



The Mole



The IMI-er

UNIVERSITY OF BIRMINGHAM

IMI INSTITUTE OF MICROBIOLOGY AND INFECTION

School of Biosciences and the Institute of Microbiology & Infection

Combined Newsletter, January 2024



In this issue

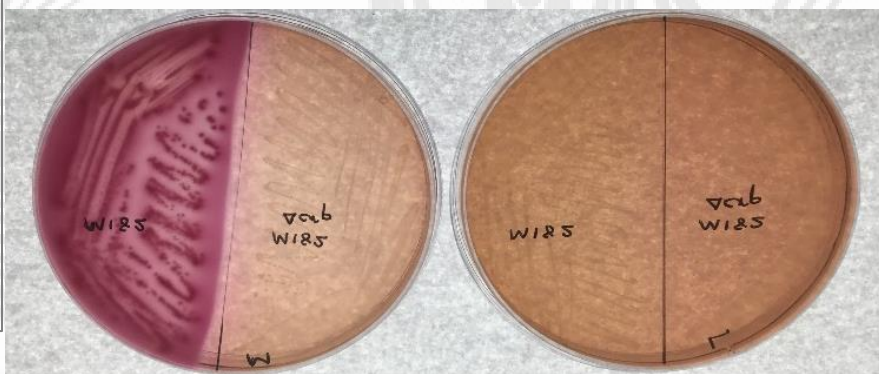
- Message from the IMI Director
- Focus on fungi
- Welcome to Professor Yin Chen
- Congratulations, Lizzy Darby
- Professor Lindsay Hall joins the IMI
- The Sam Jones Interview
- The 2024 Harry Smith Lecture
- Jeff Cole and the Crystal Ball
- Latest CERJ news
- Student news
- MSc Microbiology & Infection: Dubai
- Where are they now? Tracy Palmer & Lars Westblade
- Technicians make it happen!
- In conversation with Matt Page
- Steven Beech Foundation
- The story behind the papers
- IMI Seminars and the Forum

Introduction from the Editors

Welcome to this second combined Newsletter, jointly produced by the editors of the Mole and the IMI-er, led by Steve Busby and Alison Iboro Offong (pictured below in her splendid graduation ceremony regalia!). Both newsletters regularly bring you the latest on current happenings, views and opinions, and, this time, the Mole was due to focus on Microbiology.

So what better reason could there be to put our heads together and pool our resources, as our new-year Mole gets interested in microbiology and its history? We are very grateful to all our colleagues for producing copy on time for this issue, and, readers, please remember to keep sending copy and ideas for new features.

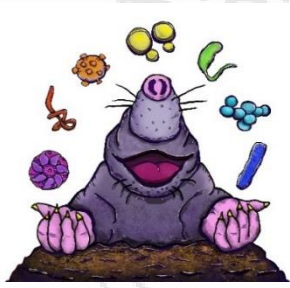
Alison & Steve



Centenary news: in 1924, Calmette & Guerin introduced a living non-virulent strain of tuberculosis (BCG) to immunize against the disease.



Moonlighting as alumni rep for CoSS...



The Mole The IMI-er

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A word from Willem van Schaik, Director of the IMI

As I am writing this foreword, the UN Climate Change Conference (COP28) has just ended. The COPs are meant to reach consensus on measures that will minimise the human impact on the global climate system. While COPs have made major policy steps towards reducing greenhouse gas emissions, it is also clear that humanity is still changing global temperatures and climate patterns in ways that will disrupt our lives, and the lives of those that will inherit the planet from us.

I would like to share some of my thoughts on how the field of microbiology will be impacted by climate change. Because global temperature patterns are changing, there is an increased risk that insect vectors for infectious diseases will spread to countries that (currently) have a more temperate climate. Indeed, this is already being observed in Southern Europe where the Asian tiger mosquito (*Aedes albopictus*) is spreading across the Mediterranean basin and into France and Germany. *A. albopictus* is a vector for many viral pathogens, including those that cause Zika, yellow fever, dengue, and Chikungunya. As climate change causes ecosystem upheaval, animals and humans are more likely to mix, increasing the risk of novel pathogens jumping from animals to humans. There is also reason to believe that antimicrobial resistance may emerge and spread quicker at higher temperatures, as modelling over continental scales, while considering a range of variables, including temperature, has shown a correlation between temperature and levels of antibiotic-resistant bacteria. Finally, there is a very real risk that microbes that produce the powerful greenhouse gas methane will reactivate when the permafrost in Arctic regions starts to melt, which would lead to a catastrophic feedback loop.

So.... is there nothing microbiologists can do against climate change? I believe as a field we should not only work on being prepared for the rising tide of antimicrobial resistance and the next viral pandemics, through improving methods for surveillance and diagnostics, but there are also opportunities for microbiologists to work across disciplines to address the global challenge of climate change. Research in this field could include the development of new ways to capture carbon and methane from the atmosphere using microbes, to modulate the composition of the rumen microbiome to minimise methane emissions by livestock, and the production of biofuels by microbes that can replace fossil fuels.

Finally, I think we all have a responsibility to minimise the carbon footprint in our place of work. While the Biosciences building is unlikely to ever be carbon-neutral, that does not discharge us from a responsibility to save as much energy as we can. Easy steps for all to take are to increase the temperature of your -80°C freezer to -70°C, and to switch off shaking incubators if you are not using them (apparently, they can use as much energy as a household!).

Willem



Research Matters: focus on fungi



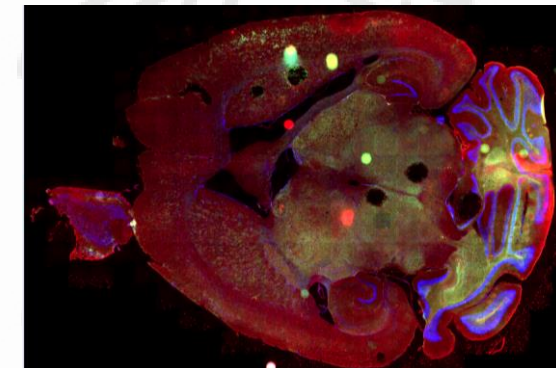
Rebecca Drummond tells us 5 things we didn't know...

