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microbiologist

Uncle Tapz

From plants to drugs

3607 – Bacterial Soundscape

Self-experimenting scientists

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All change for *Microbiologist*

I love the ritual of reading a magazine (or newspaper) in print. It's a sunny Saturday morning, tea is made. You've just got up and you have a whole weekend out in front of you. You open it up and start to read. They're not just a news source, or a vehicle for advertising, they are meant to be an enjoyable experience.

At *Microbiologist* we want to make you think, smile, frown, learn and take action by the time you have finished reading. But how does an organisation like SfAM make the magic of magazines translate to the digital world? A digital version of *Microbiologist* makes a lot of sense for SfAM. With a rapidly growing international membership and increased global focus we can achieve a much wider distribution than print, without the unsustainable expense (both monetary and environmental) of printing and postage.

Let's be honest: digital magazines, including ours, haven't always provided a great user experience. In fact, they've usually just been digital editions of print publications. Like *Microbiologist*, the most popular format for online magazines have historically been PDF replicas and flipbooks, which are extremely inconvenient to read and impossible to find through a search engine.

Magazines are fun to read because they combine detailed and interesting writing with gorgeous images, visual storytelling and design. You can read a print magazine from cover to cover, or simply flip through the pages until you find a feature that interests you most. That's harder to achieve with a PDF or a flipbook. We know from your emails that pinching-and-zooming on PDF files is not your preferred method of digesting our content, and it's always impossible to read these formats on a mobile phone.

What *Microbiologist* needs is a new format that combines digital ease of access with high-quality content, readability and design – and this is exactly what it is getting! Over the last year we have been working with developers and building a larger editorial team to bring you content you will want to read on a new generation of digital storytelling platforms. A flexible digital magazine that will utilise the best features of the web, including search, interactivity and personalisation. We will also be able to innovate with deeper insights and new ways of telling stories. With this format, we can include more content than ever before, and bring in everything from sound to video and hopefully some animation too!

To keep us traditionalists happy, the team here have also decided to print two issues a year for delegates of SfAM events to collect and we will of course convert these to PDF to keep everybody informed of what is going on in the Society. We plan to launch our online, new-look magazine, *The Microbiologist*, in the middle of October so you will not have long to wait for the site to become live – you could even bookmark the URL already **the-microbiologist.com.** We can't wait to put the kettle on and dive in.

Paul Sainsbury
Editor

If you were able to peer inside a cell, you'd witness thousands of chemical reactions inside a microbial chemical factory

Professor Kristala Jones Prather
Environmental Microbiology
Annual Award Lecture
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News

Features

Education & Public Outreach

Must-read Articles

People & Places

Policy & Public Affairs

Industry

‘People with passion can change the world’

Steve Jobs

The Society for Applied Microbiology’s 91st Annual General Meeting took place online on 12 July and I wanted to firstly thank everyone who attended – again this year we had excellent attendance and engagement from members. The AGM is always an important date in the SfAM diary, but this year was particularly momentous, as we looked forward to the future of the Society and made a number of key proposals about our bold new direction.

Our CEO, Dr Lucy Harper, outlined the new strategic direction of the Society, which aligns with seven relevant UN Sustainable Development Goals (SDGs). At the heart of this new strategy remains our belief that applied microbiologists, passionate about their work in diverse fields within our discipline, appropriately supported by the Society, can and will make major advances that contribute to the major global challenges of our time. During the past two years, while dealing with the unique challenges of the pandemic, SfAM embarked on a major strategic review. This has resulted in a new strategic direction for the Society and is focused on impact-oriented initiatives within the discipline of applied microbiology. We are excited to launch this strategy officially in the coming months. As part of the strategic review, we also considered the option of changing our name. These were challenging discussions, but we as a Society, like all learned societies, need to remain relevant, add value to our members and be future-ready in a rapidly changing and challenging sector. The proposed name change reflects our repositioning and strategic ambitions. As a special resolution at our AGM this change required over a 75% majority vote from attendees. I am glad to say that the proposed name change was overwhelmingly endorsed by members, with over 90% in favour. Changes are always difficult, but I believe this is absolutely the right course of action as we set out to pursue our bold new strategic direction. Watch this space for our new name, and other new initiatives, to be introduced in the coming months.

In addition, this was a special AGM in that we welcome our new Vice-President, Professor Jack Gilbert (Scripps Institute, University of California San Diego, USA). I wish Jack the very best of luck as he prepares to take the Society forward, and I look forward to working with him in my final year as President. We also welcomed our new Trustees to the Executive Committee; Professor Cath Rees (University of Nottingham, UK), Dr Arpita Bose (Washington University in St Louis, USA), Dr James Timmis (University of Freiburg, Germany) and Bamidele Tajudeen Akanji (Nigerian Institute of Medical Research, Nigeria). Our new Trustees bring with them a wealth and breadth of experience that will enrich our Society and I believe reflect the international nature of our membership. I look forward to working with you in shaping the direction of the Society and I hope you find your time as a Trustee a rewarding experience. Of course, we must say goodbye to our outgoing Trustees: Professor Steve Forsythe, Dr Elaine Cloutman-Green, Dr Catherine Ludden and Dr Marcela Hernández García, all of whom have served and supported the Society superbly during their time as Trustees and have contributed so positively to the development of our new strategy and direction. Thanks for everything and I look forward to keeping in touch. Finally, a very special thank you to Professor Ian Feavers for his input to the Society over many years, serving in crucial roles as a journal editor, Meetings Secretary, Scientific Programmes Secretary and as an active contributor to our policy work. Ian kindly agreed to extend his tenure as Scientific Programmes Secretary for an additional year to allow for completion of the strategic review, and we are particularly grateful to him for that. Personally, I have always found Ian’s advice and counsel invaluable, and his experience unparalleled. Thanks Ian, I look forward to your continued involvement in the future.

Brendan Gilmore

President of the Society for Applied Microbiology

It’s been a busy few months for grant awards also, and I extend my congratulations to all successful applicants who have availed themselves of our diverse portfolio of grants and support. This includes the highly competitive New Lecturer Research Grant, which pump-primes new and exciting research from newly appointed applied microbiology academics; and our international travel grants, which support the dissemination of original and exciting research by our members, at any stage of their career. As always, I encourage you to browse our grant support opportunities and let us know how we can best support you in the future. By now, many of the undergraduates who were successful in obtaining a Summer Student Placement Scholarship will have completed their time in their host laboratories. I hope this has been a fulfilling and career-informing time for you. Thanks again to all the supervisors who spent time with our scholarship recipients, sharing your expertise and experience, and allowing them to gain valuable skills, which have been so difficult to obtain during these very difficult past two years. I remain convinced that this scholarship is one of the best ways to plant the seed and nurture the future of our Society and our discipline. I look forward to seeing the outcomes of these projects, and our upcoming meetings (especially our major International Applied Microbiology Conference in 2023) will be the perfect venue to present their work.

At the end of June, Dr Arthur Gilmour stepped down as Chief Editor of the *Journal of Applied Microbiology*, a role he has held for the past 17 years. Under his leadership, the journal has gone from strength to strength, has built an international community of outstanding editors, reviewers and authors, and has this year recorded its highest ever impact factor and other citation metrics. Our journals underpin all of the work we do as a Society and are central to our mission and new strategy going forward. Arthur’s dedicated leadership at the *Journal of Applied Microbiology* has been critical in securing SfAM’s reputation, alongside our other journals, within scholarly publishing internationally. The *Journal of Applied Microbiology* is in an exceptional position to build upon for the future, and I wish Arthur’s successor, Professor Andrew McBain from the University of Manchester every success as he takes on the role of Chief Editor. On behalf of the Society, I welcome him to this exceptionally important and challenging role. Please continue to support Andrew and all of our chief editors in building our international publishing community and in driving our ambitious new strategy forward, by submitting your best work, supporting our editors and getting involved with our journals. Arthur has been a respected and valued friend of the Society, having served in many important roles in the past decades, including as a committee member, Trustee and director, and as President from 1999 until 2002. I met Arthur as a first-year PhD student at Queen’s University Belfast, and since then he has become a valued friend. I wish to record my personal thanks to him for all his support and advice over the years, especially during my time as a Trustee. I know he has been a friend and inspiration to so many of our members over the years, so on behalf of the Society, I wish him every happiness for his retirement.

Breaking down barriers to collaboration

In my last piece for *Microbiologist* magazine, I talked about collaboration in research, acknowledging that most scientific discovery comes about as a result of the effort of many, interdisciplinary experts working collaboratively towards a common goal. This piece continues that theme and develops it to describe how this tenet has shaped the development of our new strategic direction.

We are the oldest microbiology society in the UK and with more than half of our membership outside the UK, we are truly global, serving microbiologists based in universities, private industry and research institutes around the world. The Society's new strategic direction acknowledges that microbiology doesn't observe geographical borders and this is why we're continuing to build an international community taking a joined-up approach to research and collaboration to focus on the world's biggest problems.

Interdisciplinary research is rising globally, and we believe that global challenges need to be solved by interdisciplinary experts who apply their diverse experience to achieve results. Coming together across disciplines and geographies is important, but we must also ensure that industry and academia are working hand-in-hand to research, discover and realise new innovations. With our new strategic direction we will be looking to the future and nurturing those working and studying in our field, within industry, academia and beyond, to advance scientific impact.

We believe that applied microbiology is pivotal to how the global community tackles some of today's biggest challenges, from AMR and environmental sustainability to the safe and sustainable supply of food. We support those studying and working in applied microbiology, opening up networks and opportunities to make progress in, and through, applied microbiology. In doing so we will ensure we combine our practical and impact-driven approach with deep scientific rigour.

An ambitious, dynamic organisation, we are committed to diversity, equity and inclusion. As you'll all know, we provide funding to encourage research and broad participation at our events and to ensure diverse voices are heard around the table, working together to achieve our goals. We want to do even more and we have big plans in the pipeline: alignment with the UN Sustainable Development Goals; a new online magazine; an overhauled membership scheme; new prizes and awards and much, much more. We're all embracing this new strategic direction, and will be revealing more very soon – so watch this space!

Lucy Harper
Chief Executive of the Society for Applied Microbiology

Multi-country outbreak of monkeypox: where do we go from here?

In 2022, the world has had numerous infectious disease outbreaks hitting the headlines – COVID-19, *Shigella sonnei* infections and hepatitis of unknown aetiology in children. Monkeypox has now been added to that list. Monkeypox is a zoonotic disease belonging to the genus orthopoxvirus.

Whilst originally confined to tropical rainforest regions around central and west Africa, in 2003, the first outbreak outside of Africa was recorded in the USA. Since 13 May 2022, cases of monkeypox have been reported across 78 non-endemic countries, becoming the largest monkeypox outbreak outside of central and west Africa. At the time of writing, over 23,000 confirmed cases of monkeypox have been reported to the World Health Organization (WHO), with five reported deaths.

On 23 July 2022, the WHO International Health Regulations (IHR) Emergency Committee convened for a second time this year to discuss the rising concern of the international outbreak of monkeypox. Although the committee failed to form a consensus on the classification of the monkeypox outbreak, the WHO Director-General Dr Tedros Adhanom Ghebreyesus concluded that the monkeypox outbreak constituted a Public Health Emergency of International Concern (PHEIC) due to the rapid spread of the disease across the globe. The WHO assessed the risk of monkeypox to be moderate globally, excluding the European region, which was evaluated to be high risk. WHO's IHR was formed in 2005 and defined a PHEIC event to be 'an extraordinary event which is determined to constitute a public health risk to other States through the international spread of disease and to potentially require a coordinated international response'. Currently, there are only two other PHEIC classified events – the coronavirus pandemic and polio eradication. Previously, there have been five PHEIC events declared since the IHR governing framework was first established in 2007, highlighting the significance of monkeypox and its potential threat to human health. Declaring monkeypox as a PHEIC is a significant move from the WHO Director-General, but with PHEIC status in place, States may begin to acknowledge the potential implications of the virus if countries cannot mobilise a response to contain the infectious disease, to prevent monkeypox spreading further across the globe.

Monkeypox is transmitted via person-to-person contact, and cases outside of endemic areas are associated with travel links in countries where the viral disease is endemic. This outbreak is unusual as there is greater human-to-human transmission with fewer travel links to endemic countries. A substantial proportion of monkeypox cases have been found in gay and bisexual men who have sex with men (GBMSM) networks predominantly in the UK and Europe. Whilst monkeypox is not a sexually transmitted infection (STI), it can be spread during sexual activities where individuals are in close contact but can also be passed by touching surfaces with viral particles on such as bedsheets and worktops. During this outbreak, we have seen the circulation of misinformation surrounding the STI status of monkeypox. Inaccurate information has led to stigmatisation, labelling the disease as something that belongs to a certain group of people. As seen with previous infectious disease outbreaks such as HIV, stigmatisation can propagate marginalisation and stigmatisation of groups, thus fewer individuals may come forward for treatment and vaccinations, which could cause those to suffer in silence. Monkeypox is not a disease of the LGBTQIA+ network; it is an indiscriminate disease putting all people at risk, which can be seen through the data with children and women being reported within the cases.

The WHO has responded to the monkeypox outbreak, providing recommendations as to how different State parties should coordinate their response, including but not limited to establishing national surveillance for monkeypox, raising awareness about viral transmission and educating on how to reduce the likelihood of catching the disease and strengthen genomic sequencing capacity of monkeypox. In addition, vaccine rollout has begun, with vaccines available to specific groups at higher risk of being infected, such as healthcare workers caring for those with monkeypox, GBMSM who are at higher risk of exposure and people who have already been in contact with individuals with monkeypox. The smallpox vaccine used is 85% effective against monkeypox according to the WHO, and vaccine centres have documented rapid uptake of the vaccine, with vaccination slots filling up quickly.

