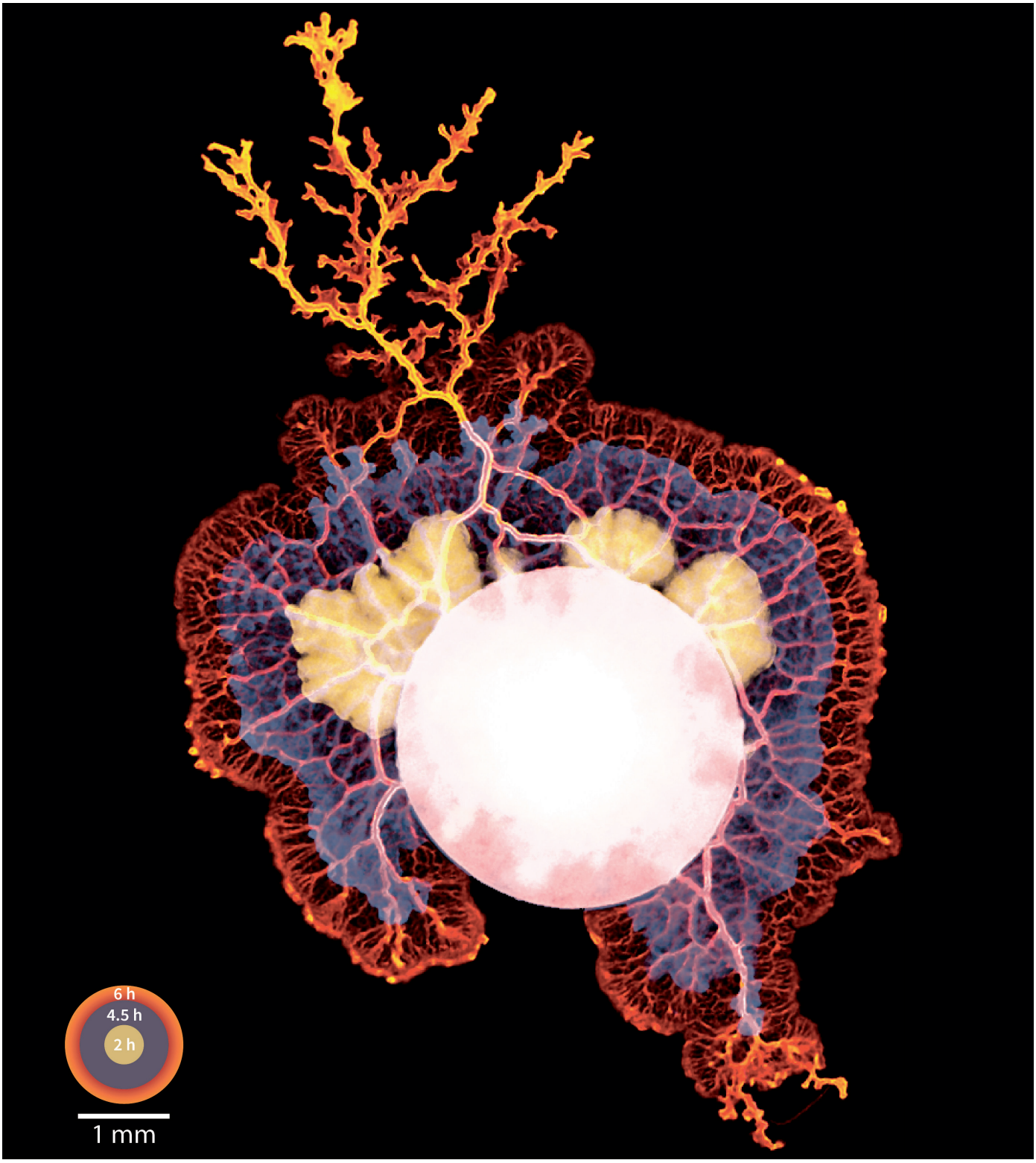
2023

BSCB Magazine

BRITISH SOCIETY FOR CELL BIOLOGY



BSCB

BIOCHEMICAL SOCIETY

BSCB British Society for Cell Biology

Dynamic Cell V

17-20th April 2023
Loughborough University, UK

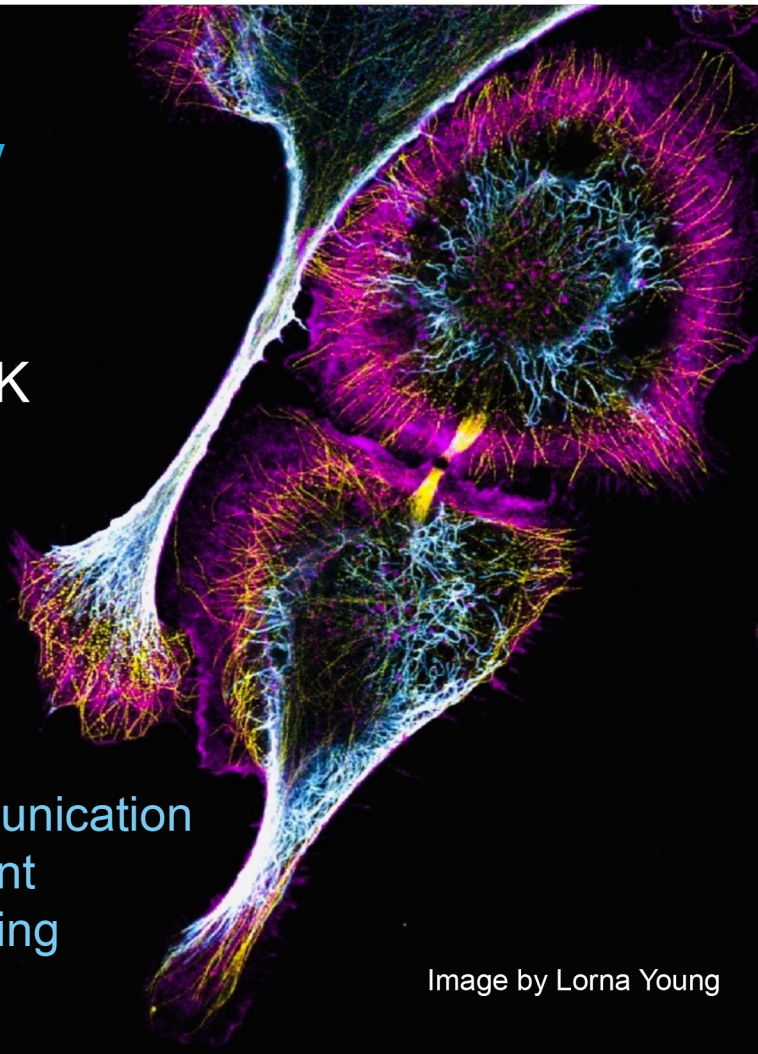


Image by Lorna Young

Topics:

- Organelle Dynamics
- Cell Proliferation and Homeostasis
- Cell Migration and Cell-Cell Communication
- Trafficking and Cellular Environment
- Cell Mechanics and Mechanosensing

Invited Speakers:

Patrick Caswell (UK)
Jow Chan (SG)
Andrew Ewald (USA)
Elif Nur Firat-Karalar (TR)
Johanna Ivaska (FI)
Mart Loog (EE)
Faraz Mardakheh (UK)
Kate Miroshnikova (USA)
Gabriel Neurohr (CH)
Matthieu Piel (FR)
Sara Sigismund (IT)
Hayley Sharpe (UK)

Organisers: Sophie Acton, Alexis Barr, Mike Deeds, Susana Godinho, Matthias Krause, Urszula MsClurg, Chris Toseland and Tobias Zech

Find out more at bit.ly/Dynamic-Cell-V

BSCB Magazine 2023

Editorial

As we write this editorial another year is approaching an end, as is the controversial 2022 World Cup. Once again, we are reminded of the frustration of supporting small nations in which football is not the major sport (Wales: 3 losses, one goal, one red card; Ireland: not even there..). We take solace in belonging to a cell biology community who may or may not enjoy football, but at least have conferences accessible to all, which we can attend more than once every 65 years.