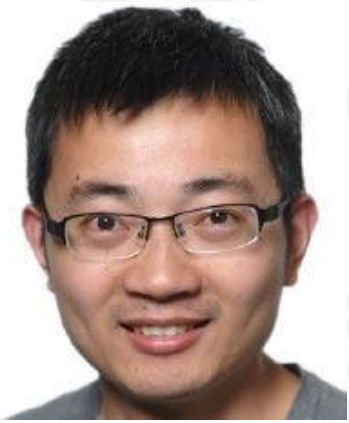
- **Fungi are related to you:** Just like us, fungi are eukaryotes and share similar biochemistry with our own cells. They are more closely related to us than to plants, making mushrooms one of your close relations (evolutionary speaking)!
- **They kill people:** 1 million people die each year from fungal infections which mostly affect vulnerable people with damaged immune systems. This makes these infections particularly hard to treat, which is made harder by rising rates of antifungal drug resistance, limited diagnostics, and no available vaccines.
- **Animal extinctions have been caused by fungi:** Fungi don't just kill people. Cold-blooded animals like frogs are particularly at risk for fungal infections, and many species have become extinct by fungal infection chytridiomycosis. There's even a theory that this might have contributed towards the extinction of the dinosaurs.
- **Fungi influence how much food we have to eat:** Fungal symbionts boost the growth of crops and are important for plant health. However, they also cause plant infections and reduce the amount of food available. The Gros Michel Banana, for example, was largely lost due to a fungal infection called Panama disease.
- **Fungal diseases are among the most poorly funded:** Despite the importance of fungi to our health and biodiversity, they remain one of the most poorly funded fields of infection research. By raising awareness, we can help train the next generation of mycologists to boost expertise in this area and help fight the negative impacts of fungi.



Rachel Calder, CENTA PhD Candidate, adds: As late as the 1960s, fungi were considered part of the plant kingdom. They are now regarded as a whole separate kingdom, more closely related to animals than to plants. We still have a lot to learn about these enigmatic organisms: less than 10% of the estimated 2.5 million species have even been named. Association with symbiotic fungi is thought to have underpinned plants' initial colonization of land, and fungi continue to shape plant communities today. The 'Myco-biome' composition can play a crucial role in the outcomes of ecological restoration and may help or hinder invasive species. But fungi aren't only of interest as a means of promoting plant diversity – they are also intriguing in their own right. *Rhodotorula taiwanensis* thrives in radioactive waste sites and has great potential for bioremediation. Several *Aspergillus* species can help break down plastics and clean up oil spills. *Arthrobotrys oligospora* traps nematodes with tiny lassos, and is being developed as a biocontrol. The question is, what are the anonymous 90% of fungal species up to?

Right: image of mouse brain (tissue cells labelled in red) infected with *Cryptococcus neoformans* (labelled in green), the most common cause of death from a fungal infection in humans. Credit: Sofia Hain.





Welcome, Yin Chen

Yin Chen, our new Professor of Microbiology, has joined us from Warwick. He writes: 'I've had the privilege of visiting the University of Birmingham's Bioscience Tower and GEES multiple times, thanks to collaborations I've had over the years with many exceptional colleagues here in Birmingham. I vividly remember troubleshooting meetings on Chip-seq in David Grainger's office.'

I recall long but productive discussions with James Bendle and others in order to prepare the 'perfect' proposal to secure the first NERC CENTA DTP bid. I was cheeky enough to pick up the phone and ask if Tim Dafforn could help host my very first MIBTP student (although we had never met before). And of course, I must mention Mike Cox, a former colleague from Warwick, who now collaborates with me in co-supervising a student studying lung pathogens. But now, it's going to be very different, but very exciting! In November, I started as a professor in microbiology at the School of Biosciences. I lead a team focusing on physiology and ecophysiology of how microbes adapt to nutrient stress.

Let me give you some background: I started my career as a UG and PG student at Tsinghua University in Beijing in 1998. My MSc project was supervised by Prof Xinhui Xing at the Institute of Biochemical Engineering. In 2005, I came to the UK to pursue my PhD on methanotrophs with Prof Colin Murrell, who, back then, was the head of the Warwick University microbiology group. I learned everything about methane oxidising bacteria from Colin, and began to develop an interest in these so-called methanotrophs, and methylotrophs (bacteria that are specialised in one-carbon metabolism). After a short postdoc with Colin, in 2010, I was awarded a NERC independent fellowship to start my own research group, initially focusing on one carbon metabolism in marine microbes. I soon became interested in how microbes adapt to nutrient stress in a variety of ecosystems, from the oceans to the human gut and the lungs. Current research in my group thus spans from understanding the regulation of methanotrophy in the environment to how intracellular human pathogens invade host immunity through modulating nutrient stress responses. Overall, we are interested in the physiology and ecophysiology of how nutrient availability contributes to microbial adaptation in different ecosystems, using multi-layered omics (including proteomics, transcriptomics and lipidomics), as well as biochemistry, genetics and structural biology.

I am very much looking forward to discussing with everyone in Biosciences, in the IMI and in LES. My lab and office are on the 5th floor, but you will probably have a better chance finding me at Starbucks or the library café!

Congratulations to Lizzy Darby

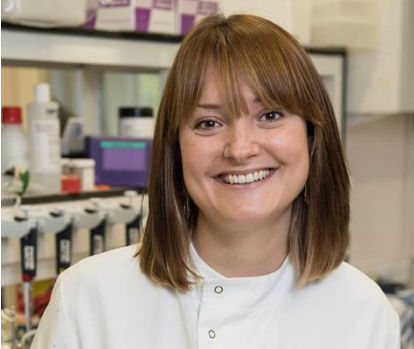
Lizzy passed her PhD viva early in December. Below left, here she is, pictured with her supervisor, Jess Blair.