Across the globe, public health agencies have recognised the need for improved communication and public engagement for knowledge mobilisation of monkeypox and the risks associated with the disease. The key to improving public awareness of monkeypox is to focus the right information on the right groups within the community. Providing clear indiscriminate information such as infographics with a variety of skin colours to show how lesions may look, refraining from calling this a disease that only affects GBMSM (as this is not true) and utilising social media to increase public engagement, which public health agencies such as UKHSA have been seen to do successfully. Coordinating effective communication will ensure individuals at risk are prepared with the correct facts and will reduce the stigma associated with the disease, allowing individuals to feel empowered to seek medical help and advice. By following the recommendations made by the WHO and improving public awareness of the disease, there is an opportunity to successfully contain the disease. However, researchers have highlighted this will not be the last disease of this nature and we must be prepared for the potential of future multi-country outbreaks of infectious disease, learning from our past experiences to prevent future global infectious disease outbreaks.

Hannah Trivett
University of Liverpool, UK

11TH ECS SYMPOSIUM 2022 REVIEW

Matthew Koch
Science Communications Officer, Society for Applied Microbiology

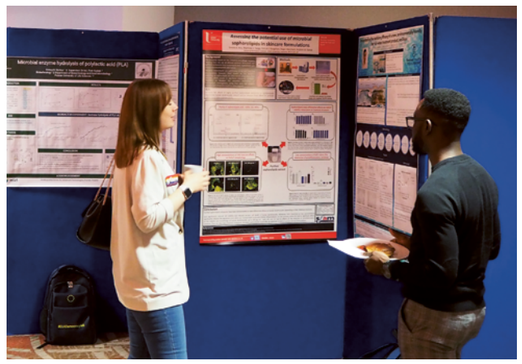
The 2022 SfAM ECS Symposium was held in the fabulous Mercure Cardiff Holland House Hotel & Spa. Situated in the centre of the Welsh capital, the ECR Symposium welcomed enterprising young researchers from numerous institutions across the UK and Europe, to network and share insights from their research.

The ECS Symposium has been a mainstay of the SfAM events calendar since its inception in 2011. As an event that focuses specifically on up-and-coming researchers, the event is a great opportunity to showcase the bread-and-butter of the scientific world that is PhD research. And judging by the quality of this year's talks, we're definitely using Lurpak.

The 10-minute talks included examples of work combatting major microbiological themes such as COVID-19 (Dr Lucy Owen) and AMR (Caleb Marsh), alongside work on the human microbiome (Hannah Trivett) and novel approaches to combatting infection (Dr Fritz Ka-Ho, Gurdeep Singh, Joanna Stephens). The talks included work from research institutions, incorporating information obtained from clinical settings and public health perspectives – a broad-ranging programme that event organiser Robert Millar was hard-pushed to squeeze into a single day.

The prize for the standout 10-minute talk was awarded to Gurdeep Singh for his engaging explanation of the use of *Lactobacillus* species in maintaining a healthy oral barrier, and in the modulation of periodontal pathogens. The talk was one of several on the day with a clear link to applied research and was a welcome addition to this year's programme.

The Symposium provides Early Career Researchers with a valuable chance to share their research findings in a



friendly and professional setting. Often, the presentations are the first time that PhD students have presented their work.

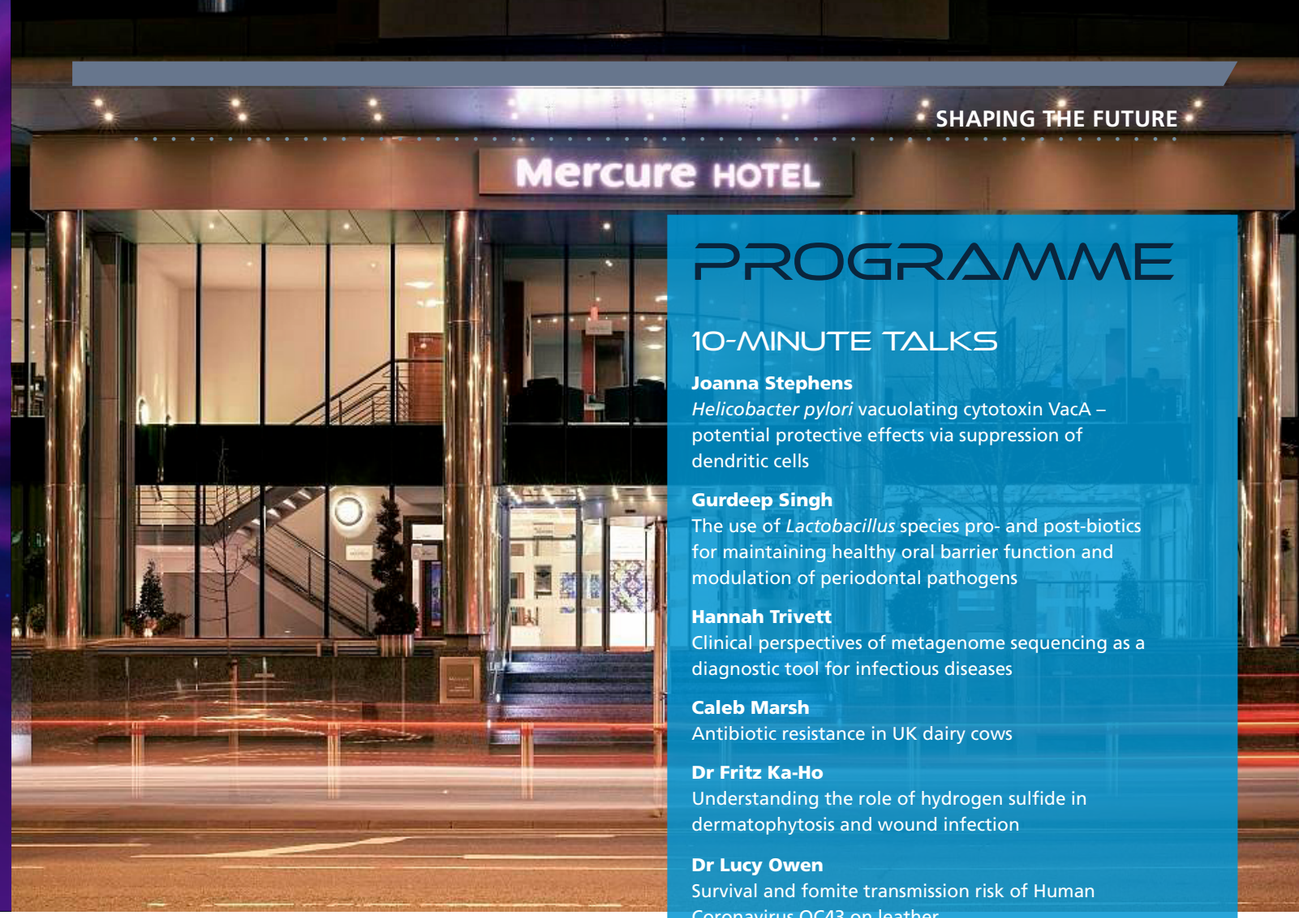
As the first in-person event the Society has held since November 2021, the chance for delegates to network was invaluable. Feedback from online events over the past few years has consistently revealed that the networking opportunities provided by in-person events are not only lacking from online symposia, but are also one of the main reasons the ECRs attend scientific conferences in general. One of the best ways to do this is with coffee and posters.

The poster session at a conference is a great way to find out about new methods, interesting results and catch a little glimpse of the research being done outside of your institution – whether you want to chat to every presenter there or scoot round by yourself with a slice of cake. It's often the case that people say the informal chats they had over a poster are the ones that led to the most fruitful collaborations, and you will invariably begin to see familiar faces as you attend conferences in the future.

To feel part of a community and a part of the wider field can be a rewarding thing in science, and so we're very pleased that we got to do this event in person and facilitate some friendly and avid discussion.

The afternoon got underway with a series of 20-minute talks. Several of these addressed the crucial and often overlooked link between microbiology and climate change (Lizzie Archer, Robin Dawson), whilst Thomas Thompson took us deep into the world of AMR in extremophilic archaea. The afternoon finished with some very applied and well-presented research from Kelly Capper-Parkin on the use of combinatory therapies in treating catheter infections – and was our 20-minute talk prize-winner for the day.

Thank you to everybody who attended the Symposium and made the event so enjoyable for us at SfAM. It was just a shame the train strikes didn't take place a day earlier, as we would have all liked a reason to stay for a second day in Cardiff. See you all next year.



PROGRAMME

10-MINUTE TALKS

Joanna Stephens
Helicobacter pylori vacuolating cytotoxin VacA – potential protective effects via suppression of dendritic cells

Gurdeep Singh
The use of *Lactobacillus* species pro- and post-biotics for maintaining healthy oral barrier function and modulation of periodontal pathogens

Hannah Trivett
Clinical perspectives of metagenome sequencing as a diagnostic tool for infectious diseases

Caleb Marsh
Antibiotic resistance in UK dairy cows

Dr Fritz Ka-Ho
Understanding the role of hydrogen sulfide in dermatophytosis and wound infection

Dr Lucy Owen
Survival and fomite transmission risk of Human Coronavirus OC43 on leather

20-MINUTE TALKS

Lizzie Archer
Climate warming and increasing *Vibrio vulnificus* infections in North America

Thomas Thompson
The evolution of AMR in extremophilic archaea

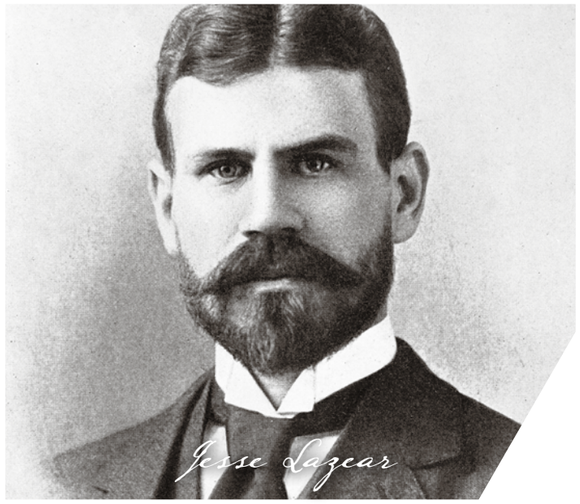
Kelly Capper-Parkin
The effects of combined biocides and quorum sensing inhibitors against uropathogenic *Escherichia coli*

Robin Dawson
Isoprene degradation by *Variovorax* sp. WS11

Self-experimenting scientists

Andrew Fletcher
University of Birmingham, UK

For most scientists the idea of self-experimentation is one that never comes to mind. However, a select few across history have used themselves to test their theories and hypotheses. Some lived on to have exceedingly impactful careers, while others pushed the limits of their research too far, leaving others to finish the work they left behind.



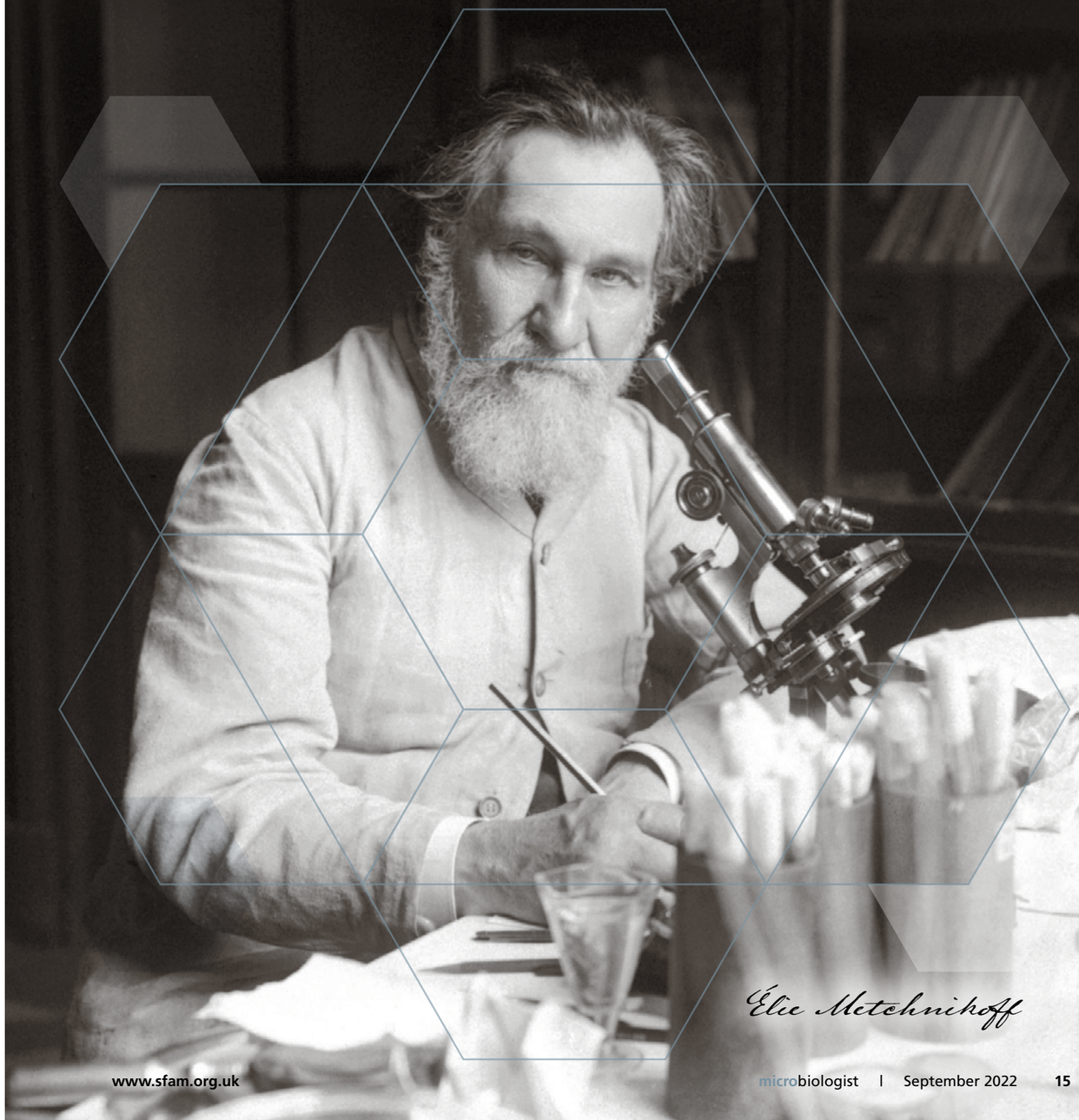
Microbiologists are not excluded from the realms of self-experimentation – despite the seemingly obvious risks. Whilst some cases have gained international attention with the accolades to show for it, most have seemingly passed under the radar and been lost to the history books. For some, they were willing to die in the name of scientific research, whilst for others it was merely a case of being in the wrong place at the wrong time. In this article we explore the unusual, the unintentional and the untimely cases of self-experimentation across the history of microbiology.

