITY OF BATH