Some time back, Lizzy shared her thoughts and advice on wellbeing: *'Work-life balance is key to a successful research career. However, it's easier said than done with all the demands that we face. For me, exercise is a great way to take a break and focus on mental health. A year ago, I set a goal of running the Loch Ness marathon (medal selfie, together with Ross McInnes, on the right!). Training for this marathon enforced regular breaks from my research which allowed me to recharge and return refreshed. You don't have to run a marathon, but if you try to do some regular exercise, you'll be amazed at what it does for your mental wellbeing!'*



‘Walk-in guts’: the joys of public engagement

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Professor Lindsay Hall, Chair of Microbiome Research, joined us in September 2023. Lindsay studied Microbiology at the University of Glasgow and went on to do her PhD at the Sanger Institute in Cambridge, supervised by Professor Gordon Dougan (our 2021 Harry Smith Memorial Lecturer). Lindsay’s PhD research combined Microbiology and Immunology, with a focus on vaccine development and design. She then went on to University College Cork, where she did a four-year postdoc in the APC Microbiome Institute.

This was followed by a lectureship in the Medical School at UEA, where the Hall Group got up and running, mostly focused on the microbiome during early life. Lindsay then moved over to the Quadram Institute (also in Norwich) where she was a group leader for several years, further building up the team’s microbiome work, and most recently, she was at the Technical University of Munich in Germany. Lindsay has a particular commitment to public engagement with science, which began when she was in Ireland, and so we asked her to articulate this and how we all might embrace it.

Lindsay: what has made you such a keen advocate for public engagement?

Public engagement is often an after-thought. However, I think that, as scientists, it’s part of our role to be able to communicate our work to the wider public. It’s something that should be considered and carefully developed, and if you’re going to do it well – it’s the same as if you’re doing research well – it needs time, investment and the right team around you. The APC Microbiome Institute in Cork have a big public engagement team, so I did a lot of work with them, and it really opened my eyes because it was central to the overall ethos of the Institute. Initially when I came back [to England], it was difficult because we were meant to be doing fifty million things and we were also trying to set up various public engagement activities. Then, when I got my Wellcome Investigator Award, Wellcome were also running a public engagement add-on for interested scientists. [Of course] I was interested, but it also meant having the funding to do a really good job so we hired a public engagement expert/consultant [Jenny Rant – SAW Trust] and the advantage was that she knew what she was doing.

We came up with the interesting ideas and Jenny would say ‘yes that’s great but how are you actually going to do that?’ Jenny was originally a (plant) scientist herself; we worked well with her and she had lots of key connections (like artists, writers and engaged ‘hobbyists’), so we could do far more, far better and for less money. Everyone in the team also trained up as STEM ambassadors, so that they felt empowered and suitably trained to deliver activities to the public; hopefully we’ll do the same thing here in Birmingham. The advantage was that, after they’d done the training and some public engagement events, the change and the improvement in their scientific presentations was enormous, and they gained a lot more confidence in public speaking. Another advantage of public engagement is that you never know who you might meet, what they might be interested in, and what this might lead to. At one of the children’s activities where we were all wearing ‘Hall Lab’ t-shirts, a ‘dad’ approached us and said ‘what’s the Hall Lab?’ and I said ‘I’m the Hall Lab – I’m Lindsay Hall.’ This ‘dad’ turned out to be a senior person in GSK, and we were able to leverage funding [because of this interaction]...

Are you conscious of being a role model and does that add to your passion for public engagement?

I guess that initially I didn’t appreciate how important being a role model is, although I should have realised because I had looked up to certain individuals [in the past]. And of course we know that in many areas there aren’t enough role models, not only that look like you but also in terms of their values, how they talk, and how they act. So it’s not something I thought about at first, but I grew to realise that it’s really important. Also, many people in my team (past and present) have taken part in career days for high school students, so they’re also role models. Being considered a role model feels like a ton of pressure (imposter syndrome claxon!), but it does give inspiration. For example, after we had developed our online classroom school-pack, ‘Guardians of the Gut’ [more on that below], I was sitting on a bus one day, travelling home from work, when I noticed a young girl, tugging on her mum’s sleeve and saying ‘*that’s Dr Hall, she’s the microbiologist. We’ve seen her video and we’ve been doing all her lessons at school!*’ I asked her ‘*what do you want to be when you grow up?*’ and she replied ‘*I want to be a microbiologist!*’ I got such a kick out of that remark!!

Lindsay Hall (continued)



Lindsay with Brian Cox and (right) the walk-in gut bringing delight to tomorrow's researchers

What have been your most memorable forays into personal engagement?

Designing and developing our giant walk-through gut for the Royal Society Summer Exhibition in 2018 is one. We got through the application selection process which was really difficult, and then we built it with lots of local artists and designers. I would have had no idea who to contact, but again Jenny [Rant] connected us with the right people. Everyone in the team mucked in, including the fitting of 5000 LED lights, painting, stapling and buying pink bathmats (because they look like villi in the gut!). It nearly broke us because it was so much work and I hadn't really appreciated this, but it was amazing and it was a busy, crazy week. Out of all the exhibits, the visiting school children voted us second in terms of how much they enjoyed it. We made sure we got feedback, qualitative and quantitative, because showing impact is really important. The school students completed questionnaires before and after their encounter with the exhibit and lots of people changed their perception of what the microbiome was, and why many microbes were beneficial for our health and not just bad for us. I've also done a couple of talks at big science festivals like Cheltenham and Edinburgh. In Edinburgh, I was paired with a top chef to design a microbiome-friendly starter (other people did the main course and the dessert), and I gave a talk whilst everyone was eating it. We could definitely do something like that in Birmingham!