Jesse Lazear

Commissioned by the American army, Jesse Lazear was an American physician who, in 1900, travelled to Cuba to study yellow fever as part of the Yellow Fever Commission. Research to date had suggested the disease was transported by a living host; Lazear and his Commission suggested mosquitos as the culprit. At a fundamental level, his methods were to allow newly hatched mosquitos to bite infected patients at Havana Hospital, and then bite healthy volunteers. As expected, the volunteers developed yellow fever. Using filters to exclude bacterial cells from suspensions did not prevent infection, suggesting a smaller causative agent was responsible. Lazear's Commission had successfully identified the first human viral pathogen. Of the three volunteers who were bitten, two survived the disease. The third, Lazear himself, was not so fortunate and died from yellow fever less than a year into the project. His act of self-infection was covered up at the time, with the truth of his death only surfacing in 1947 when his notebook was analysed by Nobel Prize-winning physician Philip S. Hench, the discoverer of the hormone cortisone.

Élie Metchnikoff

Regarded as the 'father of innate immunity', Élie Metchnikoff was the first to discover the macrophage and phagocytosis in 1882, for which he won a Nobel Prize in 1908. He never settled as a young researcher, spending time at various institutes across Europe and North America until he eventually established himself at the Pasteur Institute. In 1885, he injected himself with a spirochaete of relapsing fever, not for research but as a suicide attempt, at the same time as his wife was battling typhoid. He survived and used his own exposure to delve further into innate immunity and inflammation. Years later, in 1892, he and two of his colleagues drank *Vibrio cholerae*, to explore why only some people suffered from the disease during the epidemic in France at the time. While Metchnikoff was unharmed, one of his colleagues almost died from the disease. Further work established that some microbes in the human gut hindered the development of cholera – Metchnikoff proposed that the microbiota was essential for certain people's tolerance of harmful bacteria. He also suggested that having an increase of lactic acid bacteria could prolong an individual's life, and drank sour milk to promote their growth. This was the forethought of probiotics, which were not scientifically accepted until the mid-1990s, many years after his death.

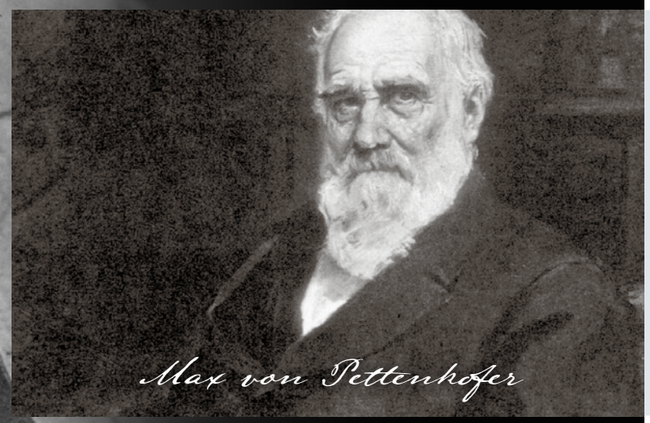


Clara Maass

Less than three years after graduating from Newark German Hospital's Christina Trefz Training School for Nurses in 1895, Clara Maass was appointed head nurse at the Newark German Hospital. She volunteered as an army medic until mid-1890, where she primarily treated those with infectious diseases such as malaria, yellow fever and dengue fever. She was recruited by the Yellow Fever Commission as a nurse in Cuba, later volunteering to be bitten by an infected mosquito. During this work, volunteers were compensated with up to $200 ($3,000 in today's money) if they became ill – the first recorded case of informed consent for medical research. Maass survived her bout of yellow fever. Several months later, she volunteered again – this time scientists wanted to show that being infected once gave you immunity from the disease. This was not the case. Maass died 10 days into her second bout of the disease, gaining public attention in the process. The scrutiny that followed was enough to end yellow fever experiments on humans.

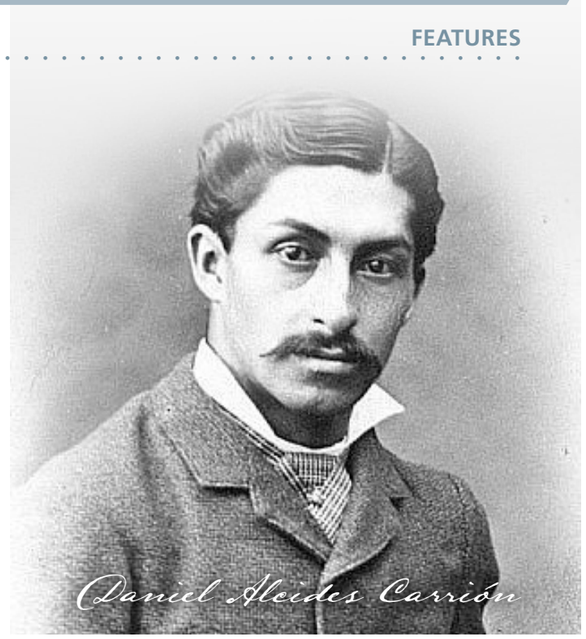
Arthur Bacot

Arthur Bacot left school aged 16, with no formal scientific training, to become an office worker in the City of London. His first foray into science stemmed from his esteemed butterfly collection and breeding work, which he presented at the London Hospital Medical School. He was asked by the Committee for Plague Investigation to research the breeding habits of the rat flea in his spare time. His research was extremely successful, and he was offered a place at the Lister Institute as a full-time researcher. During WWI, he was commissioned to Sierra Leone to study yellow fever, before researching the trench fever epidemic, which had taken over by 1917. He discovered that both trench fever and typhus were lice-borne diseases, catching the former and barely surviving. After the war, he was commissioned by the Egyptian government to further his study of typhus, which was endemic to the region. He caught the disease in Cairo and died aged 56 after a prolonged bout.



Daniel Alcides Carrión

In 1991, over 100 years on from his death, the Peruvian government declared Daniel Alcides Carrión a national hero for his work researching Oroya fever. The disease is caused by the *Bartonella bacilliformis* bacterium, which is transmitted by sandflies or by direct blood transfusion. Carrión's work cumulated in the discovery of the link between the acute haematic phase, characterised commonly by fever and jaundice, and the chronic eruptive phase, where many ulcerated lesions develop over the body. These are termed 'Peruvian warts'. In 1885, Carrión was inoculated with blood taken directly from the ulcerated lesion of a 14-year-old boy. As expected, he developed the fever and jaundice of the acute phase before succumbing to the symptoms. His self-experimentation showed that the lesions and the fever were different stages of one disease. The transfusion of blood from the boy's lesion was carried out by Carrión's close friends, one of whom was arrested for his murder and subsequently released.



Constantin Levaditi

Training at several prestigious universities around Europe, Constantin Levaditi was eventually offered a place in the lab of Élie Metchnikoff at the Pasteur Institute in 1900. Some years later, he was awarded a lab of his own at the institute, where his initial research focused on the tissues that can be inhabited by the poliovirus. His work was fundamental to the creation of the polio vaccine many years later by Salk and Sabin. His later work focused on the disease syphilis. Primarily he worked with rabbits that carried the disease and appeared to always transmit it to other rabbits. In a radical experiment, he injected himself with a spirochaete isolated from infected rabbits. Unexpectedly, he did not contract the disease – he suggested that the conditions allowing the bacterium to colonise a host must be quite specific. He instead focused on how to treat the disease and is noted for establishing the element bismuth as a treatment. This metal has been used to treat various other bacterial infections in the years since Levaditi's work.

Max von Pettenkofer

During the 1850s, cholera and typhoid were both highly prevalent in Munich, Germany, where Max von Pettenkofer was working as the Chief Pharmacist to the Court. Prior to this appointment, von Pettenkofer was a chemist to the Munich mint, where he worked his way to become an esteemed Professor of Chemistry. He is noted for curating a test for bile acids, which shares his name. By 1863 he was also an esteemed Professor of Hygiene – implementing many policies and infrastructure for clean air, good water delivery and sewage disposal. In 1879, he finally established a stand-alone Institute of Hygiene in Munich, drawing a global audience in the process. Despite his research and advocation for public health, he was not a supporter of the 'Germ Theory' model of disease transmission. This was particularly true with regard to cholera, believing that many other factors were at play. In 1892, he ingested a large dose of cholera and bicarbonate of soda in an attempt to neutralise his stomach acid – to prove it wasn't just the bacteria causing the disease. He had symptoms for over a week, but claimed they were unrelated to those of typical cholera sufferers. It is likely that he was just lucky to have some immunity from a previous bout, which subdued his symptoms.

3607 – Bacterial Soundscape: an art ‘collaboration’ with the human microbiome

Kexin Liu
Royal College of Art, UK

Clamshell box: *handmade bacteria-dyed silk book cloth, paper, 340 mm × 340 mm*

As was the case with many people living through the pandemic, mental health issues took a toll on me over the past two years. It is one thing to feel down, but losing the ability to control your behaviour and thoughts, something we strongly associate with our sense of ‘self’, can be deeply unsettling. After finding little success with several antidepressants, I started to research some of the more holistic ways to cure myself.

That is when I stumbled upon the human microbiome. Even though it now seems perfectly logical to me that I am a complex ecosystem made up of millions of tiny microorganisms, I was mostly oblivious to their existence at that point. And when I do notice them, they are often seen as foreign invaders, something to be exterminated immediately with my hand sanitiser.

Yet, as I went further down this rabbit hole and read more about how we inherit our first batch of microbes when travelling through our mother’s birth canal, how our gut microbes help us manufacture our daily dose of serotonin and how our skin flora fights off pathogens, microbes have become less of a foreign object to me, but rather friendly residents or hitchhikers that blend into my body’s landscape.

Weirdly enough, knowing there are trillions upon trillions of microbes accompanying me at this moment and that I have never been operating alone in this universe provided me with great comfort. I was eager to share this new realisation through my art practice, and was even tempted to ‘invite’ some of those microbes into my creative process as a way to introduce elements of randomness and spontaneity into my artwork.

But first I needed to find out who they were and where they lived. So as my first step I found a sequencing company that was willing to aid me in my experiment. As instructed, I mailed out four samples taken from different parts of my body (oral and nasal cavity, gut, skin and vagina) and started planning the details of my artworks while I waited for my 16S amplicon sequencing results.

From the start, I knew this project needed to have a musical element to it. Like bacteria, music possesses an invisible and fleeting quality. Translating the sequencing results into an ambient soundscape might just be the perfect way to capture the elusive beauty of bacterial life forms.

The plan was to compose four tracks, each corresponding to a different site of my body where bacteria were sampled, with the composition of each track correlating with the composition and abundance of the bacterial species that inhabit that certain part of my body. So instead of bombarding the audience with complex biodata, all the bacterial information will be delivered in a comprehensive, yet concise, manner.

And to make this piece of art more tangible and visually exciting, I decided to embed all this sonic information onto a transparent vinyl record and colour it with pigments extracted from bacteria living in the human body. Unfortunately, I quickly found out that most of the bacteria sourced from the human body were of neutral tones: off-white, beige, light yellow, brown, etc. – not the most desirable colour for a coloured vinyl record! Finally, I found *Serratia marcescens*, a bright pink pigment-producing pathogenic bacterium that can be found in the human body.

Besides extracting pigments, I also dyed textiles with this bacterium in the laboratory by layering pieces of fabric onto inoculated Petri dishes, leaving the bacterial colony

Vinyl record: *bacterial pigment, vinyl, resin, 300 mm × 300 mm*

DNA catalogue: *handbound book with bacterial pigment screen-printed cover, 235 mm × 235 mm*

These dyed textiles were later made into book cloths

to grow on the textile's surface and staining it with tiny pink dots in the process. These dyed textiles were later made into book cloths and incorporated into the packaging design for the vinyl record.

After one month of waiting, I was able to get a detailed report on the bacterial makeup of my four chosen sites, accompanied by all the sequencing reads from the 16S RNA of the 3607 types of bacteria found to be living in my body.

Due to the limitation of the technology and our current knowledge of the bacteria of the human microbiome, 8.8% of them came out as unclassifiable at the genus level, making up almost one-third of the total number of bacterial species that had been detected. Since there was so little information on them, other than their sequencing reads, for the unclassifiable ones, I chose to translate these sequences in a linear fashion by assigning different sound frequencies to each nucleotide. This created a mysterious and unique sound for each species.

The identifiable bacteria were instead divided into different groups based on similar physical/behavioural characteristics, and sound objects were synthesised based on those characteristics, making the final soundscape a mix of literal transcription and human interpretation of the bacterial information we have.

You can see more details on Kexin Liu's '3607 – Bacterial Soundscape' project, as well as listen to the soundscapes here: **https://2022.rca.ac.uk/students/kexin-liu**.

Acknowledgement

This project would not have been possible without my two talented RCA collaborators Jiajing Zhao (sound design) and Mariana Neves (graphic design) and the generous support of Zhiyuan Cao, and Keira Tucker at ASCUS Art & Science.

Have you heard? SfAM is now on YouTube

Robert Millar
Digital Communications and Engagement Officer

With all the digital content we've been generating in the past year, we wanted to make it more accessible to watch our digital events and other activities.