This year's magazine highlights some of the activities of the UK/Ireland cell biology community over the last year and into the next. It's been a real privilege getting back in the swing of meeting colleagues, attending conferences and sharing ideas. The BSCB/BSDB meeting last April was a big highlight with record attendance and a great atmosphere (see the meeting report by Helen Zenner) and more generally, all of the other 1-day meetings have restarted. The BSCB helped a record number of people to secure travel grants to head to meetings at home and abroad, allowing junior colleagues to begin building their research networks. This is one of the massive bonuses of the BSCB and we strongly encourage members to avail of these opportunities. In 2023 the joint BSCB/Biochem Soc Dynamic Cell meeting is happening in Loughborough-these meetings are always outstanding, so we really hope you will all attend.

The magazine features articles on sustainability in science and the importance of visual design in graphical abstracts- both subjects in which we know we should do better. There are interviews with the winners of the Hooke medal (Jez Carlton) and WiCB award (Laura Greaves), images from the BSCB image competition and the winning entry to our science writing competition (Amy Stainthorp). We also have news on the state of teaching in UK schools and reviews of cell biology books.

The BSCB committee is a constantly evolving, many-legged organism; we bid farewell to Anne Ridley (our ex-President), David Elliot (Treasurer), Maria Balda (Summer Studentship Coordinator) and Rowan Taylor (PhD Student representative) who have all put in a great deal of effort to support the community and have been a pleasure to work with. We are delighted to welcome Laura Machesky (University of Cambridge- our new President), Daniel Booth (University of Nottingham), Simon Allison (University of Huddersfield), Natalie Signoret (University of York) and Emily Lucas (University of Southampton).

The BSCB is your society: if you have any ideas for the magazine, meetings, public outreach, science policy or if you would like to join the committee we would love to hear from you. A motivated society with exciting science at its core is as fun as a run to the quarter final at a major tournament (honestly…..).

Kind regards
Tom Nightingale and Ciaran Morrison

Front cover: Time series projection of the slime mould *Physarum polycephalum* (a.k.a. The Blob) colonising an agar plate. Actomyosin contractions allow this single, giant cell - containing thousands of nuclei sharing a single cytoplasm - to "expand" at centimetres per hour, making it large enough to be photographed using an iPhone 11. The image, by Felix Mikus at EMBL Heidelberg, won 1st Prize in the BSCB Imaging Competition 2022..

Magazine Editors: Ciaran Morrison and Tom Nightingale **Production:** Giles Newton, Deadlift Media **Printer:** Hobbs
BSCB website: www.bscb.org

Society News

BSCB President's Report 2022

This is my last report as President of the BSCB, which included a pandemic with the accompanying rapid adjustments to carrying out research and science communication. I am delighted to be handing over the presidency to Laura Machesky, who is in the process of moving from Glasgow to a position at the University of Cambridge. Many of you will know Laura as an eminent cell biologist, perhaps best known for her discovery of the Arp2/3 complex and impressive work on actin cytoskeletal dynamics. Laura has worked on many different aspects of cell biology, and I know she will serve the whole BSCB community well as BSCB President.

There have been many changes in the BSCB since I became President in April 2017. Our BSCB postdoc and PhD reps initiated new Medals for early career cell biologists: the Raff Medal for PhD students and the BSCB Postdoctoral Researcher Medal. On the committee, we have our first BSCB Science Advocacy Officer, Jenny Rohn, who set up a policy email list of BSCB members interested in contributing to policy consultations. If you are interested in working on science policy relating to cell biology, please do contact Jenny. In addition, we appointed our first Irish Area Representative, Ciaran Morrison, who promotes the BSCB and its work in Ireland. We also started recruiting BSCB committee members from the whole BSCB membership through annual calls, which have been very successful in broadening our committee membership.

With the COVID pandemic in 2020 and 2021, we sadly had to cancel our annual meeting scheduled with the French Society of Cell Biology in 2020, but ran our first ever online conference, Dynamic Cell IV, with the Biochemical Society in Spring 2021. This was a great success, with a very interactive virtual environment for talks and Q&As, and with excellent poster sessions and poster viewing. What was also very impressive was the versatility of our members during the pandemic, with many of them providing their expertise by shifting rapidly to COVID research.

Our 2022 BSCB/BSDB Joint Spring Meeting was one of the first large conferences in the UK that were back to in person. It was wonderful to see so many BSCB members there, who were clearly delighted to see each other after two years of multiple lockdowns and restrictions. The talks and poster sessions were buzzing with the excitement of having in person scientific discussions. It was fortunate we had the possibility for speakers to present online, however, because two were not able to make it because of COVID-related reasons: we have learnt a lot in 12 months of testing different online software for conferences and meetings.

Finally, I would like to thank everyone in the BSCB for supporting me during my time as BSCB President. This includes all the BSCB committee members, past and present, who have devoted their time to many different aspects of the society and been a fantastic group of people to work with. I am particularly grateful to David Elliott, who was Treasurer for nearly all of my Presidency, and the two amazing BSCB Secretaries, Vas Ponnambalam and Carine de Marcos. In addition, I have enjoyed meeting so many BSCB members at our Spring Meetings and the annual BSCB-sponsored Actin Meeting. It has been a pleasure to award our Medals each year to outstanding scientists, from PhD students to the Hooke Medal for mid-career researchers. I look forward to seeing you all at future BSCB meetings.

Anne Ridley
BSCB President

Meetings Calendar 2023–24

Dynamic Cell V: Joint BSCB and Biochemical Society Meeting
17–20 April 2023. Loughborough University
BSCB meeting

UK Microtubule Meeting
12 May 2023. University of Edinburgh

Journal of Cell Science meeting: Imaging Cell Dynamics
14–17 May 2023. Lisbon, Portugal
www.biologists.com/meetings/celldynamics2023/

UK actin meeting-
December 2023

UK trafficking meeting-
December 2023

Check the BSCB website for information about conferences and on how to apply for funding for 1-day meetings:
bscb.org/meetings/bscb-meetings/
bscb.org/meetings/sponsored-meetings/

Dynamic Cell V – BSCB/Biochemical Society Joint Spring Meeting. 17–20 April 2023, Loughborough University

We are excited to be co-organising Dynamic Cell V with our Biochemical Society colleagues this year.

Taking place every two years, the Dynamic Cell meeting series was first launched in 2014 by Stephen Royle, Ulrike Gruneberg, Jez Carlton and James Wakefield. Since then, the Dynamic Cell conferences have provided a superb forum to unite scientists with a passion for cell biology that otherwise may not get the opportunity to interact in more specialised, field-specific meetings. We all know that the magic happens in those spaces between fields when scientists studying different organisms, using distinct technologies and working in divergent (but often more interrelated than you think…) specialisms are brought together and inspired by meeting new people.

In our 2023 meeting, we have a host of invited national and international world class cell biologists coming to join us. Our keynote speaker is the fantastic Johanna Ivaska who will talk about the excellent work their lab does in understanding how cells interpret their environment. Our invited speakers will cover topics from cell mechanics and mechanosensing, organelle dynamics, homeostasis, cell migration and cell-cell communication, cell division and proliferation and trafficking and the cellular environment. Crucially, the majority of speaker slots have been reserved for early career scientists which will be selected from submitted abstracts.. The wonderfully interactive poster sessions provide opportunities to discuss your work with specialists both within your field and in other fields. And if these opportunities aren't enough, there are dedicated ECR-lead workshops and shared dinners all in one campus, giving ample time and space to meet new people.