Did you always envisage being a scientist?

I actually wanted to be a dentist! When I was fourteen, I did a placement with a senior female dentist that had her own practice, and I really enjoyed it. Then, I looked into the grades required for dentistry and I wasn't sure.....and I thought '*actually I really like thinking about science*' - coming up with the question, and being able to answer it. And for me, the inspirational teachers were more on the Biology and Chemistry side. In terms of where I went on my PhD journey, that was definitely due to fabulous lecturers at the University of Glasgow – the inspiration I had there, the practical courses, and an undergraduate placement in Canada, which I was able to do, due to a scholarship and support from my lecturers.

Final thoughts?

Birmingham University is really good at doing public engagement already, but maybe we can start thinking about doing bigger and bolder things. [For instance] we are looking at making the walk-through gut into a flat pack that we could take all over the UK; Lizzy Darby is busy looking into options, including funding, right now. We'd also like to update our free online classroom pack and make it more IMI (perhaps AMR?) - focused; then we become relevant for the Institute and the University, and hopefully we can engage with the wider community. We've had some quite inspiring people in the team, including ECRs currently in Malawi, Colombia and Vietnam, and they are already talking about rebooting stuff that we've done that is relevant to their local communities, and making it suitable for resource-poor settings, because that's really important from an education [and widening participation] perspective too...

Welcome, Sam Jones

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Dr Sam Jones joined the School of Chemistry as an Assistant Professor in 2023. His lab focuses on understanding material/virus interactions and the potential for translating this research into clinical interventions. Alison caught up with him recently:

Where does your research focus come from?

My ideas build on my past experiences, [including] my PhD [which] was in nanomaterials and self-assembly. I then did a postdoc working with viruses - which are themselves self-assembled nanomaterials - and we started to apply to viruses some of the techniques that I had worked with during my PhD. Along the way, we picked up all the standard virology required and this led us to discover new properties of materials that hadn't previously been reported. We developed new hypotheses and tried to understand why our materials were different, and we will continue that iterative feedback process of developing, testing, trying to explain how something works and making a new material to test that hypothesis - that's how we come up with new ideas. I didn't do any biology or any medical-related work until I was a PhD student, but I'd always been fascinated by biology, not viruses at all actually, but just biology in general. I have bred tropical fish as a hobby for 25 years, and the genetic side was always fascinating for me, cross-breeding and understanding how genetic traits were passed on. But it wasn't until my postdoc that I was able to do actual bio work in a bio lab, learn the skills and pick up the virology skills that we needed. Now we are pushing towards the clinic, so we are definitely having a lot more interactions with researchers in the bio space. I have three patents now and we are [currently] in discussion about a fourth with the University. As a postdoc, I was co-inventor [on one of the patents], developing an antiviral product that's now licensed to a spinout company. We have also developed a new and completely different antiviral since I left [the University of Manchester] and started my own academic career. The third patent is related to an assay which allows us to probe the integrity of a viral sample so that we can tell if the virus is still intact or if it's broken...In terms of finding new things it's going very well; sitting at the interface between chemistry and virology is exciting. And we're not focusing only on human viruses - there are a lot of animal viruses we will consider as well.

You have mentioned that you are keen to work with other researchers across the University

Yes, and [obviously] within the IMI: please reach out to me because I don't know who everyone is yet! We'd love to be able to develop our antivirals and our detection systems further and we need input from people who are in that field to help us to do that. We often describe ourselves as 'not very good virologists' because we know the base skills and the minimum we need to get by, but we really need to work more closely with the experts.

All of my group are currently in Manchester, although they will be coming regularly to work in Birmingham. I have also advertised positions for PhD students to join me here and I'm keen to have some Masters project students - I've got one through Chemistry but I'd like to look at other opportunities to bring in say, virologists or others with bio backgrounds, into the research group. We are soon to advertise for a postdoc position and technical staff in my lab so we are growing. Unfortunately, until the labs in the new Molecular Sciences Building (MSB) open, I won't be able to do any viral work in Birmingham but that's only until the new year (hopefully!) so not too far away.



Save the date

**2024 Harry Smith Memorial
Lecture to be delivered by
Professor Tracy Palmer FRS
(University of Newcastle)**

Tuesday 20th February, 1.00 pm

**Venue: the Teaching &
Learning Building LT2**

Crystal ball gazing with Jeff Cole



The editors asked Emeritus Professor Jeff Cole to predict where microbiology will be in the year 2070.....

‘Such is my lack of qualification for this task that in the year 2000, I answered “no” to the question “will it ever be possible to sequence the genome of a single bacterial cell?” Some safe predictions of future developments might include that personalized health assessments and medication will be the norm. This will include the ability to sense sepsis and identify its microbial cause. Less certain is whether this will be achievable without insertion of personal chips that are currently in use across the world. Uncertain is whether a new pandemic will severely decrease the world population before an effective vaccine or biopharmaceutical cure can prevent it. There is little hope that advances in disease treatment will reverse lower life expectancy due to obesity.

Foodcrop seeds will be pre-inoculated with new strains of rhizobia that scavenge nitrous oxide, decreasing greenhouse gas production by agriculture. Ruminants for meat production will be fed with bacteria that inhibit methane production. Industrial scale mammalian cell cultures will compete with fungal meat replacements. There will be few limits to products produced by microbial cell factories. Microbes will be key players in achieving a bioeconomy without waste, which was the aim of the recent meeting in Poznan of the European Federation of Biotechnology. Microbiology will have solved the problem of removing plastics from the environment and recycling all forms of agricultural, food and household waste.