Head to...
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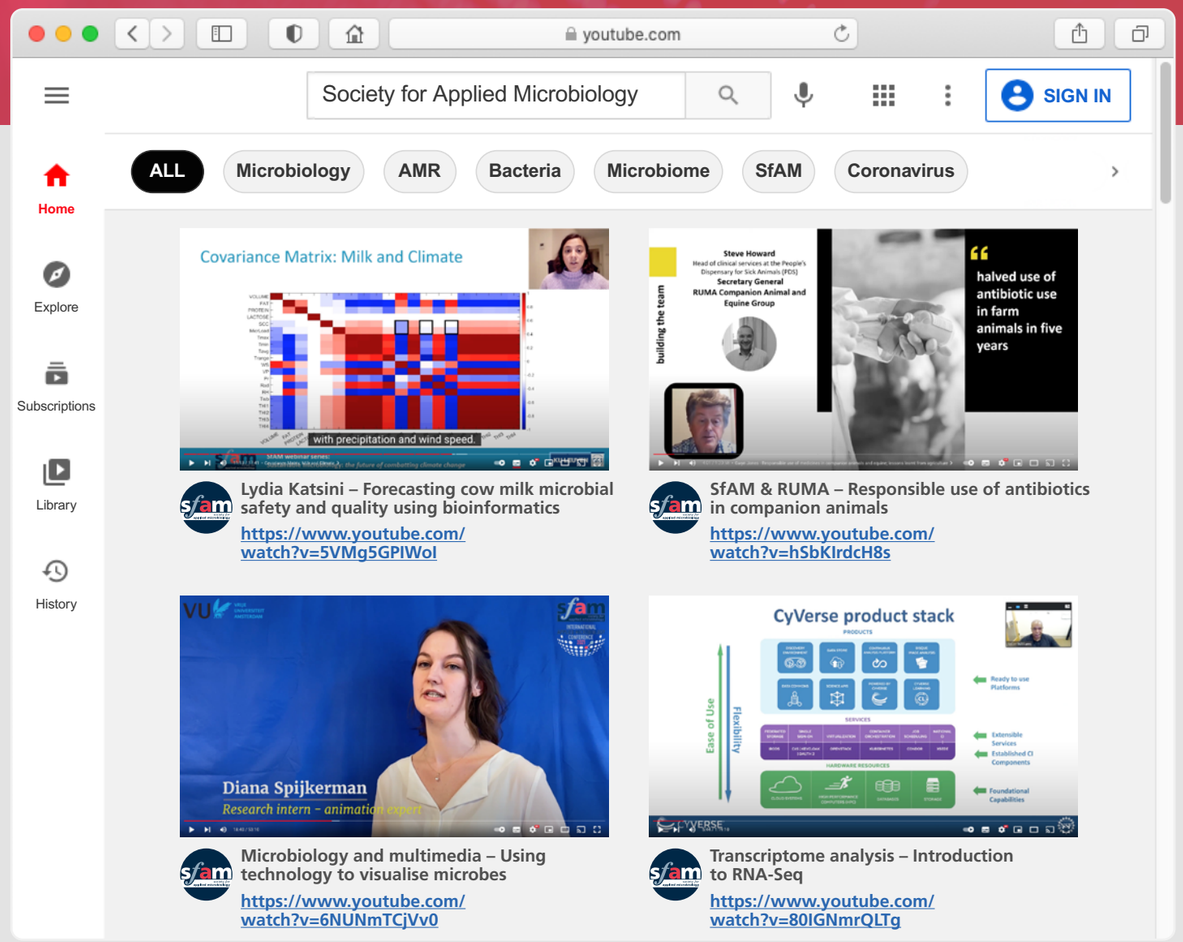


Uncle Tapz: get your just desserts

Dr Tapiwa Guzha
Tapi Tapi, Cape Town, South Africa

I have never been interested in specialisation – I find the prospect of it so limiting to my capacity as a human being. We're such a great 'generalist animal' and I believe we have thrived as a species in part because of this adaptability, and keenness for diversity in our lives. So, it was a surprise to me that I ended up spending 15 years of my life in academia, exploring the singular world of *Arabidopsis thaliana*. Well, sort of.

My life followed the path of least resistance and I ended up in the Molecular Biology department at the University of Cape Town. The decision to enter academia had very little to do with my own musings on life and more to do with indoctrination into the 'script of life'. To be a great thinker one must join the Western Academy, right? So, while I've always been curious and interested in knowledge acquisition, I have grown less and less enamoured with the idea that knowledge and wisdom can only be earned through degrees, missionary secondary schools and literal Germanic kindergartens.

How is it that I came to work at a research facility in Southern Africa that almost exclusively conducted research on colonial legacy plants? Well, because the academy is very much a colonial tool, much like journalism, much like conservation, much like tourism and of course agriculture. These are all concepts and processes that evolved out of spaces curated by one particular lens, that of 'discovering', acquiring, conquering and vanquishing pre-existing systems and imposing the one true way. Science, like any other belief system created and curated by people, is full of cult and dogma. The scientific method is the one true way to arrive at truth and any knowledge systems out of this normalcy are those of the simple minded, naive savage.

I came to study molecular biology because I went to a primary school based on the British Empire's definition of a school, a place of true learning, unlike the informal and 'colloquial' knowledge system of my ancestors. This is a legacy enforced by the new Zimbabwean government that still strongly resembles the colonial machine. I grew up eating fruits and vegetables planted by the Spanish, the Portuguese, the Dutch, the Belgians, the Brits, the French, the Italians. OK maybe not planted *by them* and more planted under their strict *supervision and encouragement*. To this day most Africans think maize, cassava, beef, plantains, kale, rapeseed etc. are all native to the continent and rarely recognise zviyo, hute, tsubvu, rapoko,

munyemba. I grew up thinking that conservation biology is about separating us and the animals, as if we're not a part of nature. I grew up learning about violently displacing tribes to make room for game reserves. I grew up knowing I was wiser than my elders because I had several pieces of paper from whiteness that stated for a fact that I am clever, with an exact ascribed percentage of cleverness. I grew up in a world in which Zimbabwean music legends still yearn for PhDs in music when they themselves are the subject of music PhDs. I grew up in a world where every single aspect of this continent can only exist in comparison to true north, the white standard.

Although I had spent most of my adult life as a scientific practitioner, I was fortunate enough to have dedicated some of that time to learning how to cook, calligraphy, graphic design, soap making and a few other seemingly random and disconnected skills. I had also spent so much of my childhood eating local wild fruits, learning about Shona foods from my family and travelling around Zimbabwe and Southern Africa. Within all this time and experience I was surrounded by elders willing to share centuries' worth of wisdom, and it's only later in life that I realised how little I had listened. How much I had dismissed the opportunities to learn and pass all this knowledge forward. Even with this attitude I still managed to hold on to some of those lessons and ultimately, they've led me to this particular iteration of myself. Someone who's interested in healing work, someone with a unique integration of knowledge and skills from diverse sources who can bring about change in the world in their own particular way.

In 2018, I started an educational space that utilises food and art to tell African stories, to teach people about continental cuisines, literal and metaphorical invasive species, philosophy, politics, natural phenomena and to heal the collective esteem of blackness within the continent and diaspora. I chose to use ice cream as the main educational tool because it's playful, nostalgic and approachable. Almost everyone can connect with it and while most people think we sell ice cream at Tapi Tapi, they don't realise that every time they walk in, they are attending a lecture, they are going through therapy and they're disrupting the food spaces we've inherited and reimagining a world in which our flavours of home will one day be the norm.

After a few years in the food space, I've begun to question why we have become so dependent on restaurants and the service industry in general. I could have lived my entire life without ever needing to know what wagyu beef, sushi, pasta, tamales or schnitzel taste like. Yet I can rattle off more pasta names than Zimbabwean herbs. We've created a world in which we are overly dependent on experts to cook our food, make our music and art, and indeed generate our knowledge. A world in which we think there are distinct creative types and logical types, when in fact every single one of us is a perfect distillation of creativity and logical rationality. It's a requirement of daily existence, to be curious, to ask questions, to fumble through solutions, to fail and try another approach, to realise what you knew as truth yesterday must be reassessed today.

I always make the distinction that I am not, and have never been, a scientist. I'm a person that practises science but it is not a defining feature of my identity. It is something I have a right to practise in some capacity because I'm a human and it's part of what we do. Daily. I have no regrets about leaving the formalities of the academic space and I'm grateful I am still able to teach and share knowledge with others in such a fun way, over a scoop of ice cream.

Environmental Microbiology

ANNUAL AWARD LECTURE

Professor Kristala Jones Prather

18:00 – 20:00 / 6 OCTOBER 2022 / BMA HOUSE, TAVISTOCK SQUARE, LONDON WC1H 9JP

This year's EMI Lecture will be given by Professor Kristala Jones Prather. Professor Prather is the 'Arthur Dehon Little' Professor and Executive Officer for the Department of Chemical Engineering at the Massachusetts Institute of Technology (MIT). Her work focuses broadly on the themes of 'design and assembly of novel pathways for biological synthesis', 'enhancement of enzyme activity and control of metabolic flux' and 'bioprocess engineering and design'. As well as the winner of this year's EMI Award, Professor Prather has in the past been the recipient of numerous awards, and been recognised for her contribution to the science of microbiology. Most recently, in 2021 Professor Prather was awarded the Andreas Acrivos Award for Professional Progress in Chemical Engineering, awarded by the American Institute of Chemical Engineers.

The 2022 SfAM EMI Lecture will take place on 6 October 2022 and is free to SfAM members who hold an invitation. The format of the lecture will be a talk by Professor Kristala Prather followed by a Q&A session.

This year we are also celebrating the many years that Professor Ken Timmis has acted as Chief Editor of *Environmental Microbiology* as well as *Environmental Microbiology Reports* and *Microbial Biotechnology* as he retires from the role, and we are taking the opportunity to thank him for his service to SfAM and our journals. He will speak at the event about his long history with the journal and what he hopes for its future.

Register for your place at **https://bit.ly/SfAMEMI2022**

Antibiotic-resistant bacteria: from farm to infirmary

Chanwit Tribuddharat
Mahidol University, Thailand

The evidence of multiple resistance genes carried by 'endemic' pan-drug resistant nosocomial bacteria has pointed to the influx of resistance genes from outside of the hospital. The ever-expanding resistance gene island existing in *Acinetobacter baumannii* may be obvious evidence.

The timeline of emerging resistant traits starts in the early years of antibiotic use, around the 1940s, from resistance to penicillin (1940) to first-generation cephalosporins (1970), tetracycline/chloramphenicol (1980), third-generation cephalosporins/fluoroquinolones (1990), carbapenems (2000), polymyxin/colistin (2010) and pan-drug resistance in 2020.

An important factor is that we can never go back to re-using the antibiotics that have lost their activity. Why? The presence of antibiotic resistance integrons may be part of the answer to this phenomenon. We have found that a very large resistance gene island exists in the chromosome of *A. baumannii* EU Clone II, identified in France in 2006. The clone carries resistance genes from

Southeast Asia, such as bla_{VEB-1} along with many more resistance genes for antibiotics that have rarely been used in humans for many decades, such as chloramphenicol and tetracycline. Those resistance genes were identified in *Salmonella* species and *Escherichia coli* isolated from chicken and pork meats. The resistance gene segments from animal isolates were a lot shorter than ones from multidrug-resistant nosocomial strains, indicating that they were the forerunner. *Salmonella* species and *E. coli* infections in the community are thought to be the starting point of the flow of resistance genes, eventually ending up in hospitals, where *Pseudomonas* and *Acinetobacter* encounter the incoming resistance genes.

The study of large plasmids carrying multiple resistance genes may be necessary, and is possible with the advent of long-read DNA sequencing platforms. With this technology, covalently closed circular plasmid DNA can be assembled without the issue of needing to omit the repetitive DNA sequences that are, in most cases, multiple copies of the same resistance genes. The long-read sequencing results can also enable bioinformaticians to close the chromosomal ring without any gap during assembly. These capabilities will lead us to use many microbial epidemiological markers to identify bacterial clones, resistance genetic elements, transposons and a plethora of resistance plasmids. If these microbial epidemiological markers are carefully used, we should be able to find the sources or reservoirs of those multidrug-resistant bacteria, which are currently suspected to be restaurants, supermarkets or animal farms.
We should try to improve the quality of our food prepared from these animals and from fruits and vegetables that may be contaminated with animal waste and manure.
The power of whole-genome sequencing can be used to track down the source of resistant bacteria, and will allow us to choose how to remove bad batches or otherwise

improve the quality of these foods. These may include making them free of live organisms by way of cooking, processing or changing the way they are sold – for example, not in their raw forms. We may eventually have QR codes on meat products that advise consumers on the additional resistance genes in the food in their hands.
If we found that there were outbreaks in particular animal farms, we could take outbreak strains to be candidates for vaccine production. Autogenous vaccines may have to be considered seriously. This way we could protect the animals from becoming carriers, or infected through precisely selected autogenous vaccination in those animal farms.

The use of microbial epidemiological markers has been introduced by many groups, the most beneficial of which were recommended by the International Meeting on Microbial Epidemiological Markers (IMMEM) and the Center for Genomic Epidemiology, Technical University of Denmark (DTU). The World Health Organization also released the global action plan on AMR in 2015, requiring Member States to report on the AMR situation in their respective countries. For other international agencies, the Transatlantic Taskforce on Antimicrobial Resistance (TATFAR) is the forerunner for the Asia Pacific One Health Initiative on AMR (ASPIRE), and is organised by the Japan Agency for Medical Research and Development (AMED), and the e-Asia Joint Research Program. With such a concerted effort, the future of outbreak investigation is predicted to rely heavily on bioinformatics and molecular epidemiology.