This meeting will also see the award of several medals across both societies. The Biochemical Society will see the award of their ECR Award to Hendrik Messal, the Excellence in Science Award to Jordan Raff and their International Award to Antonina Roll-Mecak. The BSCB are a little more secretive on their award winners but will be awarding their PhD Raff and Postdoc medals, the Hooke medal and their Women in Cell Biology medal. All promise to be excellent talks.

If you are worried about whether you can afford the meeting – fear not! Apply for our Honor Fell travel awards from the Company of Biologists that will cover registration and accommodation costs for BSCB members. Check here how to apply: https://bscb.org/competitions-awardsgrants/travel-bursaries/honor-fell-company-of-biologists-travel-awards/

We're really looking forward to welcoming you to Loughborough!

Alexis Barr and Tobias Zech

Book review

Principles of Cell Biology

Plopper, George and Ivankovic, Diana Bebek. 3rd edition 2021 p/b.. Jones & Bartlett Learning. Burlington USA

Since I reviewed the 1st edition of this book cell biology has advanced greatly; so has this very attractive volume which now has a second author. The book has 744 pages as against the 510 of the 1st edition. The 14 chapters, also called Principles, are now written in a declarative style with the main text written in a pleasant student-reader narrative.

The book is well illustrated with many of the graphics drawn and annotated as a teaching aid rather than as plain illustrations. I liked this 'teaching and learning book' and the authors are learners too. Following comments from users they have made many changes including for example, adding a 'Case Study' to each chapter and 'Applied Cell Biology' callout boxes where applicable. Suggested search terms are also given to help guide students when searching the World Wide Web.

If available, use of the 'access code' will enable students to access a range of other facilities including the ebook version, animations and Study Aids. For lecturers Teaching Tools are available including PowerPoint slides and a Test Bank.

If you are looking for a text book for teaching, then this volume is certainly worth considering.

David Archer

Interview with the new BSCB President: Laura Machesky

Could you give a brief summary of your research interests and background, how did you become a cell biologist?
I started my cell biology career working on amoebas (*Acanthamoeba castallanii*), which were great for biochemistry and pretty good for cell biology, but not genetically tractable at the time. I was a postdoctoral fellow in Cambridge working on *Dictyostelium* when I heard Alan Hall speak about Rho GTPases at a meeting and I knew that I wanted to join this field. Rho GTPases had begun to provide long awaited connections between cytoskeletal dynamics and cell motility. I worked with Alan for four years before starting my independent group in Birmingham in 1999. I became fascinated by how cells could adapt their actin cytoskeletons to perform essential activities such as migration, cancer cell invasion, phagocytosis and macropinocytosis. A visit to Glasgow to attend a CRUK Beatson conference convinced me that this would be a fantastic place to develop my growing interest in cancer invasion and metastasis. I have spent 15 wonderful years there, enjoying the highly collaborative and excellent scientific environment and learning about the complexities of cancer and the challenges for developing new therapies. Now, I am ready for the next adventure as the Sir William Dunn Chair of Biochemistry at the University of Cambridge. I am very excited to join the vibrant community in Cambridge and to expand the interdisciplinary side of my research further.

What motivated you to accept the role of BSCB president (aside from having your arm twisted!)?
BSCB has been an important part of my career and enjoyment of being a part of the scientific community in Britain since arriving here from the US in 1993. I have benefitted from attending BSCB meetings, where I met many colleagues and from having summer students funded by BSCB student grants. I was honoured to be asked to stand for president and for the chance to give back to the BSCB. I think that now is a crucial time to champion cell biology and to make sure that the next generation of cell biologists are supported. BSCB provides an excellent framework for that support and a sense of community that we all need to thrive.

What would you like the society to achieve over your period as president?
The BSCB is a great community and I hope that I can build on the hard work of Anne Ridley and all of the committee members to make sure that British cell biology is well-supported- including students and early career scientists. I would like to form strong links with European and other international cell biology societies and to keep the cell biology community in Britain strong and well connected. I think it will be especially important to engage with society members to find out what they want the society to be and what they care about going forward- e.g. should we be focussing on sustainability, careers, cross-disciplinary science?

What are the main challenges facing cell biologists (and scientists in general) at the moment is there anything we can do as community to help?
One of the main challenges is recovery from the Covid19 pandemic. It has disproportionately hurt early career scientists, people with caring responsibilities and people at crucial stages of their career progression. It will be important for funding agencies and employers to account for these issues, but this is difficult to do properly. Another challenge will be to reassure people that they shouldn't give up on a career in science because of the hardships of the past few years. We all need to regain our mojo and our excitement about science. The current challenging times make it more difficult to feel optimistic, but this is a time of great opportunities for cell biologists, with high potential for crossover with other fields and exciting breakthroughs.

Do you have a favourite scientist or role model that helped you shape your research career?
My PhD supervisor, Tom Pollard (Yale University, USA), has been an inspiring figure in my career since the very beginning. He always had a super positive attitude and no hurdle was too big or daunting for him in science or life. He had a great capacity to motivate us in the lab and to create a fun environment where we worked as a team and enjoyed doing science together as well as being individuals who were encouraged to follow our curiosity.

Are there any topics or techniques which you think are particularly exciting at the moment and if so why?
I think it is an especially exciting time for cross-disciplinary research, such as biophysics, mathematical and computational biology and biomedical science. I think that cell biology has a huge amount to contribute to these areas, as the fundamental unit of life is the cell, after all. Masses of data are being generated, but we don't always understand what it really means for the cells and the mechanisms behind the various pathways or programmes we are studying. Careful reductionist cell biology, in the context of the environment or the organism can be very powerful.

Finally, could you give an interesting fact about yourself that you wouldn't perhaps know from your cv.
I am in the first generation in my family to go to university. I grew up in the suburbs of Detroit, Michigan and moved to Britain for my first postdoctoral fellowship. I had planned to stay for 2 years, but I ended up loving the science and the lifestyle here and making Britain my home.

Interview with 2022 Hooke medal winner Jeremy Carlton

Jeremy Carlton studied Natural Sciences at Cambridge University and then joined the lab of Pete Cullen for his PhD at the University of Bristol to work on membrane trafficking pathways regulated by the phosphoinositide-binding family of sorting nexins.

He then moved to Juan Martin-Serrano's lab for a postdoc at the Department of Infectious Diseases at King's College London as a Beit Memorial Research Fellow. There, while setting out to study how the ESCRT machinery is hijacked by HIV-1 during viral budding, he discovered a key role for ESCRT proteins in the final stage of cell division. Jeremy set up his independent research group in 2012 at the Division of Cancer Studies, King's College London, as a Wellcome Trust Research Career Development Fellow. He is now a Wellcome Trust Senior Research Fellow and his lab, currently seconded to the Francis Crick Institute, investigates membrane and organelle remodelling during cell division.

We have previously interviewed Jeremy (doi:10.1242/jcs.242982) in this series and now caught up with him again after he was awarded the **Hooke Medal** by the British Society for Cell Biology (BSCB).

Congratulations on winning the Hooke medal! How do you feel about receiving this prize?

I'm very surprised and super grateful! When I got the email that they had chosen me for the medal, I was completely shocked and couldn't believe that my name will be on the list after all those other worthy recipients. The BSCB is an incredibly relevant society for me and is run by amazing scientists that I like and respect, so receiving an accolade from them is a real privilege.

You told me that when you got the email about winning the award, you were in the middle of running a Science Museum Lates event on CRISPR. Is public engagement something you enjoy, and why do you think it's important?

I do really enjoy public outreach, whether it's for school kids, adults, or anyone else. It's incredibly fun to present to a crowd that is almost entirely non-critical (very rarely is there a 'reviewer three' in the audience) and speak to them about something they haven't thought about before, or get their minds working in a different way. When talking to school kids, you can easily build on what they've learnt already, show them some new findings or technologies, and normalize being a scientist. I think people always need role models to validate their choices, so if we can go out there and be relatively 'normal' in a researcher role, and tell students that it's possible for them to become scientists, that can have an important impact – and I'm always very happy to help support, engage and encourage people into this career.