Bioelectrochemistry and new sources of energy (G4X), are key topics for the forthcoming ECB2024 Congress in Rotterdam. Their use will soon be as commonplace as laptops and mobile phones today, or coal fires a century ago. My hope is that public perception will be convinced that European regulations are based upon scientific evidence, not on current prejudices. A final reflection: the objectives of the Green Movement are laudable: but only by embracing biotechnology will their aims be achieved.



Green Deal Biotechnology conference, Poznan, Poland, November 2023

Upcoming:



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Latest News from CERJ



Welcome to **Dr Karin Slater** as the newest CERJ Assistant Professor (of Biomedical Semantics), who also sits within the Institute of Cancer and Genomic Sciences in MDS. Prior to her appointment, Karin was a Research Fellow in the same institute. Karin’s research focuses on an ontology-based approach to analysis and knowledge representation in the biomedical sciences. During her Ph.D., she worked with natural language processing and data mining in a clinical setting, extracting phenotypes from clinical letters for the purposes of outcome prediction and patient stratification. She has also worked to analyse and evaluate logical consistency throughout the ontology ecosystem, working to create solutions that automatically identify and repair issues, with a view to improving experimental results. Karin joins a growing team of new faculty members that now includes Dr Jiarui Zhou, Dr Pu Xia and Dr Scott Glaberman (who starts in early 2024).

Student matters: BioSoc

Greetings IMI-er and Mole readers!

'My name is Alisha and I am so excited to be the President of BioSoc this year. For those who don't know us, we are a society linked to the School of Biosciences. This year our aim is to increase inclusivity in our society by creating events fit for undergraduates, staff, and post-graduates. We hope to improve networking opportunities and ensure that everyone feels welcome, and has the chance to connect with peers in different year groups. We want you to share your cohort's voice with us and to help us integrate you better within the School of Biosciences. We also understand that Human Sciences students will be starting afresh this year, so we want to emphasise that our events are open to the entirety of the university, not just those in Biosciences. We have already had a range of successful events, so far including recruiting new members at the Societies Fair during Welcome Week, a trip with the legendry Milo to the Conservation Wildlife Park, and we are looking forward to many more in addition to three sports teams you can join, Hockey, Netball and Football! Which one will you be joining?

One thing coming up is the BioCup, a competition between Biological Sciences/Human Sciences/ Human Biology vs Biochemists where students and staff fight for the esteemed BioCup, crafted by our very own resident ceramicist, Neil Hotchin. I'm sure you've all seen the Goblet of Fire-inspired reel on our Instagram account but, as mentioned there, we have Karaoke events, Sports Tournaments, Pub quizzes and a Sports Day to end the year. Biology have been the champions for the past three years but who knows, will 2024 be the year Biochemists and Dr Mike Tomlinson finally get the win they so deserve?

We have the glamorous Easter Ball as well which will be hosted at Hockley Social Club in Digbeth. We are switching things up this year so it's an event you can't miss! We have DJs, delicious food and a beautiful venue to be excited about as well as the chance to spend an evening in finery with your peers.

We are also establishing fundraising partnerships with several charities including the Birmingham and Black Country Wildlife Trust and Love the Oceans, both of which aim to improve local biodiversity and preserve our natural treasures. There will be conservation talks, fundraising events and volunteering opportunities coming soon.

Please reach out if there is anything you want to know, we hope to see you at our events! If you wish to join our society then please buy our £8 membership which covers the whole year giving you free access or discounted entry to our events. This can be found on the guild website (see link on the right).



BioSoc Email Address:

biosoc@guild.bham.ac.uk

Alisha's email address:

axd237@student.bham.ac.uk

Instagram: @biosocub

£8 Memberships

<https://www.guildofstudents.com/organisation/biosoc/>



More student matters

Sergio Mendes (right) writes about his interests and involvement with the Guild of Students..... I am a second-year Biochemistry student. My interests are hockey, film, and live production.

Last year, I played hockey at university level in the BUCS league where our team won our Saturday league as well winning Silver in the BUCS cup. Another society that helped me find people who share my interests was Guild TV (GTV) where I was able to work as Head of Tech and helped produce livestreams such as xpLosION and the Guild Officer Elections. Though it has kept me busy, the skills I have gained have prepared me for my next academic year. This year I have continued to work in GTV as secretary, assisting with event planning and pre-recorded videos for the next xpLosION event.

As a result of being exposed to the work of the Guild, I was able to find a paid role within the Guild Technical Department which uses the skills I learned in my first year. My involvement with the Hockey community at the University and the Guild continues to offer opportunities for fulfilling involvement and social interaction...Thinking back on my first year, I was able to get involved with so many things, so that I have created a network of people who are able to help me grow this year into more interesting and new ventures!



Left: the IMI Halloween Bake Off (held on Tuesday 31st October) was open to all IMI PhD students and postdocs. The winner was Isabelle Potterill (PhD student, McNally Group) pictured holding her prize (a giant bag of cake sprinkles generously donated by Mike Cox ☺).



Right: the Christmas Graduation Ceremony presided over by our Chancellor, Lord Bilimoria, who, in his inspirational parting address, reminded us that luck is simply spotting and seizing opportunities, and, also, of Gandhi's words: *"Your beliefs become your thoughts, Your thoughts become your words, Your words become your actions, Your actions become your habits, Your habits become your values, Your values become your destiny."*

Student matters: launch in Dubai of the MSc in Microbiology & Infection



The Programme Lead, Apoorva Bhatt, writes: our hugely successful MSc Microbiology and Infection was launched at our Dubai campus in September 2023, exactly 10 years after being launched in Edgbaston. It is the first School of Biosciences-led course at the new campus, and the students were the first to use the new wet labs there. We welcome our new member of staff, based in Dubai, Dr. Neveen Abdelaziz, who is running the Programme there. Neveen obtained her PhD from the Ahrum Canadian University, Egypt. With our very own Dr. Santosh Kumar (pictured left, centre, together with Neveen), and various flying faculty, Neveen has been working hard to provide students with a learning experience on a par with that of the Edgbaston course. The course has been successful in attracting about twenty student applications for the next year.