From plants to drugs: harnessing the antiviral activity of natural product compounds

Gemma Cooper and **Maitreyi Shivkumar**
De Montfort University, UK

Viruses have been evolving alongside humans and animals for many thousands of years, with viral infections plaguing us regularly through history. While we have successfully eradicated some, such as smallpox, viruses are still a prominent issue for global health. Within the last two decades there have been many instances of zoonotic viruses spilling over from animals to humans; this has resulted in pandemics and outbreaks by coronaviruses, influenza, Ebola and Zika viruses. With many more viruses circulating in animal reservoirs, human viruses emerging in the future is likely.

Viruses are comprised of a protein coat surrounding the DNA or RNA genome. Upon entry, viruses utilise host cell proteins to enable their replication, and production and release of new virions. Targeting essential viral proteins to disrupt the viral life cycle in the cell is a key antiviral strategy. For instance, remdesivir, a nucleoside analogue approved for use against COVID-19, inhibits the viral RNA-dependent RNA polymerase (RdRp), whilst nirmatrelvir, the main component in Pfizer's Paxlovid, inhibits the viral 3CL protease (3CLpro). However, viral replication is prone to errors, resulting in high mutation rates and continuous emergence of new variants, leading to potential escape from drugs. Resistance mutations in RdRp and 3CLpro detected in *in vitro* experiments are already present, or appearing in viruses isolated from COVID-19 patients.

One potential solution is to target highly conserved motifs within viral proteins, which will present a higher barrier to escape. Alternatively, antivirals that target host proteins that are essential for viral infection are less likely to induce resistance mutations compared with compounds that directly bind to the viral proteins. Moreover, as several viruses across different families have been linked to common host pathways and proteins, the host-targeting antivirals could be developed as broad-spectrum drugs. Inhibiting across viral families is a crucial step towards future pandemic preparedness against emerging virus infections.

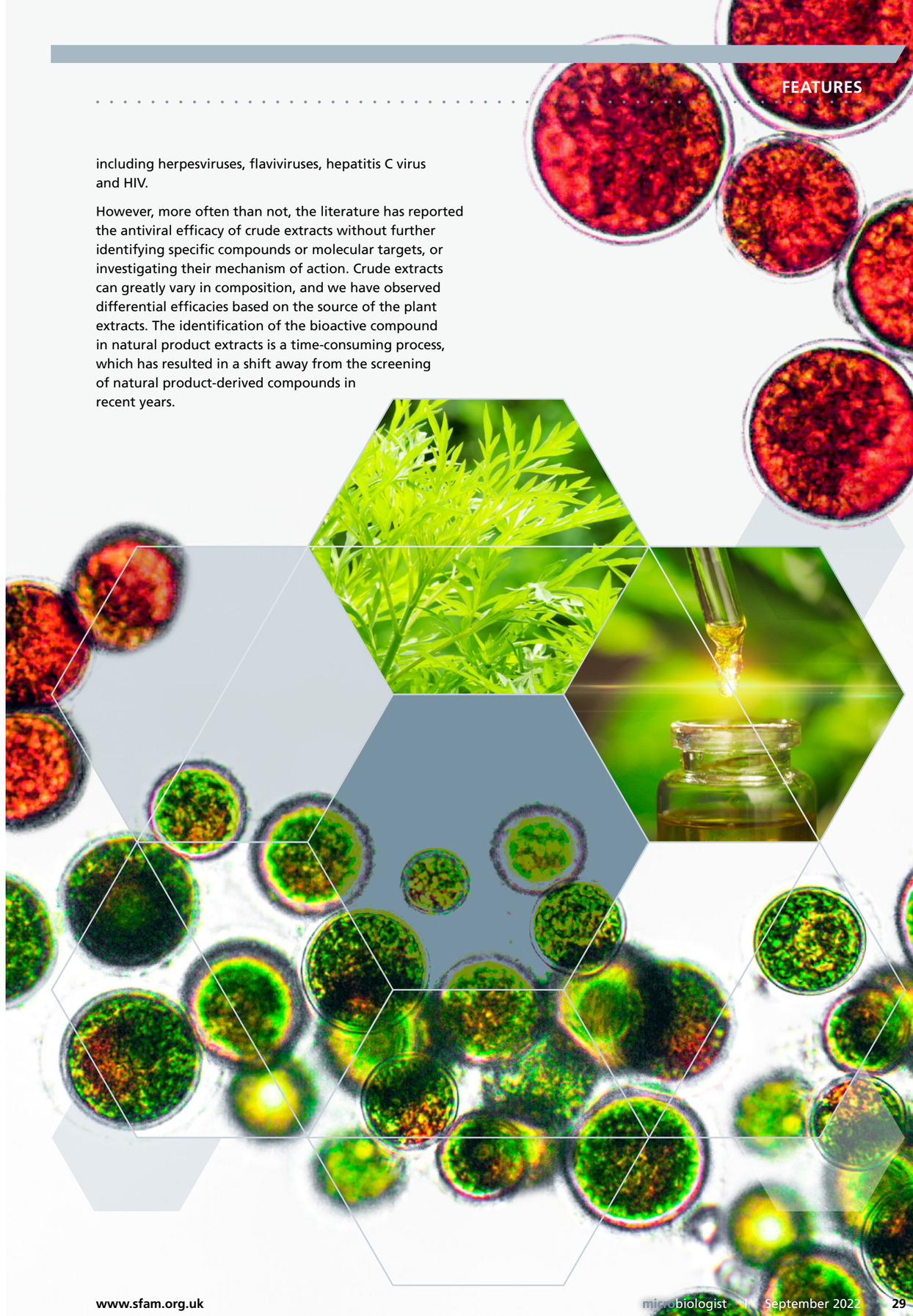
Turning to natural products

Plant extracts, rich in structurally complex and biologically active compounds called phytochemicals, have historically been used around the world for medicinal purposes. Evidence for the use of plants dates back to 3000 BCE, with recipes for drug preparations that refer to over 250 different plants. Between the 16th and 19th centuries, herbal encyclopaedias were printed featuring the medicinal properties of many familiar plants. More recently, the potential for plants to be a source of novel antiviral agents was identified by the Nottingham-based drug company Boots, who in the 1950s conducted a screen with more than 140 different plant extracts against the influenza A virus. Indeed, since the advent of modern drug discovery, extracts from medicinal plants have been investigated for their therapeutic potential, and it is estimated that 34% of new drugs developed between 2000 and 2014 were natural product-derived compounds.

Numerous classes of natural product compounds, including flavonoids, xanthones and terpenoids have been shown to have *in vitro* antiviral activity against a range of RNA and DNA viruses. Perhaps one of the most well-known examples is artemisinin, a product derived from the Chinese medicinal plant *Artemisia annua*. Traditionally used as a remedy for malarial fevers, Tu Youyou and her team isolated the active compound in 1972. This discovery of the antimalarial activity of artemisinin and its derivatives is estimated to have prevented over 145 million cases of malaria since 2000. More recently, its antiviral activity has been demonstrated against a range of viruses

including herpesviruses, flaviviruses, hepatitis C virus and HIV.

However, more often than not, the literature has reported the antiviral efficacy of crude extracts without further identifying specific compounds or molecular targets, or investigating their mechanism of action. Crude extracts can greatly vary in composition, and we have observed differential efficacies based on the source of the plant extracts. The identification of the bioactive compound in natural product extracts is a time-consuming process, which has resulted in a shift away from the screening of natural product-derived compounds in recent years.



Advances in *in silico* approaches and computer modelling provide a valuable tool in overcoming some of these challenges and assisting in rapid screening of natural product libraries. Execution of an *in silico* screen only requires the structure of a potential viral or host protein target to be known. For instance, recent *in silic*o binding analyses of angiotensin-converting enzyme 2 (ACE-2), the entry receptor of SARS-CoV-2, have predicted several natural product compounds including thymol (contained in thyme) and curcumin (contained in turmeric) as coronavirus entry inhibitors. The rapidity and versatility of this approach narrows down the list of compounds that can then be assessed through *in vitro* infection models to confirm their antiviral efficacies. Further, iterative rounds of *in vitro* testing alongside molecular modifications of the core chemical scaffolds can help determine the structure–activity relationships of the compounds and their derivatives. This provides us with the opportunity to develop more potent and efficacious antiviral drugs.

Overall, medicinal plants provide a significant resource, and there is great value in growing our understanding of bioactive compounds hiding within them. With around 2000 new plant species being discovered each year, natural product extracts may be the key to tackle new viruses emerging in the future.

FURTHER READING

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Kumar A, Choudhir G, Shukla SK, Sharma M, Tyagi P, Bhushan A *et al*. Identification of phytochemical inhibitors against main protease of COVID-19 using molecular modeling approaches. *Journal of Biomolecular Structure and Dynamics* 2021; 39(10), 3760–3770 doi:10.1080/07391102.2020.1772112

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Pandey P, Rane JS, Chatterjee A, Kumar A, Khan R, Prakash A *et al*. Targeting SARS-CoV-2 spike protein of COVID-19 with naturally occurring phytochemicals: an *in silico* study for drug development. *Journal of Biomolecular Structure and Dynamics* 2021; 39(16), 6306–6316 doi:10.1080/07391102.2020.1796811

NEW MEMBERS OF THE SOCIETY SEPTEMBER 2022

China
W Guan

Germany
N Abdulkadir
M Taubert

Ireland
E Garcia-Gutierrez
E Murray

Italy
M Donadu

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L Zakaria

Mexico
A Castillo

Nigeria
Y Oluwafemi
O Daodu
O Ajigbewu
O Oluyele
A Abidemi
R Fashogbon
I Mordi
E Afocha
A Mba
A Adefolalu
E Adebayo
F Banji-Onisile
O Buraimoh
S Nwafor
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A Ahmed El-Imam
J Clayton
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Zimbabwe
A Adebule

We will also launch our new name at the event, our Global Ambassador programme and give details of the new awards coming in 2023.

Nominations for SfAM Awards close 19 September 2022 so please be quick. Self-nominations are especially welcome and encouraged.

An edited recording of the evening will be posted online for SfAM members and *Microbiologist* readers after the event.

Register at www.sfam.org.uk

Microplastics reduce soil microbial network complexity and ecological deterministic selection

Shi J, Sun YZ, Wang X, Wang J. Microplastics reduce soil microbial network complexity and ecological deterministic selection. *Environmental Microbiology* 2020; 24, 2157–2169

Available from

https://sfamjournals.onlinelibrary.wiley.com/doi/full/10.1111/1462-2920.15955

The widespread contamination of microplastics (i.e. plastic particles ranging from 0.1 μm to 5 mm) has raised significant scientific and policy concerns. While soil has been considered as the primary sink for microplastics, what would typically happen when microplastics enter into soil?

Actually, 'microplastics' is a catch-all term for a variety of unique chemical compounds, which can originate from different products with various polymers (e.g. polyethylene, polystyrene, polyvinyl chloride and polypropylene) and morphologies (e.g. fibre, film, foam and sphere). How these idiosyncrasies of microplastics influence soil represents a large knowledge gap.

To address this, the research group from China Agricultural University studied the effects of three polymer microplastics (polyamide-6, polyethylene and polyethylene terephthalate) on soil properties of four different soil types. The processes related to carbon cycling and the responses of bacterial communities were investigated.

The study generated a comprehensive understanding of the effects of microplastics on soil carbon cycling, which were closely related to polymer and soil types. This study also indicated that the microplastics might influence the co-occurrence networks and the assembling processes of microbial communities before they change the community structure.

This study only employed short-term exposure. How the microplastics mediate the relationships between microbial communities and soil functions after a long period needs further studies.

Jie Wang
China Agricultural University, China

When it rains, trees have a trick up their trunk that can influence neighbouring soil bacteria

Teachey ME, Otteson EA, Pound P, Van Stan JT II. Under the canopy: disentangling the role of stemflow in shaping spatial patterns of soil microbial community structure underneath trees. *Environmental Microbiology* 2022; Early View.

Available from

https://sfamjournals.onlinelibrary.wiley.com/doi/10.1111/1462-2920.15970

The health of trees depends, in part, on the microbial neighbours that live around and within them. Trees interact with their neighbouring soil microbial communities in multiple ways, shaping which taxa reside beside them. However, most of the studied plant–soil microbe interactions have been identified during 'dry' (non-stormy) conditions – could tree canopies interact with storms in ways that impact the neighbouring soil bacterial community?

Anyone who has taken shelter under a tree in an unexpected rainfall recognises that trees can intercept a portion of the rain that falls on them. But where does that water go? Depending on the shape of a tree's branch pattern, large volumes of rainfall can be diverted to run down the branches and trunk and funnelled to the ground in the immediate vicinity of the trunk. This water is called stemflow. Although stemflow is generated from a small fraction of rainfall across the tree canopy (<10%), it can result in hundreds of litres of water draining directly to the soil beside trunks, which can pick up nutrients, pollutants and organisms on its way to the soil. Could this enriched, voluminous water flow that infiltrates near stems influence the neighbouring bacterial community?

Scientists at the University of Georgia and Cleveland State University sought to capture stemflow from oak trees and divert it away from the near-stem soils. Stemflow is difficult to catch as the path it takes down the bark surface can literally 'change with the wind' in a storm. Thus, a flexible gutter was placed completely around the trunk, then sealed to the bark surface to capture all stemflow, no matter its path. This captured stemflow was drained to a pipe that diverted the water flow to a location three metres away from the trunk. After several months without stemflow, the experimental soils were sampled and the bacterial community composition was assessed. Soils were also sampled from similar control trees where stemflow was not disturbed.

It was found that bacterial community composition changed significantly with the removal of stemflow – even though stemflow from the oaks in this study only represented around 8% of the rainfall at the site. The removal of stemflow significantly increased the diversity of the soil bacterial community and altered the relative abundance of many taxa in soil samples up to 2.5 metres away from the base of the trunk. Thus, stemflow represents a novel plant–soil interaction capable of influencing soil bacteria, and a significant gap in the research in this field to be addressed.

John T. Van Stan [1] and **Elizabeth A. Ottesen** [2]
1 *Cleveland State University, USA*
2 *University of Georgia, USA*

AN INTERVIEW WITH

Andrew McBain

Editor-in-Chief of the Journal of Applied Microbiology

Firstly, how does it feel to be the new Editor-in-Chief of the *Journal of Applied Microbiology* (JAM) and how would you describe your role?