And from your Hooke-medal talk at the BSDB/BSCB meeting it is obvious that you continue to encourage PhD students and postdocs to follow their curiosity and passion.

When I was preparing my talk, I tried to reflect on what I've really enjoyed about my career as a scientist so far. I don't think there's any other walk of life where you have such freedom to follow your curiosity and make new discoveries; in my lecture, I talked about how thrilling was the feeling of discovering that cells failed cytokinesis when ESCRTs are depleted. I also strongly believe that if you follow your curiosity, everything in science becomes fun and rewarding.

In a previous interview with us, you mentioned that before discovering that ESCRTs play a role in cell division, you were absolutely desperate to become an HIV biologist. It seems that the COVID pandemic gave you a reason to work on a virus again

That's right! When I started at the Crick, seeing the HIV biologists on the floor above did make me think that I'd

quite like to do some virology again (smiles). I really love cell biology, and think that the way pathogens exploit cell biological processes is amazing – studying pathogens is a great way to understand how cells work. When it became apparent that something was brewing at the very beginning of 2020, many questions started ticking over in my head about the cell biology of SARS-CoV-2. I was excited to see how a part of the scientific community under lockdown pivoted their research and started contributing to the COVID research effort; it was also a great opportunity for us to get involved and try to apply a little bit of our expertise to researching the virus. We started working on some of the less-studied SARS-CoV-2 membrane proteins to understand how they localise and what their function is, and began looking at the envelope protein of SARS-CoV-2. It's been a really enjoyable project and a great learning experience about the scientific process – we knew nothing at the start and nearly all of our hypotheses so far have turned out to be wrong! But we're following the data and are happy to have made some cool findings about how this protein moves through the cell, oligomerises and might help deacidify lysosomes – we ought to write this up soon!

You've put a SARS-CoV-2-related study and other works from your lab on bioRxiv; do you post all of your studies as preprints?

Yes, I think it's a no-brainer to put your work on bioRxiv and would like to encourage everyone to do so. It's just so powerful for sharing findings and demonstrating progress. I can remember being terrified the first time we put something out; we were in a trio of co-submissions with Patrick Lusk and Adam Frost, and back in 2016, Adam was very good at persuading us that this was a good thing to do. It's been useful for me to be able to put preprints into grant applications and progression applications at universities. I think that people often worry that they won't be seen by committees as valid, but I haven't had that experience. Preprints have also really advanced how quickly we can do science – just the other day I saw someone tweet about their preprint and I asked for some of the plasmids they used, which they've sent to me already.

What are the scientific questions that currently keep you up at night?

The simple truth is that nothing keeps me up at night; I've somehow managed to compartmentalise my thoughts and can very easily switch off and sleep well! But what stops me from going to bed is when we find something new that we've never seen or understood before – then I can stay up planning experiments and figures for hypothetical papers late into the night.

Could you tell us about the citizen science project 'Etch-A-Cell' that you are involved in and describe how it helps your volume EM projects?

Although we do science every day, there are many people outside of our immediate sphere who would love to participate in scientific experiments, but don't have a route to do so. There's a wonderful Citizen Science platform called Zooniverse (https://www.zooniverse.org/), where members of the public can engage with academic work from research labs across the world. For us, the revolution in electron microscopy (EM) has allowed us to move away from two-dimensional images to high-resolution, volumetric images. To analyse these complex datasets, you first need to delineate the membranes and organelles from the background in a process called segmentation. This is still largely a manual process and a real bottleneck in any type of volumetric EM. Lucy Collinson (Crick EM-STP Head) and Helen Spiers (Zooniverse Biomedical Research Lead) had previously created a citizen science project that allowed the public to participate in the manual segmentation of the nuclear envelope. We are now working with Helen, Lucy, the Zooniverse platform and Crick's Scientific Computing Team to allow the public to segment other organelles and will use these segmentations to train machine learning algorithms to segment raw data de novo. Therefore, it's entirely due to the public's work that we're able to perform these automatic segmentations and form new hypotheses from our volume EM data.

You've now led a lab for 10 years. How would you compare the experience of being an early-career PI with doing research as a mid-career group leader?

When you're just starting out, I think it's important that you demonstrate you can use your funding sensibly and make discoveries you can build on in future career stages. So, in the first five years of my lab, after a few false starts, we developed a very strong focus on a specific question – the reformation of the nuclear envelope during cell division – and were lucky to get some good papers out of it. I was very aware that if we weren't successful early on, the long-term prospects of maintaining a lab were not looking great for me. Now that I've transitioned from an intermediate fellowship to a senior fellowship, it's been really nice to be able to diversify my research portfolio and get engaged in a broader range of projects. So, as well as understanding organelle dynamics during division, we're now looking at immune and cancer cell migration and membrane and organelle dynamics during neurodegeneration. These are all connected by the membrane biology theme – although we're sometimes a bit agnostic to the actual question as long as we can keep doing exciting things! Another advantage of being more senior is that I can focus more on helping the career development of people in the lab, whether they plan to stay in science or leave for something else – I would have found that hard in the first years as I was too terrified about taking my foot off the gas.

And what are the main advantages and drawbacks of running a lab as a fellow?

I started my independent career as a Career Development Fellow and will hold a Senior Fellowship until 2028 – so I'll have been on the fellow 'side' in academia for quite a while. In the UK, these schemes pay your salary and give you a generous budget for research that lets you recruit staff and hit the ground running. This was absolutely transformative for me, the five-year period of support gives you time to work up stories without needing to reapply for more funding. These fellowships are also investments in people, rather than projects, and I think (hope?) they give you some freedom to make mistakes. But fellowships also come with their own challenges – their time-limited nature and absence of institutional underwriting bring a lot of precarity, and transitioning to something more secure is not always easy. In the UK, we have several different fellowship schemes from many different funders, but at the same time there don't seem to be many faculty appointments generated. One of the things some universities, such as King's College London, have done in the past few years is set up tenure track programs for fellows, which

can really help ease this uncertainty, especially since many of the senior schemes that enable you to continue running your lab as a fellow no longer exist.

How much do you need to teach as a fellow, and do you enjoy teaching?

I actually really enjoy the teaching and I do quite a bit. I know there are conflicting ideas around this, including the argument that if you pay your salary through a research fellowship then that obviates you from teaching responsibilities. I think that teaching is an important part of the job for university academics, so I've always been of the opinion that if you want to be treated as a full member of academic staff, then you should contribute to teaching and administrative duties too. I also think that as a fellow, you might save the university your direct costs, but you're still benefiting from the indirect costs of the environment, facilities and infrastructure that make up a functional department. Therefore, I've always tried to contribute broadly and maintained teaching throughout my fellowships. Teaching can also be really great – it's fabulous seeing students you've taught over previous years progress through the system and get onto PhD programmes now, and I really hope they go on to do cool science. I've also experienced how teaching can influence your research; our recent paper on CDK1-mediated control of ESCRTs was something new for us, so teaching undergraduate lectures on the cell cycle really made me learn the biology of it properly for the first time!

Throughout the pandemic, what has been your experience with using remote tools for meetings and teaching?

I've been amazed at how well management and administrative meetings have run on these online platforms. They've been a massive time saver for me, as I don't need to hop on a train to travel to King's in the middle of the day and I think we've all discovered that some degree of multitasking is possible in these meetings! I think they work less well for scientific meetings, and I've definitely missed travelling to in-person conferences as I think you get much more out of them in person, including making new connections and meeting old friends. I'm not sure that we've found a way to replicate that online, but I do recognise that this format makes attendance more accessible for delegates and speakers alike. Regarding teaching, we are now transitioning back to in-person delivery, which I enjoy a lot more than talking to a screen of Microsoft Teams pastel discs, and I think the students will also benefit a lot and be more engaged.

Finally, what do you do in your free time?