In her own words, Neveen explains *'The opportunity to unravel the mysteries of this discipline and ignite curiosity in students is what drives me. My diverse educational journey through the past 15 years taught me the value of adaptability and embracing different perspectives, shaping my approach towards teaching. The University of Birmingham Dubai represents not just a career move but a milestone in my journey towards further accomplishments. As I step into this new chapter, I do so with a heart full of enthusiasm, ready to contribute my part in fostering an environment, where every individual's uniqueness is celebrated and valued.'*

Some numbers to crunch:

Following the full start-up of the IMI in 2012, the MSc programme in Microbiology & Infection was set up (due to the tireless efforts of Julia Lodge). The first intake for this 'flagship' programme, in September 2013, was 16, but student numbers quickly stabilised at 20-30 each year, and this has been remarkably steady... until September 2023, when numbers shot up to 64. Remarkably a similar jump was seen with the parallel MSc Molecular Biotechnology programme. The editors (Steve!) offer a complimentary drink to anyone who can come up with a plausible and rational explanation for this!



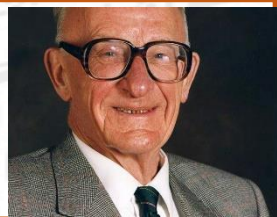
Above: dry view from the Dubai campus wetlab
Right: Neveen (pink) and Apoorva (tangerine) in the classroom with students



Where are they now?

Tracy Palmer writes: I am now Professor of Microbiology at Newcastle University. I am based in the Medical Sciences Faculty and am lead for the 'Microbes in Health and Disease' Theme. I have a long-standing interest in protein transport, which developed out of my PhD work on bacterial redox enzymes in Baz Jackson's lab in what was then the Biochemistry Department at the University of Birmingham. Many bacterial redox enzymes carry out their roles at the extracellular side of the cytoplasmic membrane, and they often require metal cofactors for their activity. I started my independent research career as a Royal Society University Research Fellow at the John Innes Centre in Norwich studying how such enzymes are exported across the membrane. I established a collaboration with Ben Berks who was then a new lecturer based at UEA, also in Norwich and together we published a series of papers showing that these proteins are exported in a folded form by a novel export pathway we termed Tat (because proteins that use this pathway have an essential twin arginine motif in their signal peptides so it was named the Twin arginine transport pathway). More recently my group also started to work on the type VII secretion system (T7SS) in the Gram-positive pathogen *Staphylococcus aureus*. Our work has demonstrated the secretion of antibacterial toxins by this pathway and we believe they are used by *S. aureus* to establish a niche during colonisation. In addition to research, one of the most rewarding aspects of my current role is to support ECRs and help to develop their careers. I am a mentor to several fellows and junior faculty around the UK. I am proud to chair one of the Royal Society University Research Fellowship panels, the same scheme that supported my career all those years ago. During my career I have been fortunate to work with colleagues who have supported and encouraged me, and I am a strong advocate for 'paying it forward' to support the next generation of microbiologists.

Tracy will deliver the 2024 IMI Harry Smith Memorial lecture on 20th February!



Lars Westblade is presently associate professor in pathology, laboratory medicine and infectious diseases at Weill Cornell Medicine and the director of the clinical microbiology service at New York-Presbyterian/Weill Cornell Medical Center in New York City. Lars did both his undergraduate and postgraduate training in biochemistry here at the University of Birmingham, followed by postgraduate studies in molecular biophysics at Rockefeller University in New York City. Subsequently, he completed a fellowship in medical and public health laboratory microbiology at Washington University School of Medicine in St. Louis. His research laboratory primarily focuses on understanding antimicrobial resistance in the setting of the immunosuppressed host and clinical and antimicrobial stewardship outcomes related to implementing rapid diagnostic tests. Lars is also fascinated by so-called "Weirdobacter weirdii" microorganisms that give clinical microbiologists countless hours of fun!

Here we catch up with School of Biosciences alumni. This time it's Tracy Palmer and Lars Westblade, who graduated with undergraduate Biochemistry degrees in 1988 and 1998, respectively. The photos below show Tracy (in Birmingham colours) and her husband at her son's graduation ceremony, and Lars hobnobbing with IMI Director Willem, in New York recently.



Technicians make it happen...

What are technicians?

Technician - a person whose job requires specialist knowledge of the practical use of machines or science. A specialist in their field using transferable skills to ensure the long-term sustainability of technical skills here in Biosciences.

Value your technicians!

Without their hard work, dedication, passion for their role, Research in Biosciences would not be where it is today. You may be surprised to know that some technicians work long hours, evenings, weekends. Some, take on extra roles to ensure your working environment is a safe place. Others identify where new skills could be advantageous to their role and go through training to keep up to date with innovative technologies.

A massive shout out and thank you to all the Technicians in Biosciences!!!! Here are some of them, introducing themselves. Some, you may recognise, some you may not. Please say "Hi" when you pass them in the building.



Rachel Hoare writes: 'I have 17 years laboratory experience working in Cancer Research in Birmingham. Following my undergrad degree in Biological Sciences (also at UoB), I started my career as a Research Technician working on the biology of Kaposi's sarcoma-associated herpesvirus (KSHV). During this time, I achieved a Distinction in a part-time MSc in Clinical Oncology. In 2013, I moved on to working on the engineering of T cell immunity in cancer biology, working on two Leukaemia & Lymphoma Research-funded clinical trials. Then, in 2017, I joined the lab of Professor Andrew Beggs; followed by joining the Institute of Metabolism and Systems Research in 2022 to continue and extend my career in Cancer Research, developing a Nanopore sequencing project. Finally, a year ago, I joined the Grainger lab in Biosciences as senior research technician, taking a new and exciting direction to investigate pathogenic bacteria.'