Enthusiastic, excited and mindful that the journal is very important to the Society, and we must do the best job possible.

There are several aspects to the role but ultimately the overall aim is to ensure that JAM is high on the list of microbiologists when selecting a journal to publish high-quality research in applied microbiology.

As the name would suggest, JAM is a journal that has a strong inclination towards applied research. How would you define applied research?

This is not as straightforward a question as it might first seem but applied research in the context of JAM is work that involves an application which can be viewed broadly as a real-work use or benefit.

How important do you think the role of applied microbiology could be in solving some of the world's problems?

It's difficult to overestimate the importance. Just taking three existential threats for example: pandemic disease, climate change and pollution. I expect that all readers will be aware of the role that microbiology can play in these, and other global challenges.

Matthew Koch
Science Communications Officer,
Society for Applied Microbiology

How would you advise authors to handle recommendations and criticism of their work from reviewers?

Anyone who publishes scientific research will receive criticism. A good reviewer will normally provide constructive criticism that can be taken on board in the short (through, for example, resubmission) and longer term (through, for example, the design of future experiments). I think we are all geared to do this as researchers; it is something that develops naturally with experience.

What advice would you give to people who would like to take on an editorial role with a journal or Society for the first time?

The normal route is to gain experience through peer review and progress from there. This is how my own interest in the editorial process started. Early career researchers should seek advice from more experienced colleagues or through SfAM. Most journals including JAM publish advice for manuscript reviewing. Take that on board before starting.

Editorial roles are mostly built on an excellent track record as a reviewer. It is then generally possible to register interest for editorial roles via the journal correspondence email address.

What advice would you give to our ECS members, or those looking to submit a manuscript for the first time?

In most cases, there will be a more senior person involved with prior experience – the supervisor/advisor(s) for example. Take constructive advice on board. Read the scope of the journal, make sure that the manuscript tells a coherent story, and don't use unnecessary jargon. Target the manuscripts to the journal. For example, don't explain what a biofilm is in detail in the introduction if submitting to a specialist biofilm journal. Think about the journal and the readership.

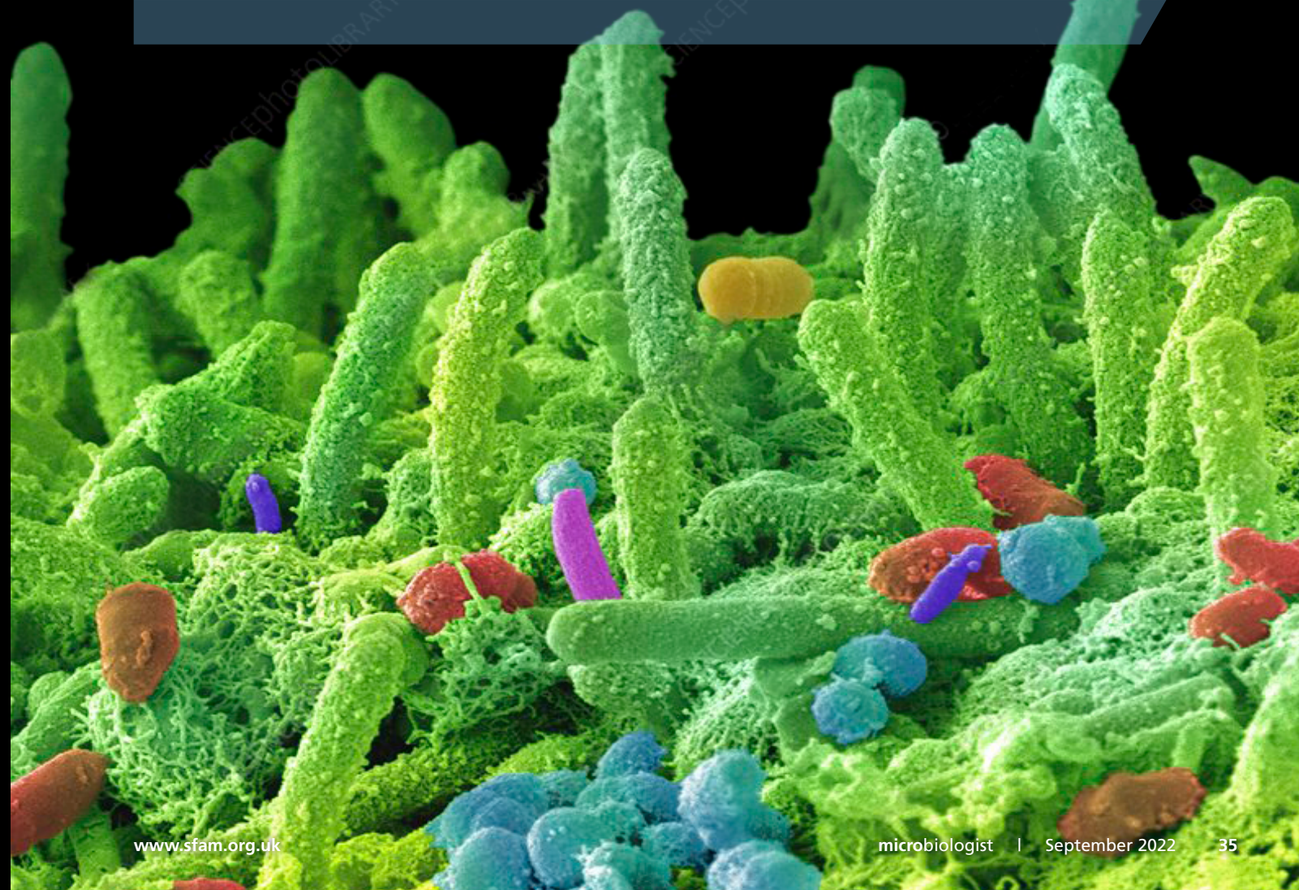
Can you share with us anything from your experience of juggling work–life balance, particularly in light of the COVID-19 pandemic and/or working from home?

I don't think it has been easy for anyone. I try to be in my office at the university most days during the week now. I find supervision of the research group works better that way and I appreciate interaction with colleagues.

You were researching the oral microbiome as well as biofilm dynamics when you won the WH Pierce Prize in 2005. Can you tell us how each of those research themes developed?

Back in 2005 we were very interested in understanding the composition and activities of bacteria on and in the human body and in various external environments. I had been inspired in this direction in the mid-1990s by my PhD supervisor, George Macfarlane, who was one of the leading intestinal microbiologists. The themes of the 2005 WH Pierce Prize have continued essentially without interruption to the present day. The main differences are i) that we now have the technologies to rapidly profile the microbiome and ii) there are a lot more groups active in the area, which can only be a good thing for the development of microbiology.

Anyone who publishes scientific research will receive criticism



From biofilms to biological weapons: a career in public health

From my own perspective as a wee working-class boy from Airdrie, I often wonder how I managed to get where I am today. Looking back, it all started in my biology classes at Calderdale High School, where the teacher, Mrs Ironside, was encouraging and I passed my Biology 'O' level with a B. Whilst never a high academic achiever, I realised that as long as I worked hard enough and was able to pass my exams then I could progress.

Leaving school with 'O' levels and Highers, I enrolled for an Ordinary National Certificate in Scientific Laboratory Techniques at Clydebank College (where we were trained in 'mouth pipetting'). Following that, I enrolled for a Higher National Diploma in Biology at Bell College. It was at this point that I considered applying to university and was accepted by the University of Aberdeen on the Microbiology Honours degree course under Professor Allan Hamilton.

It was through Allan and Shimna Parkinson that I discovered this entity called 'biofilms' and my final-year project was on '*The influence of oxygen on sulfate-reducing bacteria*' using a laboratory model that Shimna had built. As the first in my family to go to university I was very proud of my 2:2, awarded in 1987. I had not even contemplated doing a PhD until my attention was brought to an advert, that summer, for a PhD in Calgary with a gentleman called William Costerton. I met with the supervisor, Hilary Lappin-Scott, in Peterborough, and was duly awarded the position. However, I was unable to undertake the PhD as the University of Calgary would not allow me to register with a 2:2 and so after working with Hilary and Bill in Calgary for three months I came back home to the UK.

In Spring 1988, I applied for a post at the Centre of Applied Microbiology and Research at Porton Down, Salisbury. The one-year post was to study *Legionella* biofilms on copper and plumbing materials in laboratory models with Bill Keevil and Aileen West, and was funded by the copper pipe-manufacturing industry. Due to the aerosol transmission of *Legionella*, the laboratory models, using continuous culture chemostats, were built into Containment Level III microbiological safety cabinets.

For a number of years we had to keep applying for funding, as is so often the way with science. It was through this funding and whilst working at Porton that I eventually registered for my PhD through the Open University. Typically, doing a PhD whilst working tends to take longer and so five to six years was not unusual. As our projects were commercially funded it was important that we attended scientific conferences and published our work with that old mantra of 'publish or perish'. Part of this process was learning to write abstracts, drafts of manuscripts, scientific annual reports and working as a team. There was a wealth of support and history at Porton and many internal facilities; the centre was like a mini university.

Over a number of years my career progressed from one grade to another, our jobs became permanent and the institute and our organisation changed name on occasions, often becoming more commercial, and eventually we became Public Health England (now UK Health and Security Agency). However, we were fortunate that the government recognised the value of the public health laboratory service and the Gulf War probably resulted in us staying within the public domain. I was fortunate to gain a wealth of experience, including evaluating disinfectants against a range of waterborne and medical microorganisms and developing bacteriophage against *Pseudomonas aeruginosa* (with Professor Richard Sharp), as well as working at Containment Level IV, in biological suits with supplied air, during the production of the H1N1 vaccine. Other projects and activities included working with Professor Phil Marsh to investigate the contamination of dental unit water lines and volunteering with the United Nations as a Biological Weapons Inspector.

Water microbiology and biofilms have been the main theme through my career, and working with Allan Bennett and colleagues in the Biosafety Unit at Porton, as the Scientific Leader in Water Microbiology and Decontamination, was a natural fit, where our expertise on water and aerobiology could be applied to support the NHS. One such example was the Northern Ireland *P. aeruginosa* outbreak that unfortunately led to the deaths of four pre-term babies. The outbreak investigation team calls typically started on a Friday and I had to take part in a number of teleconferences from our canal boat that weekend. This was an example of bringing together a multidisciplinary team and using a range of expertise including traditional plate microbiology, detailed light microscopy for staining and visualising biofilms (that we developed back in the 1990s), scanning electron microscopy and variable number tandem repeat (VNTR) analysis. Using this latter analysis the team were able to determine that the *P. aeruginosa* recovered from the contaminated tap outlets and plumbing components were representative of the strains that infected the neonates.

Through my career, the role of clubs and societies was always important and this goes back to the days of the BBC – the 'British Biofilm Club' with its esteemed committee of Julian Wimpenny, Peter Gilbert, Pauline Handley and Hilary Lappin-Scott, which I was later able to join. The residential meetings at Gregynog are forever to be remembered as an intellectual learning experience for all. One of the first society meetings I attended was the International Biodeterioration and Biodegradation Society (IBBS) conference on Microbial Corrosion, Musée National d'Histoire Naturelle, Paris. This meeting was infamous due to the cell-like nature of the student's accommodation. However, the IBBS was a constant in my career and I was eventually elected President (2000–2003) and organised a number of biofilm/water conferences. Through our research on prions at PHE we worked with the Department of Health and the NHS to draft guidance, including for the management and decontamination of surgical instruments. This work led to an introduction to the Central Sterilising Club, of which I am currently the Chair.

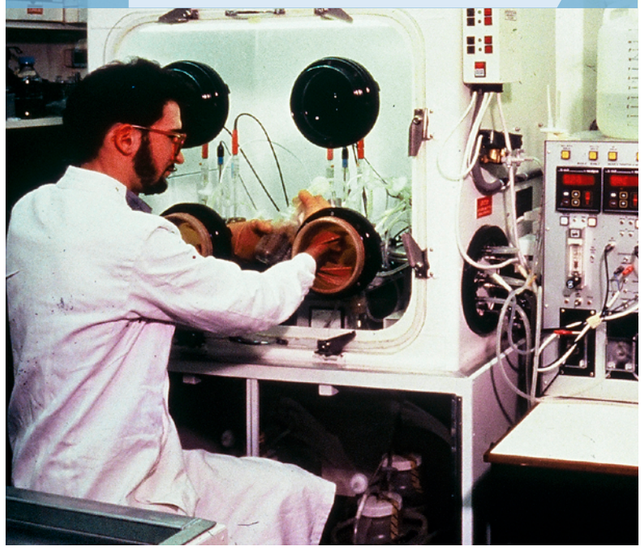
In 2017, I decided to take a two-year career break to spend time with family and do some travelling. This experience taught me a lot about the value of time and how you cannot buy that time back. Therefore, I decided in 2019 to leave my 30-year employment with PHE. I currently work part-time through my consultancy 'Walker on Water', which enables me to work from where we happen to be located. The pandemic has certainly helped make remote working easier, whether you are on a canal boat in the Midlands or in the middle of New Mexico. At the end of this summer, my co-authors and I plan to finish a book called *Safe Water in Healthcare – a Practical and Clinical Guide*, which will be published through Elsevier.

Many thanks to all the colleagues I have worked with, for I could not have achieved what I did over my career without them. If I can do it then so can you; never give up, keep on going and believe in yourself.