I love cycling, but as life got busier, I found less and less time to ride. Then, during the lockdowns, it was a bit of a revelation that instead of taking the train, I could commute by bike – which I've tried to keep doing every day.

Jeremy Carlton's contact details: King's College London, The Division of Cancer Studies, New Hunt's House, Guy's Hospital, London, SE1 1UL and The Francis Crick Institute, 1 Midland Road, London, NW1 1AT, UK.
E-mail: jeremy.carlton@crick.ac.uk

Jeremy Carlton was interviewed by Máté Pálfy, Features & Reviews Editor at Journal of Cell Science. This piece has been edited and condensed with approval from the interviewee.

Cell scientist to watch – Laura Greaves

Laura Greaves studied pharmacology at Newcastle University, UK, where she also obtained her PhD in the lab of Douglas Turnbull for her work on the role of mitochondrial DNA (mtDNA) mutations in the ageing human colonic epithelium. During her postdoc with Douglas Turnbull and John Mathers, funded by the Food Standards Agency, UK, she showed that clonal expansion of mtDNA point mutations drives mitochondrial dysfunction during human ageing.

With MRC funding for the Lifelong Health and Wellbeing Centre for Ageing and Vitality programme as well as a Newcastle University Research Fellowship, she established her independent research group in 2016 at the Wellcome Trust Centre for Mitochondrial Research, Newcastle. Her lab uses genetic mouse models and intestinal organoids to investigate the functional consequences of mtDNA mutations on cellular metabolism and colorectal cancer development.

Laura is the winner of the **2022 Women in Cell Biology Early Career Medal** awarded by the British Society for Cell Biology.

What inspired you to become a scientist?

I'm not one of those people who always knew they wanted to be a scientist. I liked maths and science at school, and was interested in how things work, so when it came to applying to universities I looked through the various science courses that were available; I ended up choosing pharmacology at Newcastle, because it brought together science with drugs and diseases, which were a bit more tangible to me. Back then, I thought that universities were mainly focussed on teaching; this changed during my third year when I did an undergraduate research project, which I absolutely loved, as it opened my eyes to how much research actually goes on at the university. That project was a turning point and it's then that I decided that research is what I wanted to do.

And how did you end up studying mitochondrial mutations in ageing, a topic you've been working on since your PhD?

I wanted to stay in Newcastle, as it's where I grew up and I have strong family ties here, so coming to the end of my degree I met with numerous supervisors who were accepting PhD students to talk about potential projects. I decided to take on a project, supervised by Professor Doug Turnbull and Professor Tom Kirkwood, which was about studying the role of mitochondrial DNA (mtDNA) mutations in neuronal stem cell aging. However, when I got to the department, they had just received a piece of colon and told me that before I start on my project I should have a look at mitochondrial function in the colonic epithelium. I did that, and it turned out that I never went anywhere near a neuron during my PhD or career! Working on the ageing colon also meant that I had my research niche carved out at that point, as it was quite different to what others in the department were working on. So, I had to learn quite quickly to stand on my own two feet.

What are the main questions your lab is trying to answer just now?

We're trying to understand how mtDNA mutations in colorectal cancers can change the metabolism of the tumour. We see that a high proportion of colorectal cancers have a wide spectrum of mtDNA mutations, and each of them can have different effects on mitochondrial metabolism. One of the questions we're trying to answer is whether specific defects in mitochondrial oxidative phosphorylation sensitize or cause resistance to particular drugs or therapies. Ultimately, we'd like to be able to find the best treatment for an individual person or tumour, but before we

get there, we need to understand at the molecular level what different mutations are actually doing to the tumours and how we might exploit them.

Which technologies have had the biggest impact on your research?

For a long time, one of the biggest stumbling blocks in mitochondrial research was the fact that it was really difficult to manipulate the mitochondrial genome, directly or indirectly. Then in 2004, the mitochondrial mutator mouse was developed, which has a mutation in the proofreading domain of the mitochondrial DNA polymerase – so every time the mtDNA replicates, there is a very high chance of a mutation being introduced. I've used this model in a number of studies, combined with other mouse models, to look at the effect of mtDNA mutations on intestinal tumour development or intestinal stem cell proliferation. More recently, new technologies such as mtDNA base editors have emerged, which allow us to directly and specifically manipulate mtDNA – and I think this will make a huge difference in the field! Then from the perspective of studying the intestine, the development of intestinal organoids by the group of Hans Clevers has really revolutionized the field and allowed us to carry out the kind of drug testing we are doing.

Looking back at the time you started your own group, what were the main challenges you faced?

I think a big challenge in the transition from postdoc to PI is going from being responsible for yourself to being responsible for a whole group and having to get those grants to be able to keep people in a job – which is a lot of pressure. Also, it's difficult as a new group leader to suddenly have to do all sorts of things that you haven't necessarily been trained for – be it budget management, people management or sorting out all the paperwork for doing experiments. Having an already well-established network at the institute did help me when starting my group.

Could you elaborate a bit on the main advantages of staying at the same research institute for a long time? And on the flip side, what challenges did that come with?

One massive benefit of having been in the same place is that I know a lot of people on a personal level – including the admin staff, technical staff, animal house staff, catering staff and cleaning staff. This has really been useful if I was struggling with something and needed to ask for help. In general, I feel that The Wellcome Centre for Mitochondrial Research is a massively supportive environment. Everyone has the same core interests in mitochondrial DNA mutations and mitochondrial biology, but each group has their unique focus – whether that's neurodegenerative disease, ageing, cancer or primary mitochondrial diseases – so rather than competing against each other, people are hugely collaborative. It's also brilliant to have world-renowned experts on your doorstep who you can discuss any interesting or weird result with. Conversely, one of the main challenges I faced due to not moving to other places was convincing people that I was independent and that the research ideas were mine. Doug Turnbull, our head of the department, would be the first person to tell anyone 'this is Laura's research', but it was still difficult to assert my independence, and to have that recognised by people outside of the department. Since I've started to work more on ageing and then moved on to the cancer field, this has been less of an issue, at least externally. One of the things I really had to do was find my own collaborators and develop my independent network, both internationally and in the UK. Professor Owen Sansom, who is the Director of the Cancer Research UK Beatson Institute, has been a hugely generous collaborator and a really great mentor with whom I discussed various things about my career.

What advice would you give someone seeking independence?

I think it's key to have a really good project that you deeply care about and are passionate about.
Another important thing, as I mentioned, is to find good mentors and talk to people; if you're someone who wants to move institutions, talk to the PhD students and technicians working there, as that will give you an idea of how the lab or the institute operates on a day-to-day basis.

Tell us one thing you'd like to see change in academia

I feel that one of the things that people can fall in the trap of is not realizing that everyone has an important role and

is equally valuable, be that a researcher, clinician, student, technician or professional support staff. No research group is going to run without everybody's contribution, and I think this has often been overlooked in academia. But I'm hoping that with the advent of different incentives to promote a positive research culture, this will change, and emphasizing the value of each person is something I'm trying to really push within my own research group.

Is there any piece of advice that you found particularly helpful during your career?

Something that Doug used to tell me a lot is to focus on myself, do my best and forget what everyone else is doing. A lot of people in science, particularly in academia, really struggle with imposter syndrome, myself included. It's easy to get yourself into a situation where you compare yourself to others, but this can actually be quite destructive.

You are this year's WICB Early Career Medal Winner. What does this prize mean to you?

Obviously, I was delighted and really honoured to receive the prize. And looking at some of the past winners, I was also very surprised about how on earth they selected me – you see, my imposter syndrome really shows! Of course, in science, no prize is really for an individual, and without all the amazing people I work with on a daily basis nothing what I've done would have been possible. So, the prize is not really for me, it's for all of us!

What kind of policies do you think are needed to get more women into leadership positions in science?