Lisa King writes: 'Erin Jarvis and I work in *Daphnia* Facility as Senior Research Technicians. We both work on the PrecisionTox Project, which comes under the wider Centre for Environmental Research and Justice (CERJ). As well as maintaining *Daphnia* cultures, our focus is running experiments to determine the toxicity of chemicals of interest to the project on *Daphnia magna*, a model species for toxicity, evolution, and environmental studies. We perform both acute and chronic experiments examining different behaviour traits and reproduction. We are also involved in developing new experimental methods for behavioural studies, as well as testing automation of lab processes, such as algal production. I am quite new as staff member here at UoB, and so far, have really enjoyed working within the facility!'

Fay Hughes - Genomics Facility Technician – 'starting in Biosciences 1990 (33 years ago!!) as a trainee technician learning a variety of laboratory skills. Working for 20 years in Plant Genetic Research Labs doing research on Rice, Coffee, Tobacco, and Sugar Beet. For the last 13 years, I have worked in the Genomics Facility here in Biosciences, where I run the Sanger Sequencing service that is available to both internal customer as well as external customers. I also look after and maintain communal equipment within the facility, these are all available for internal and external users – Nanodrop, QPCR Machines, X-ograph autorad developer, Gel documentation equipment and the newest addition is the Amersham Typhoon, which is a great asset. I am also a first aider and fire warden.

Contact me if you would like more information on accessing communal equipment, or pop along to W131 have a look at what is available.'

Website link to the Genomics Facility: <https://www.birmingham.ac.uk/facilities/genomics/index.aspx>



'My name is Marta, and 10 years ago I left my home country, Portugal, and joined Alicia Hidalgo's Lab as a Research Technician on the 6th floor. I've been working with her team, and with fruit flies, studying Brain Plasticity & Regeneration ever since. I am also a first aider and fire warden.'



You may also be surprised to know that we have some long serving technicians who have worked between 40 and 50 years here in Biosciences, the knowledge these technicians have is invaluable. They are a little shy so we won't be naming them here but huge shout out them for their dedication (or madness, some may say!)

In conversation with Matt Page

On 18th October, we were joined by Dr Matt Page, a consultant in genito-urinary medicine at the Queen Elizabeth Hospital Birmingham, for IMI's Black History Month event 'Bad Blood: the Legacy of Tuskegee'. The event explored one of the most egregious medical trials in history. Here Matt answers questions about his path into the GU speciality and why it is uniquely placed at the intersection of healthcare, research and public health awareness. The photo shows Matt (right) together with Willem and IMI Black History Month co-panellist, Oyinkansola Ojo-Aromokudu from the London School of Hygiene and Tropical Medicine.

Matt, what was Medical School like in the noughties? I was at the Birmingham Med School between 2003-2008, when there was no Wi-Fi and no smartphones, so very different from the way it is now. I lived at home in Halesowen; I was able to save money, but I missed out on the social aspect of student life. It was a sharp learning curve; the first year was okay because we were building on A level stuff, but I struggled because I went from being upset at getting 98% in a school test to much lower scores. It was like that for everyone – it's difficult when you've always been top of your class! Then I went through an apathetic phase and I just wanted to get through med school...

How diverse was Birmingham Medical School in those years? A large majority of people came from private schools and were usually from a lineage of doctors. I went to a grant-maintained secondary school [in Birmingham] and King Edward's sixth form college which was selective entry (based on grades), so I didn't go in thinking 'I went to terrible schools and that's why I feel out of place.' But the expectations were just different: for a lot of people there it was 'written in the cards' that they would become doctors, whereas there were no doctors in my family. There was a decent split between men and women (using gender in its binary form) and there were no non-binary genders at all; in terms of sexual diversity, it just wasn't visible. The large majority of students were white; there were a few of South Asian heritage (the next largest group) and not many from the Afro-Caribbean diaspora.

Why Genito-Urinary Medicine? At Medical School, there was a slight tilt towards getting people into general practice, and I left thinking that I wanted to be a GP. Then I did GU medicine in my second year [after graduation] and I really enjoyed it. I also did a GP job in that year and I absolutely hated it – the experience was very different from when I was a student. That sealed the deal that I was going to go down the medicine route rather than becoming a GP. But it wasn't until I got to the specialty stage that I decided on GU medicine.

The term 'multifaceted' really does apply to the GU speciality. There are three branches to it. One is sexual health, from simple sexually transmitted infections to complicated debilitating infections with quite high morbidity and mortality. Another is HIV medicine, where, again, patients can be on a spectrum from being really stable with nothing wrong clinically, to patients in intensive care and about to die unless we intervene and start managing the co-infections. The third strand is sexual and reproductive health, including contraception. There are not many specialties where you feel like you've got so many different jobs, and there's so much variety within the specialty...If you want to do medicine and you want to make a difference in a person's life and on a public health level, I think GU medicine is probably the best specialty to go into.



Matt Page interview (continued)



What makes GU – and particularly HIV medicine - so special, in your opinion? The specialty has a unique relationship with patients. There's a lot of clinical and community engagement, and that stems from the HIV epidemic of the 1980s, when patients and allies started working together to get treatments. That has continued, and so patients are experts in their own health condition, more so than with other conditions. I think it's really rewarding being involved in such a relatively new specialty; there are lots of opportunities for being at the forefront of treatment.....also there is the sheer diversity of cases and people: I see a lot of people from marginalised communities, so as well as dealing with clinical infection and the stigma around this, you appreciate that there may be social, family and psychological pressures. Because it's a relatively new specialty it's a lot more accessible in terms of opportunities for involvement at national and international level. Initially I just wanted to complete my training and become a consultant as quickly as possible. But a colleague persisted in getting me involved in a clinical trial and I eventually agreed to do it for a year. That year changed everything: my involvement took me all over Europe and I was able to network with overseas colleagues, and by doing that I also became involved with the British Association of Sexual Health and HIV and the British HIV Association.