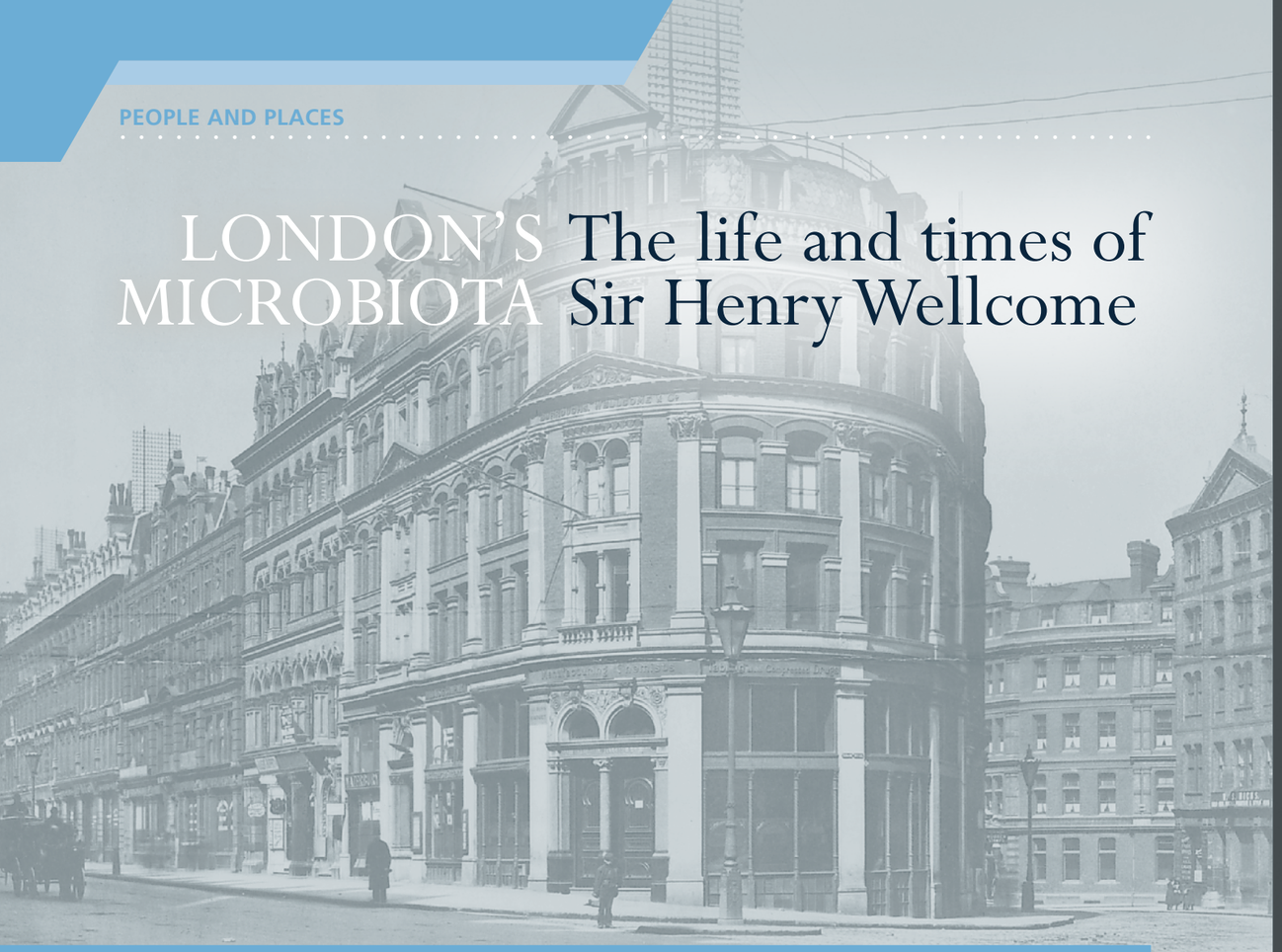
Jimmy Walker
Chair of the Central Sterilising Club, UK

FURTHER READING

Walker JT, Jhutty A, Parks S, Willis C, Copley V, Turton JF *et al*. Investigation of healthcare-associated infections associated with *Pseudomonas aeruginosa* biofilms in taps in neonatal units in Northern Ireland. *The Journal of Hospital Infection* 2014; 86(1), 16–23



LONDON'S MICROBIOTA
The life and times of Sir Henry Wellcome



The ability to find beauty where others see ugliness is said to be the gift of poets and estate agents. Being neither, I am rather surprised that I find so much to admire in Euston Road, despite the blight of six lanes of traffic, HS2 construction work and the continuous threatening rumble of malevolent wheeled suitcases.

From its eastern end, going west, Euston Road boasts some splendid buildings: King's Cross Station, the Eurostar terminal, St Pancras Hotel, the British Library and St Pancras New Church, with its stubby caryatids. Slightly further on there is an Arts and Crafts Fire Station, the Elizabeth Garrett Anderson Hospital, Friends House (the home of Quakers in Britain) and, finally, the two that concern us here: the Wellcome and Gibbs Buildings. The first, a neoclassical design of 1932, is home to the Wellcome Collection and the adjoining Gibbs Building is an impressive 2004 glass-and-steel construction housing the administrative centre of the Wellcome Trust, the world's largest medical research charity.

Martin Adams
SfAM President 2011–2014

Their founder, American-born Sir Henry Wellcome, trained in pharmacy before moving to England in 1880 where he teamed up with fellow countryman Silas Burroughs who had already been in London for two years marketing products of the US pharmaceutical company John Wyeth. Together they established a new venture, Burroughs Wellcome & Co. Initially they continued to sell goods produced by other companies, but soon moved into manufacturing at their own premises in Wandsworth when their British supplier of malt extract and cod liver oil encountered production difficulties.

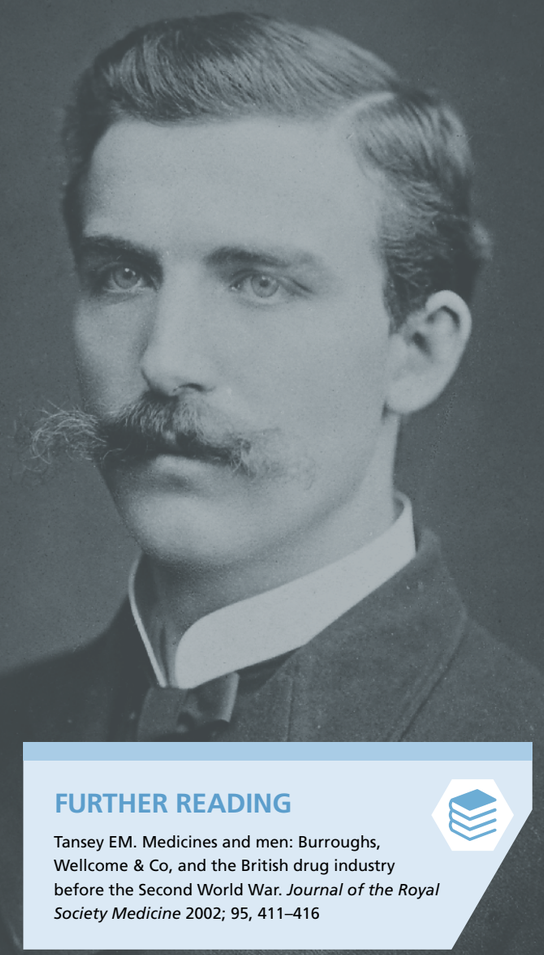
Wellcome, in particular, wanted to emulate the science-based pharmaceutical companies emerging in Europe, particularly in Germany. To this end, the company continued to increase its own manufacturing, focusing on ethical pharmaceuticals, advertising only in the professional press and deleting many extraneous items, such as shoe polish, from its product range. Its success was such that in 1883 the company moved into prestigious new offices at the corner of Snow Hill and Holborn Viaduct. It was one of the first commercial buildings to be lit entirely by electricity, supplied from the nearby Thomas Edison power station, itself the world's first coal-fired plant producing electricity for public use. The interiors were designed by Christopher Dresser, a leading designer of the day and a major figure in the Aesthetic Movement.

When Burroughs died unexpectedly in 1895, Wellcome was left to continue his transformation of the firm alone. That same year, it started production of diphtheria antiserum, supported by the recently established Wellcome Physiological Research Laboratories (WPRL). Five years earlier, von Behring and Kitasato, working at the Koch Institute, had shown that immune serum from an animal inoculated with diphtheria or tetanus could be used to treat infected animals. The value of serotherapy was dramatically demonstrated on Christmas Day the following year, saving the life of a child suffering from diphtheria, and by 1894 the antiserum was in widespread use in Berlin hospitals, reducing diphtheria mortality dramatically. Increased manufacture of antisera was facilitated by Roux's demonstration that horses could be used in its production and, as a result, Wellcome established stables at Lissom Grove with a laboratory, first in Portland Place then later in Charlotte Street.

Wellcome was committed to high-quality science and founded other laboratories to join the WPRL, including the Wellcome Tropical Research Laboratory in Khartoum. This commitment was also reflected in his recruitment of staff such as his unfulfilled ambition for Frederick Gowland Hopkins (a later Nobel Prize winner) to run the WPRL.
In 1904, Henry (later Sir Henry) Dale joined the laboratory, becoming its director two years later. Here, he started his work examining the pharmacological activity of extracts of ergot of rye (the sclerotium formed following infection of the rye plant with the fungus *Claviceps purpurea*). Their use in obstetrics was first recorded in the 15th century and they have a range of physiological activities based on their content of ergoline alkaloids and simpler compounds such as tyramine, histamine and acetylcholine. It was Dale's discovery of acetylcholine in ergot extracts that ultimately led to him receiving the Nobel Prize for work on the chemical transmission of nerve impulses.

Wellcome used the wealth he accrued for travel, archaeology and building a massive collection of artefacts and books associated with the history of medicine, some of which is on display in the Euston Road building and in the Wellcome Galleries of the Science Museum in South Kensington.
He died in 1936 and in his will established the Wellcome Trust supporting research in medicine and its history. The commercial activities of Wellcome merged with Glaxo in 1995 to establish Glaxo Wellcome but the name disappeared in 2000 with the merger that created GlaxoSmithKline, now GSK.

Unsurprisingly perhaps, in view of his riches, Henry Wellcome was well connected in the world of his time. He had a large house on the edge of Regents Park (now sporting a blue plaque) and at one stage lived in Marylebone Road, two doors away from the Tussaud family (of waxworks fame). In 1901 he married Syrie Barnardo, daughter of Dr Thomas Barnardo, founder of the children's charity, though the marriage was not a success. Syrie eventually left Wellcome for Somerset Maugham, an extremely popular author and playwright of the day. Maugham initially trained as a doctor until the success of his first novel in 1897 changed the path of his career. His medical background may, however, explain his distinction of being one of the few authors to include a bacteriologist as one of his main characters, in *The Painted Veil*, a novella published in 1925. At the time of its publication the book was twice threatened with libel actions and has been made into a film on two occasions (in 1934 and 2006). Sadly though, the bacteriologist depicted is not a completely admirable character; cuckolded by his wife he takes her with him into the heart of a cholera epidemic in China as an act of revenge. You'll probably be relieved to hear that it backfires on him, but it's certainly not the sort of behaviour one would expect from an SfAM member.



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BioFocus

Big things on the horizon for RSB: optimism for the future

Yet again, it seems the year is just flying by, with Biology Week already around the corner. We have had a busy summer at the RSB, with the expansion of our education policy, membership and engagement team as per our new strategy, and a return to in-person events.

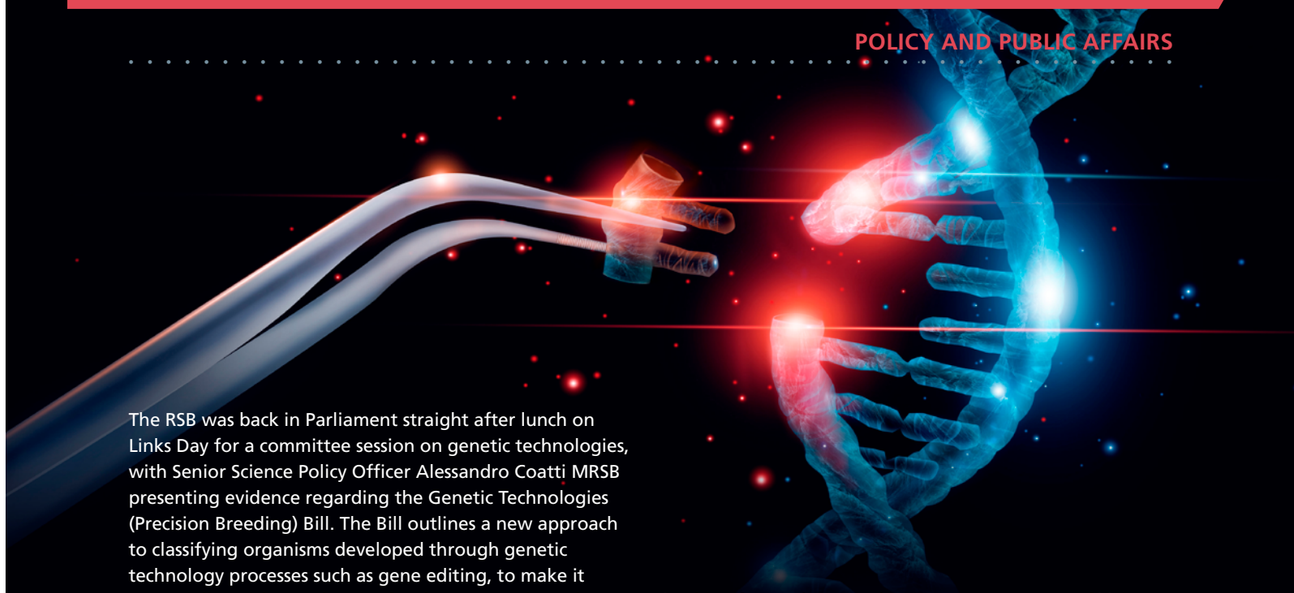
In June we returned to Portcullis House for this year's Parliamentary Links Day, delivered in partnership with a number of organisations, including SfAM. It was lovely to be able to see an overflowing room of old faces and new as politicians, policymakers, sector leaders and scientists came together to discuss international collaboration efforts. Keynotes were delivered by Chi Onwurah MP, the Shadow Minister for Business, Energy and Industrial Strategy, then Minister for Science, Research and Innovation, George Freeman MP, and Government Chief Scientific Advisor, Sir Patrick Vallance. The hot topic of the day was our pending involvement with Horizon Europe, which, at the time of writing, is still uncertain.