Although things are starting to slowly change for the better, when you compare the proportion of female PhD students and postdocs with those in leadership positions, there is still a massive imbalance. And I think part of the solution is giving women support when they're at the postdoc level and promoting flexible working policies and work–life balance. I think we need to allow people to work their own way, because as long as we pull together and are successful, it doesn't matter when people do their job – for example, if they need to leave early and then can catch up on work during the evening, that should be totally okay.

How do you achieve work–life balance as a parent?

Don't get me wrong, it is tricky. But when you have children, your priorities do change and you also learn to delegate – which I've found quite easy because I have fantastic people in my lab who I really trust. I think I've also become much more efficient in getting things done at work, so I do try to keep work and home life quite separate.

Finally, could you tell us an interesting fact about yourself that people wouldn't know by looking at your CV?

I ran the Yorkshire marathon last October – which was the first and probably last time I did a marathon. I trained really hard for it and tried to get a specific time which I then missed by 23 s, so I obviously beat myself up about it for the next 6 months (smiles).

Laura Greaves's contact details: Wellcome Centre for Mitochondrial Research, Newcastle University Centre for Cancer Biosciences Institute, Newcastle Upon Tyne, NE2 4HH. E-mail: laura.greaves@newcastle.ac.uk

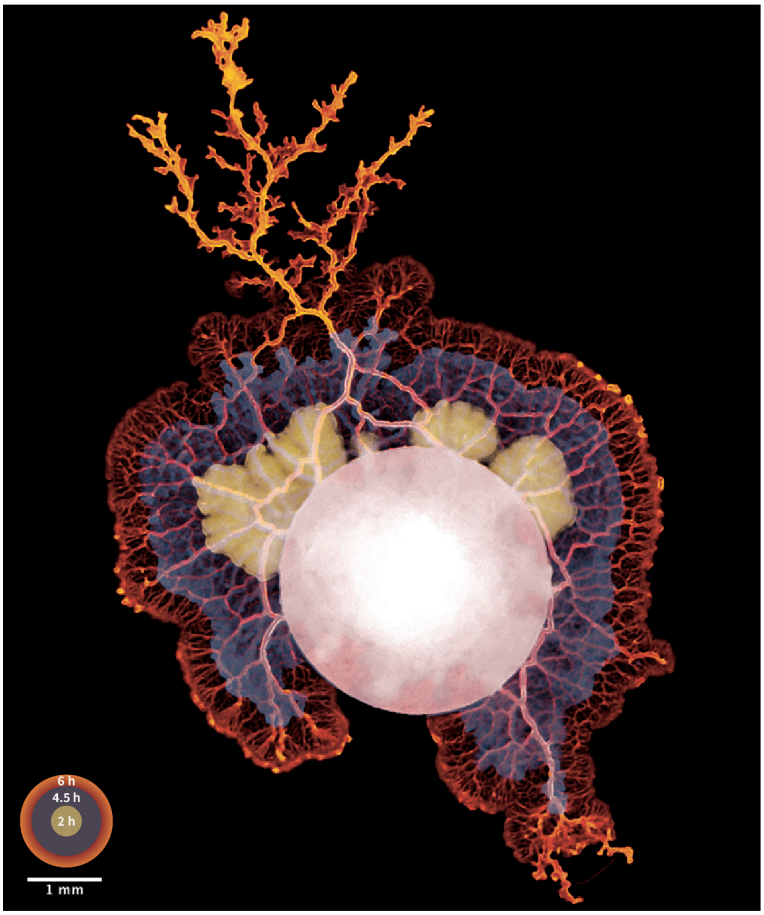
Laura Greaves was interviewed by Máté Pálfy, Features & Reviews Editor at Journal of Cell Science. This piece has been edited and condensed with approval from the interviewee.

Image Competition 2022

1st prize: Felix Mikus
EMBL Heidelberg

Time series projection of the slime mould *Physarum polycephalum* (a.k.a. The Blob) colonising an agar plate. Actomyosin contractions allow this single, giant cell - containing thousands of nuclei sharing a single cytoplasm - to "expand" at centimetres per hour, making it large enough to be photographed using an iPhone 11.

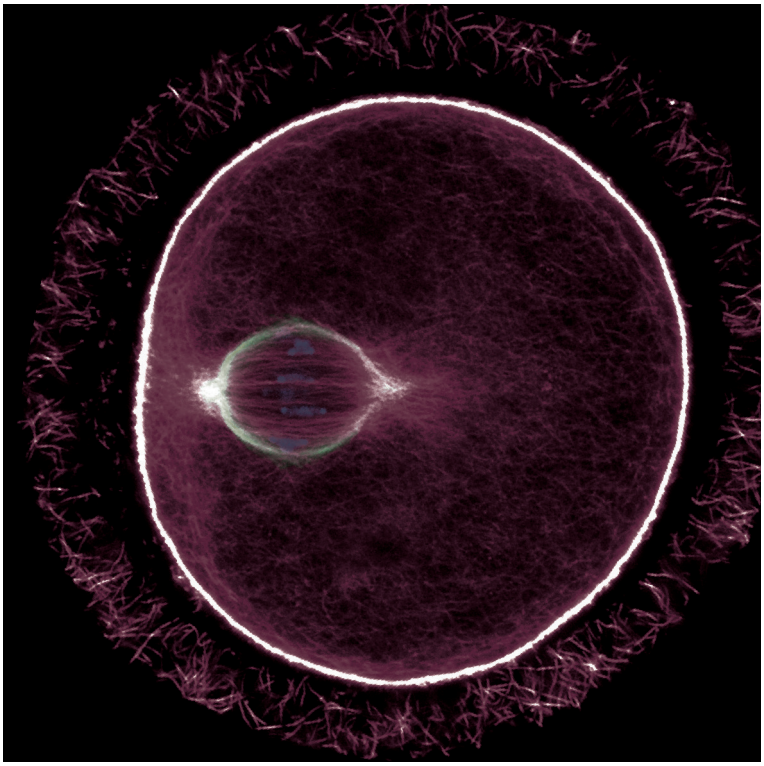
"I obtained my Master's degree in molecular and cellular biology from the University of Heidelberg. For my thesis project I worked with Freddy Frischknecht and Ross Douglas (now at University of Giessen) on the fascinating cell biology of *Plasmodium* gametogenesis, which really helped shape my future research. In the autumn of 2020 I started my PhD at EMBL Heidelberg in the group of Gautam Dey, that studies the cell biology of the nucleus in an evolutionary context. Using the fission yeast *Schizosaccharomyces pombe* as the model organism of choice, my project focuses on the homeostasis of nuclear pore complexes (NPCs) and how their remodelling might regulate nuclear envelope breakdown. *S. pombe* divides its genome within an intact nuclear envelope, with breakdown only occurring in a narrowly defined zone, and we are investigating the hypothesis that this particular region is also utilised to remove old or damaged proteins in a process regulated by the NPC basket."