Do you encounter hesitancy towards treatment and patient participation in research? With HIV, all patients are offered treatment regardless of clinical status, but the big issue is around the stigma of taking antiretrovirals and the realisation of what living with HIV will mean. Some of our patients are asylum seekers, some have no fixed abode, many have work-life balance issues and challenging social circumstances. The NHS model is that people have to come to us. If those people live far away and they've got no money or access to transport it may be a two-hour walk – I've had patients in that situation - or they may think 'I feel alright – I'm not going to bother to come'. We are limited as to what we can do. We are looking to do more outreach work, but we need a reliable framework and we don't have that at the moment, so it's a work in progress. We do a lot of clinical studies and there are different hesitancies related to these, reflected in the people that are recruited. Historically (and even to this day) most of our clinical trial participants are cis-gendered Caucasian males from Northern Europe and the United States. I guess that this group is the most invested in the research because they were the most affected in the eighties. And the system is more geared towards this group in terms of managing any potential stigma; if you're gay from a particular minoritized group, cultural or religious background, those peer support groups are mostly not an option. We try hard to educate: people who feel well may resist going into these trials, or ask 'why are you putting me on a different medication?' Some people fear potential side effects or are concerned that the drug may not work properly. When it's a group that's already marginalised, particularly by race, culture or religion, there's always suspicion of 'why me?', 'Are you doing this to see what happens?' And I guess that links with the Tuskegee experiment, where unfortunately the men were unwilling participants who did not know that they were being experimented on...



Be Better

Steven Beech Foundation

Campus visit of Steven Beech Trustees

Steven, formerly a Birmingham Biosciences undergraduate, died in 2018. This year, the charity set up in his name funded undergraduate student summer projects for Oliver Crutchley and Renata Toro Mesa, pictured here with Biosciences staff and Trustees during the visit in November. More details at

<https://www.stevenbeechbebetterfoundation.org/>



The stories behind the papers.....



Here, Professor Laura Piddock explains the back story to two recent publications from her lab that give valuable new insights into important bacterial efflux pumps



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Exposure of *Escherichia coli* to antibiotic-efflux pump inhibitor combinations in a pharmacokinetic model: impact on bacterial clearance and drug resistance

Alasdair P. MacGowan^{1*}, M. L. G. Attwood¹, Alan R. Noel¹, R. Barber², Zachary Aron², Timothy J. Opperman², Elizabeth Grimsey^{3†}, Jack Stone^{3‡}, Vito Ricci^{3§} and L. J. V. Piddock^{1¶}

Efflux pump inhibitors (EPIs) are an attractive therapeutic option when combined with existing classes of antibiotics as they can restore drug susceptibility to resistant bacteria. However, the optimal dosing strategies of EPIs are unknown. We investigated the pharmacodynamics of ciprofloxacin +/- a tool EPI, phenylalanine-arginine β naphthylamide (PA β N), and a developmental molecule MBX-4191 in an in vitro model using *Escherichia coli* MG1655 and its isogenic MarR (MDR) mutant. No changes in population profiles were seen in experiments with ciprofloxacin + EPIs. However, WGS of some recovered strains from simulations had mutations in *gyrA*, *gyrB* or *marR*.

To determine if *acrAB* induction in *Salmonella* Typhimurium relies solely on RamA and to better understand the kinetics of induction of both *acrAB* and *ramA*, green fluorescent protein (GFP) transcriptional reporter fusions were used to investigate the changes in the expression of *acrAB*, *ramA*, *marA*, and *soxS* following exposure to sub-inhibitory concentrations of antimicrobial compounds. We showed that most of the compounds tested induced *acrAB* via the RamA-dependent pathway. None of the antibiotic substrates of the AcrB efflux pump directly increased expression of AcrAB. Using a dual GFP/RFP reporter, we found that *acrAB* gene expression was transient compared to *ramA* gene expression.



Antimicrobial Agents
and Chemotherapy

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Antimicrobial Chemotherapy | Full-Length Text

Antibiotics do not induce expression of *acrAB* directly but via a RamA-dependent pathway

Vito Ricci,¹ Jaswant Kaur,¹ Jack Stone,¹ Laura J. V. Piddock¹

IMI Seminars and the revamped Forum



Rebecca Hall and Río Wood write about the IMI Forum – monthly seminars given by ECRs in MDS-IMI and Biosciences: ***'It's back! This year we are encouraging short talks from early stage PhD students, outlining the background to their projects and longer presentations from third/final year PhD students and postdocs. The first session was standing room only for two great talks from Alicja Szkolnik (Tsai lab) and Charles Cooper (Grainger lab) followed by Freya Allen (van Schaik lab) and Callum Clark (Geoghegan lab) at the next session. Join us for interesting science in a welcoming environment, snacks provided!'***

.....and Hung-ji Tsai (who coordinates the IMI seminar programme with Professor Joan Geoghegan) writes about the weekly IMI seminars: *'The IMI is an international research hub, drawing together amazing scientists from across the world to study microbiology and related fields. It's a place where scientists converge to share insights and the excitement of new discoveries. The IMI seminar programme and IMI forum are central to this.*

This year we have an amazing line-up of speakers, covering all aspects of microbial life. Nominations were received from the entire IMI community, including postgraduate students. Notably, the speaker selection process for the prestigious Harry Smith Memorial Lecture has been led entirely by the IMI early career researchers and we look forward to their nominee, Professor Tracy Palmer, delivering this lecture on February 20th 2024.

We have changed the format of the IMI forum for 2023/24. Early career researchers, particularly first/second-year PhD students and newly arrived postdocs, are encouraged to give short "data-free" talks to provoke discussion and collaboration. A brief social gathering with refreshments will be held either before or after each forum.

Please join us at 1pm every Tuesday, to immerse yourself in intriguing frontier science.