During the event, Sir Patrick stressed the importance of continued involvement – 'For us to not associate to Horizon would be mutual self-harm for both the UK and Europe' – whilst also sharing how important it was to maintain international links throughout the pandemic.

International collaboration has always been the foundation on which our scientific community thrives, allowing us to tap into the potential and the smartest minds from around the world and source new ideas, perspectives and solutions. The RSB will continue to work closely with government to ensure that these collaborations are maintained and strengthened going forward, regardless of political upheaval or change.

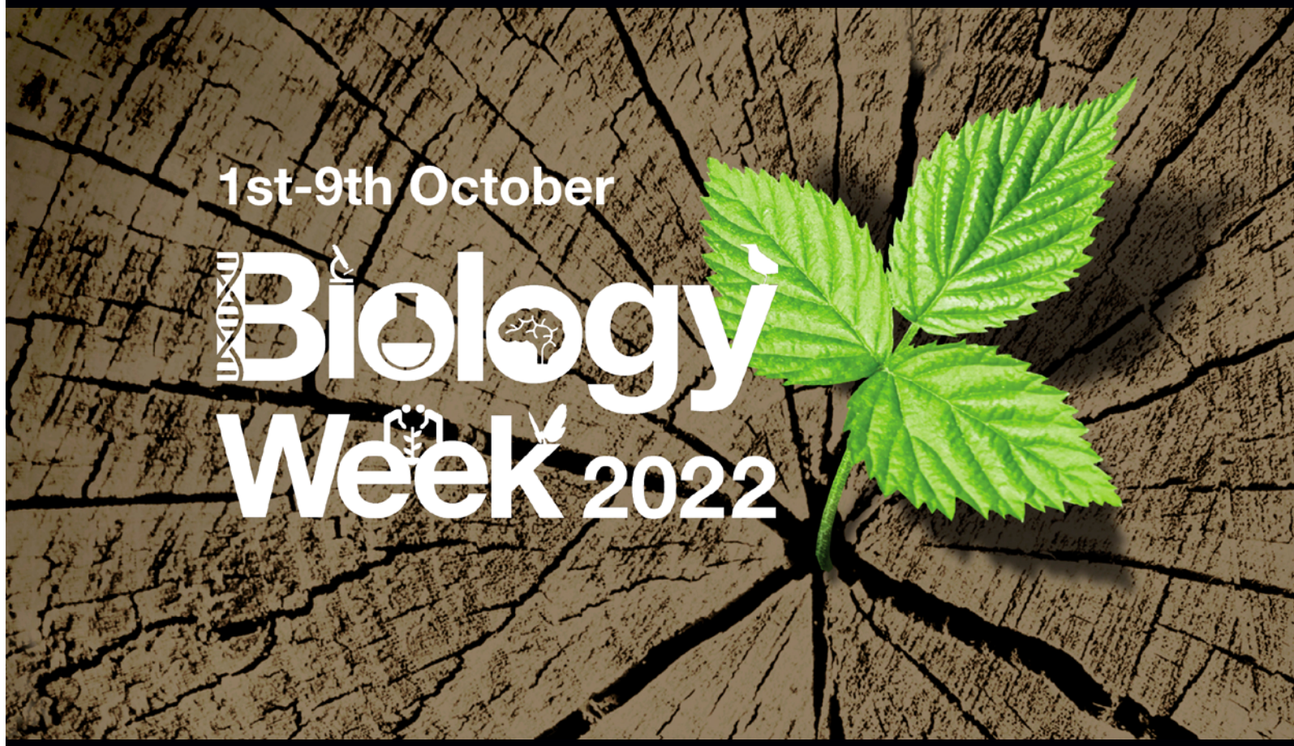
Mark Downs CSci FRSB
Chief Executive of the Royal Society of Biology

Find out how you can get involved on the RSB website: rsb.org.uk/biologyweek



The RSB was back in Parliament straight after lunch on Links Day for a committee session on genetic technologies, with Senior Science Policy Officer Alessandro Coatti MRSB presenting evidence regarding the Genetic Technologies (Precision Breeding) Bill. The Bill outlines a new approach to classifying organisms developed through genetic technology processes such as gene editing, to make it potentially quicker and easier for them to reach market. The discussion focused on the benefits of genetic technologies, potential risks and oversights, and the role of advisory bodies in assessing risks and the impacts on animal welfare. Being able to engage directly with decision-makers is such an important part of the work we do, as it ensures that the expertise and experience of our collective is used to help shape the guidelines that govern our sector. We continue to thank our membership organisations, including SfAM, for bringing their expertise to the table.

Looking forward, we are hoping to see a return of Voice of the Future. Young representatives from across STEM, including SfAM, will get the chance to put MPs in the hot seat as they ask the questions that matter to them, and we anticipate this will return in November. We will also be celebrating Biology Week from 1-9 October. This year's calendar of events will include the return of our flagship debate at the Royal Institution, as well as recognising our award winners and membership achievements throughout the week.



Parliamentary Links Day returns to Westminster

Members of SfAM were delighted to once again attend the Royal Society of Biology's Parliamentary Links Day, which took place physically in Westminster (which hasn't been possible since before COVID) on Tuesday 28 June. On the day, over 100 policymakers, politicians, scientists and sector leaders met to discuss the opportunities and challenges for the future of science and international collaboration.

Stakeholders including the Rt Hon Dame Eleanor Laing MP, Stephen Metcalfe MP, Chi Onwurah MP, George Freeman, Minister for Science, Research and Innovation, Rt Hon Greg Clark MP, Chair of the House of Commons Science and Technology Select Committee, and Sir Patrick Vallance, Government Chief Scientific Advisor, presented and answered questions on their priorities and concerns for the future of scientific international collaboration.

The most popular and pressing issue of the day was the precarious future of Horizon Europe. Many parliamentarians expressed concerns about the UK leaving Horizon Europe after citing how much this programme has achieved through its support for international collaboration. George Freeman MP noted that the government is preparing a Plan B if no agreement is reached but did not provide details of the plan.

Others discussed the importance of science in rebuilding the economy through the government's Levelling Up Plan. Chi Onwurah stressed the need for more investment in universities and regions across the UK. Speakers also emphasised how international collaboration was key for impending future crises including climate change, net zero and food security. The panel session involved a robust discussion on the significance of tackling ED&I challenges locally, nationally and internationally in order to support better collaboration and progress.

Lisa Rivera
Policy and Public Affairs Manager

Lastly, the House of Commons Science and Technology Select Committee announced that they will be conducting another '**My Science Inquiry**', where they will invite individuals and organisations to propose new research areas for the committee to explore. SfAM was previously successful with its 2019 proposal of an inquiry into the microbiome. SfAM's Chris Brown was subsequently invited to Westminster to present oral evidence to the Committee on the opportunities that further microbiome research could provide. You can read SfAM's submission and watch Dr Brown's pitch on SfAM's **oral evidence sessions webpage**.

Members representing SfAM, including Emmanuel Adukwu, Ian Feavers, Marcela Hernández Garcia, Lucy Harper, Catriona MacDonald and Diane Purchase then enjoyed lunch in the House of Lords following the Parliamentary Links morning session. During lunch, they were able to speak to peers and stakeholders one to one. This enabled SfAM to promote members' interests, such as short-term research contracts, and our recent policy work, including AMR in the environment, with those influencing government directly. We aim to keep those discussions going as we continue to highlight policy issues our members and the microbiology community face.

You can watch the RSB's recording of the morning session on **RSB's YouTube Channel** here or read a recap of the event via **RSB's news story** here.

The latest news, views and microbiological developments

CHROMagar for colourful microbial detection

In 1979 Dr Alain Rambach introduced his chromogenic technology to the microbiology world. The introduction of this technology triggered a revolution in microbial diagnosis, highly improving and simplifying traditional culture techniques.

Today, CHROMagar supplies the widest range of chromogenic culture media available, covering applications in clinical bacteriology, industrial microbiology, quality control for food and beverage industries, water testing and environmental monitoring... among other fields. These media allow for a quicker and simpler detection of key clinical and food-borne pathogens.

Further information

Visit: www.bioconnections.net
Tel: **+44 (0)1782 516010**
Email: **welcome@bioconnections.co.uk**

Workstation innovation

Innovation has been at the core of DWS throughout the years, from invention to manufacture and service. The entire process happens in-house, ensuring each element of production and design is quality checked with the tightest of quality controls. As modern technology and processes have been continuously improved, the Whitley Workstation range has expanded while remaining superior in its functionality and aesthetics.

The Whitley Anaerobic Workstation range provides the ability to manipulate samples in a sustainable environment for anaerobic growth. Each cabinet has a rapid airlock system, a touchscreen interface, and sleeved oval access ports. Options include Anaerobic and Catalyst Monitoring Systems, Data Logging and Cable Glands. Applications for these workstations include clinical microbiology, dental, and research into the human gut microbiome.

In response to changing customer demands, the Whitley A135 GMP Anaerobic Workstation has been specifically designed to be used as a clean-air isolator in processes following Good Manufacturing Practice (GMP). The application of anaerobic culture apparatus from clinical diagnostics to biotherapeutics brings a new set of challenges in addition to maintaining strict anaerobic conditions. The GMP Workstation range provides a solution to many of these challenges.

Contact our sales team today or visit our website, www.dwscientific.com for more information.

Further information

Visit: www.dwscientific.com
Tel: **+44 (0)1274 595728**
Email: **sales@dwscientific.co.uk**

The company Genetic PCR Solutions™ will soon launch a qPCR kit to detect monkeypox

Friday, 20 May 2022. The Spanish company, branded Genetic PCR Solutions™ (GPS™; www.geneticpcr.com), has already designed a kit of qPCR reagents for the rapid genetic detection of the monkeypox virus, which has been detected in Spain and other countries such as the United Kingdom, Portugal, Italy, Sweden, France, Belgium, Germany, Canada and USA.

The GPS™ technical team has completed the design and development work on this kit, which began as a priority when it received confirmation of the news from the Instituto de Salud Carlos III (Madrid). Although reference laboratories have techniques for detecting this virus, the Center for Disease Control (CDC), Atlanta, USA, has indicated that there is currently no commercial qPCR kit available to facilitate surveillance if required. For the design of this qPCR, GPS™ has been based on a genetic marker used by the group of Dr I.K. Damon (CDC-Atlanta) but taking another fragment that is inclusive of the 76 sequences of MPXV available at the NCBI (National Center for Biotechnology Information). To verify in silico exclusivity, they have been compared with all data available focussing the most phylogenetically related viruses according to the current taxonomy of Orthopoxviruses (International Committee on Taxonomy of Viruses, ICTV), specifically cowpox virus (90 sequences), vaccinia virus (132 sequences) and smallpox virus (73 sequences).

GPS™ laboratories are validating its development following strict recommendations of international standards and, later, it will be tested in hospitals with real and reference samples. The company has planned that the kit may be available at the end of next week, which will allow any laboratory to carry out specific tests to detect the monkeypox virus. At the present time GPS™ has already received the interest of several hospital centres for the use of this qPCR currently under validation.

With this new diagnostic kit GPS™, once again, shows the innovative character and the agility to develop precision PCR assays for the control of epidemic outbreaks that threaten global health. In 2016, generated the first genetic kit for the detection of the Zika virus and in January 2020 it was one of the first companies worldwide to develop efficiently the kit for the detection of SARS-CoV-2, which causes CoVID-19.

Further information

Visit: www.geneticpcr.com
Tel: **+34 96 542 9901**
Email: **info@geneticpcr.com**

NCIMB appoints Dr Edward Green as CEO

Dr Edward Green has been appointed as Chief Executive Officer of NCIMB Ltd. He takes over from Dr Carol Phillips who is retiring after 12 years in the post.

NCIMB Ltd curates the National Collection of Industrial, Food and Marine Bacteria, and is a well-established provider of analytical and biological material storage services.

Dr Green joins NCIMB from CHAIN Biotechnology, a microbiome therapeutics company, which he founded and led since 2015. Prior to that he founded Green Biologics, a fermentation company using bacteria to manufacture renewable chemicals.

Dr Green said: "I am very much looking forward to being part of NCIMB, and the opportunity to shape the future direction of a company that has such high standing amongst industrial microbiologists and the research community. It's great to be starting this new chapter with a move to new purpose-built premises, which will provide a fantastic foundation for growth and development of the products and services that NCIMB offers."

He concluded: "This is a fantastic post for anyone with a passion for microbiology and its role in a cleaner, healthier, and carbon-free future. There are so many issues that microorganisms have the potential to solve, and NCIMB is in a great position to contribute."

Further information

Visit: www.ncimb.com
Tel: **+44 (0)1224 009333**
Email: **enquiries@ncimb.com**

NCPV continuing to support pandemic research

NCPV has added two strains of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) to the collection to assist the scientific community with pandemic research.

SARS-CoV-2 strain B.1.1.7/N501Y/V1, clade 20I (Kent/Alpha lineage, cat no. 2111223v) is NCPV's first commercially available virus inactivated through X-ray irradiation. X-ray irradiated products are non-infectious whilst maintaining genome integrity and antigenic structures. Additionally, no residual toxic inactivation chemicals are present in the preparation.

SARS-CoV-2 strain B.1.1.529, clade 21K (Omicron lineage, GenBank reference: OM003685.1, cat no. 2112101v) is also now available to order.

These strains were identified through whole-genome sequencing, Nextclade (clades.nextstrain.org), and the Phylogenetic Assignment of Named Global Outbreak Lineages (PANGO Lineages, cov-lineages.org).

Further information

Visit: www.culturecollections.org.uk/ncpv
Tel: **+44 (0)1980 612512**
Email: **culturecollections.org.uk/contactus**
Twitter: **@NCPV**

Society for Applied Microbiology

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