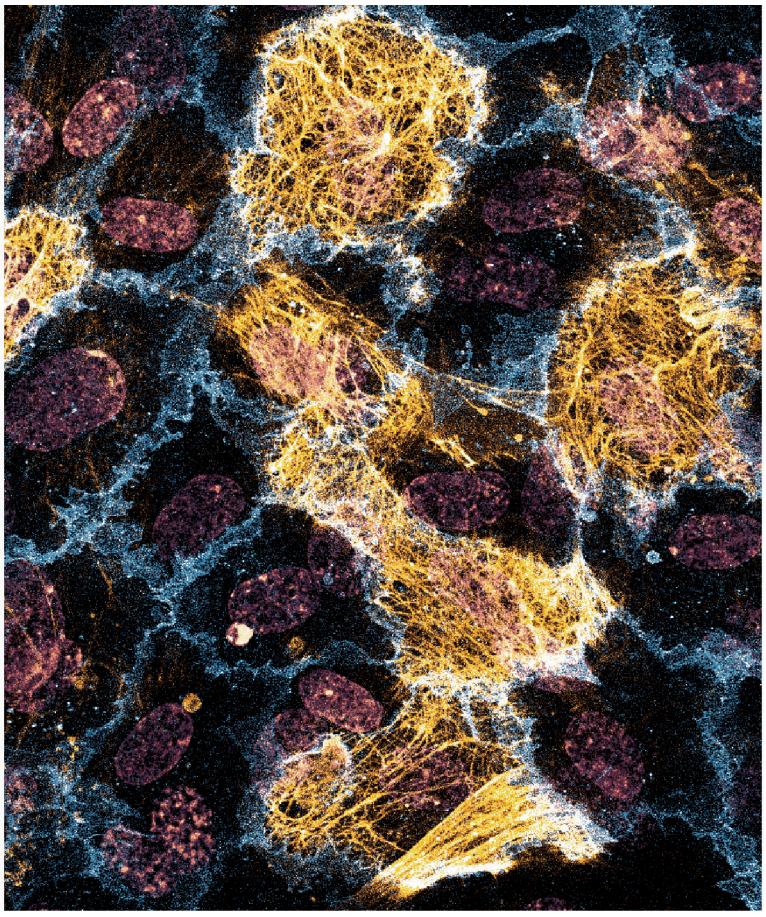
2nd prize: Sam Dunkley
University of Bristol

Single slice Airyscan image of a C57Bl/6 mouse oocyte arrested at metaphase-I of Meiosis. Actin filaments can be seen permeating the microtubule-based spindle. Chromosome labelled with Hoechst (blue), the microtubule spindle by tubulin (green) and actin with phalloidin (magenta). The image was taken using a Zeiss LSM 800 with Airyscan.

"I am a fourth year Dynamic Molecular Cell Biology PhD student at the University of Bristol. I completed my undergraduate BSc at the University of Bristol, before undertaking a masters by research at the University of Oxford. Our lab works to unravel the molecular mechanisms at play throughout female meiosis and therefore understand the perturbations that leads to chromosome segregation abnormalities. We employ gain/loss of function assays in combination with high resolution live-imaging at different stages of meiosis. My research investigates the emerging role of the actin cytoskeleton in this fascinating process."



3rd prize: Tom Mitchell
Queen Mary University London



Proximity labelling is a powerful tool to investigate protein trafficking. In these HUVECs a fusion protein of neuropilin-1 and HRP biotinylated proteins within a 20 nm radius (streptavidin, gold). This reveals a highly striated pattern of bounded by, and overlapping the cell junctions (PECAM-1, blue). Nuclei visualised via DAPI (Purple).

"I studied Pharmacology as an undergraduate in King's College London and had a particular interest in cardiovascular pharmacology. This led (after a period working in scientific publishing) to me applying for a cardiovascular-focused Masters's and PhD programme at Queen Mary University of London. My PhD studies, in Tom Nightingale's Lab, were focused on endothelial biology and I am continuing this project as a postdoc there. This research utilises a novel labelling technique to identify if changes in the trafficking of key proteins can lead to major alterations in endothelial cell function – most particularly in blood vessel growth."

Science Writing Prize Winner 2022 – Amy Stainthorp

In Search of the Holy Grail

Amy Stainthorp is a post-doctoral researcher using 3D cell systems to study Barrett's oesophagus at the University of Leeds. She works in Professor John Ladbury's group as part of the Leeds Centre for Disease Models. She recently completed her PhD investigating the regulation of microRNA expression at the University of Leeds.

Would you choose to live forever? And, more importantly, can you? The quest to slow ageing is possibly the oldest pursuit in medical research, with ancient societies trialling remedies such as alchemy, curative waters and drinking gold (which was of course toxic). For good reason, the question of whether we can create an elixir of life has been a controversial one in the scientific community. Anti-ageing medications have been brought to market without evidence that they work in humans[1], and other treatments have caused lab animals to grow 'teratomas' (terrifying cancers which can contain teeth, hair and bone; google if you feel brave…). While many medical organisations still do not recognise anti-ageing medicine, a growing number of scientists (and billionaires) believe we may be mere years away from the development of a pill to treat ageing.

But what does 'anti-ageing' actually mean?

Without a doubt, advances in medicine and public heath have radically improved life expectancy. However, this quality of life is poor, with 74% of people globally dying from diseases of ageing, such as cancer, cardiovascular disease and dementia[2]. Thus, the focus of anti-ageing research is not to increase lifespan, but instead 'healthspan'. The 'geroscience hypothesis' proposes that by treating the physiological signs of ageing we will consequently cure related diseases. Simultaneously, we may also curb cosmetic features associated with getting older, which is a nice little bonus.

Various mechanisms in cell biology contribute to the 'hallmarks of ageing'[3]. Firstly, throughout our lives our cells are constantly dividing. While this keeps us alive, replicating cells accumulate mutations in their DNA; the longer we live, the more our cells must divide and the more genetic mutations we accrue. These mutations disrupt the normal functioning of our cells and are best known for their cancerous properties.

While our genes serve as the instructions for how our cells behave, our epigenetics dictate which genes are 'read'. It's this phenomenon which allows all the cells in our body to have the same genetic sequence but to look and act completely differently. As we get older, we develop 'epigenetic drift', which leads to aberrant cell behaviour.

The vulnerable ends of our genome are protected by extra pieces of DNA called telomeres. As our cells divide telomeres get shorter, eventually triggering cell death by 'senescence'. Senescent cells release damaging chemicals and immune senescence leads to chronic inflammation, both of which promote ageing. Furthermore, older tissues become depleted of stem cells, which are required to replace dying cells, causing both senescent cells and DNA damage to amass.

One of the best evidenced longevity boosters is dietary restriction (Twitter CEO Jack Dorsey fasts for 22 hours a day). Unsurprising then, that deregulated nutrient sensing is a hallmark of ageing. Nutrient level is detected by specific proteins in our cells, which in response mediate changes in cell growth, immune function and metabolism. The nutrient-sensors, and many other systems in our body, participate in cell-to-cell communication. As we get older, these networks malfunction, contributing to development of diseases like type 2 diabetes and atherosclerosis. Another trait of ageing is central to the development brain disorders such as Alzheimer's disease. This 'failure of proteostasis' is characterised by protein misfolding and an imbalance in protein abundance.

Finally, mitochondria, the energy-producing centres of the cell, produce 'reactive oxygen species' (ROS), which were initially thought to drive ageing. However, this has since been contested, and ROS may in fact promote longevity. However, dysfunctional mitochondria still contribute to ageing through regulation of cell death and inflammation.

All sounds pretty inevitable…

Indeed, our chance of dying doubles every eight years, making many scientists predict a maximum age of around 120 years[4]. However, some animals are luckier. When the Galapagos tortoise and species of BOFFFF (big, old, fat, fertile, female fish, not joking), reach a certain age they enter 'negligible senescence' and their chance of dying plateaus[5]. Which means they could live forever, right?

So, if them, why not us?

At this point, you might have guessed one anti-ageing strategy is to target senescence. Indeed, senolytics (which remove senescent cells) and senostatics (which quell the effects of senescent cells) are the focus of many startups, but have not yet shown efficacy in clinical trials[6]. Partial cellular reprogramming is another approached favoured by Silicon Valley moguls such as Jeff Bezos. The discovery of Yamanaka factors and their ability to restore a cell to its younger epigenetic state won Shinya Yamanaka the 2012 Nobel Prize. However, this approach is tricky; exposing cells to these factors for too long can lead to the development of those nasty teratomas. It's likely that other genes involved in cell reprogramming will need to be found, with Google's Calico Labs admitting that research on Yamanaka factors is "not something where we're thinking clinically"[7].

One of the more gruesome methods to slow ageing is a transfusion of babies' blood. The startup Ambrosia sold adolescent blood transfusions for $8000 a litre (or grab yourself a bargain with $12000 for two) until it was shut down by the FDA in 20198. However, parabiosis has been shown to reduce age-associated inflammation, increase stem cell capacity and even improve neurological function. Faecal transplants may similarly benefit older patients; transfer of the gut microbiome can improve nutrient sensing and weight regulation. Existing drugs metformin,

a diabetes medication, and rapamycin, an anticancer compound, could be repurposed to treat ageing, again through targeting our nutrient sensing systems. Rapamycin has already shown some promise in the 2020 Dog Ageing Project (possibly the cutest ageing trial so far)[9].

The above examples represent just a trickle of the many avenues being explored in the race to cure ageing. With a treatment potentially around the corner, is it time to rethink our views on the inevitability of getting older? And which therapy has your backing? Or maybe we should just take the advice of the oldest human in history, 122-year-old Jeanne Calment: she attributed her longevity to cigarettes and chocolate.

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FocalPlane – where biology meets microscopy

FocalPlane is an online community site that connects people, products, resources and information from the microscopy field. Anyone from the community can contribute to the site, and it is free to read; it is your site.

FocalPlane is hosted by Journal of Cell Science, one of the five journals published by The Company of Biologists. It was launched in July 2020 after identifying the need for a platform where both microscope/software developers and researchers can exchange ideas and information to help the field develop and progress. Journal of Cell Science has a long history of publishing papers relating to microscopy; in fact, the journal was established in 1853 as the 'Quarterly Journal of Microscopical Science' and FocalPlane extends this tradition.

FocalPlane is overseen by a dedicated Community Manager, who looks after the daily running of the site and is your contact for any questions or suggestions. Additionally, we work with our Scientific Advisory Board, distinguished leaders in microscopy, who provide expertise and advice on all scientific aspects of the site: Lucy Collinson, Ricardo Henriques, Florian Jug, Christophe Leterrier, Jennifer Li, Jennifer Lippincott-Schwartz and Kota Miura.

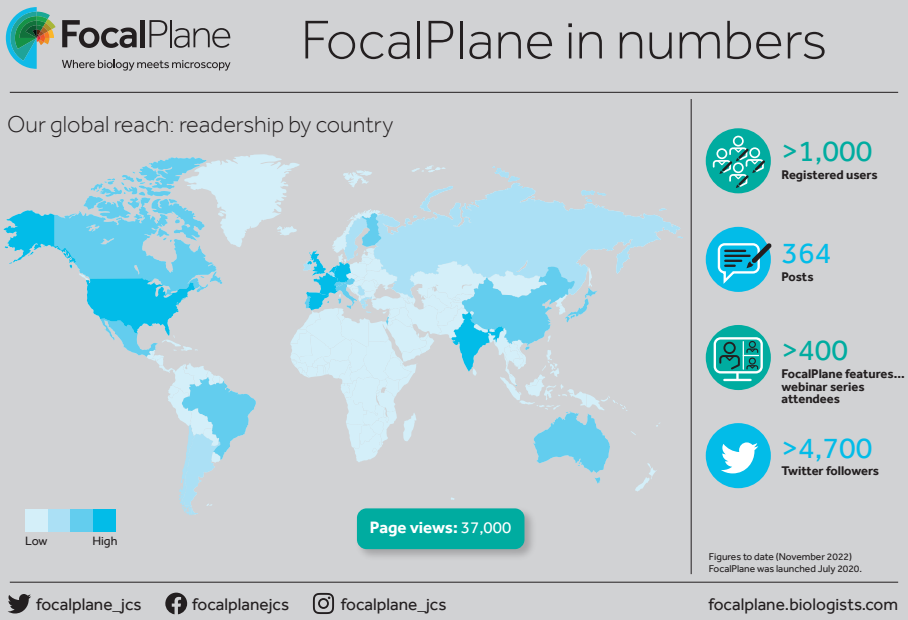
FocalPlane houses a range of microscopy related content, including 'How to' posts, tools, case studies and blogs. You can scroll through the different posts or click on the relevant icon to choose a particular topic.

You can also browse the beautiful images in our gallery and add your own images to the collection. If you are looking for a job, or have a position to fill, visit our job listings page, where you can advertise and find jobs in both research and industry, and at all career stages. The site also has an events calendar, which highlights the latest microscopy workshops, webinars and meetings. If you are holding a microscopy event, you can advertise it here for free. It will then be included in our weekly email sent to registered users. And if you are looking for funding for your event, do get in touch. We have been delighted to support a range of microscopy events.

More recently, we set up the FocalPlane Network (focalplane.biologists.com/network), an international directory of researchers with microscopy expertise including developers, imaging scientists and bioimage analysts. In line with FocalPlane's mission, it is designed to facilitate the microscopy community and can help you to network and find speakers, committee members, reviewers and potential collaborators.

To get involved with FocalPlane, simply register for free and tick the 'author' box – you'll then be ready to post, comment and connect. Once you are registered as a contributor, you will have your own profile page showing your posts and any professional and social links you choose to list. You will also be able to receive the latest posts direct to your inbox.

So please visit, read, post, comment and get involved. We look forward to welcoming you to the FocalPlane community. **focalplane.biologists.com**



Approaches to environmental sustainability in a cell biology laboratory

Saroj Saurya is a post-doctoral Laboratory Manager in Jordan Raff's lab and the Chair of the Dunn School Green group at the Sir William Dunn School of Pathology, University of Oxford. Since 2019, she has been working towards implementing environmentally sustainable practices within the context of a modern laboratory. This article describes some of the initiatives within the Raff lab and the Dunn School that readers may want to consider for their own group or Institution.

As a society we are embracing environmental sustainability in an effort to conserve resources and protect global ecosystems. Laboratory work is, however, an area in which there is much to improve and most laboratories still produce large amounts of plastic waste. Washing and regenerating plastic ware and glassware are often viewed as being too labour-intensive to be cost-effective. However, a recent article examined the re-use of lab plasticware and concluded there was a significant potential reduction in costs, with an up to 11-fold reduction in CO2 footprint—even when including staff and energy costs (Farley and Nicolet (2022), bioRxiv doi: https://doi.org/10.1101/2022.01.14.476337).

Raff lab green initiatives

- the recycling of uncontaminated gloves and masks through Terracycle;
- the use of 100% recycled paper for all printing
- washing and reuse of 15/50ml plastic conical tubes (>10 times)
- washing and reuse of columns for DNA/RNA purification (>10 times)
- the use of glass cell spreaders rather than the single disposable plastic ones
- washing and reuse of plastic plates used for embryo collection (>5 times)
- making all competent bacterial cells in-house

These initiatives save money and significantly reduce the lab's carbon footprint, and the lab recently received a Gold LEAF award (details of this scheme are available at: https://www.ucl.ac.uk/sustainable/make-your-lab-sustainable-leaf). Most importantly, now that the lab has shown that these initiatives are feasible they are being rolled out more generally within the Dunn School. For example, there was considerable resistance to recycling plastic conical tubes and DNA/RNA purification columns; we have now shown that these items can be reused multiple times without any contamination or loss of efficiency, and our central washing services are taking over the recycling so that all the labs in the Dunn School can benefit (saving even more money and plastic waste).

The Dunn School environmental sustainability initiatives

The Dunn School has established a Green Group that has driven wider initiatives for sustainable practice. The group organises various events such as Climate awareness week, sustainable food survey, a monthly Dunn School freezer challenge, and it coordinates with several local Action Groups to promote initiatives in areas such as gardening, swap shops, litter picking events, climate action marches etc. The Green Group received two awards in 2022 for their efforts in reducing the carbon footprint of the Dunn School—the Oxfordshire High Sheriff Climate Action Award and University of Oxford VC's LEAF Champion Award. These awards may seem trivial, but they help to establish the credibility of the Green Group, and to ensure that our views are taken seriously within the Dunn School and the University more widely. Several recent initiatives from the Green Group are highlighted below.

Stores/ purchasing: The Dunn School has onsite stores and we ensure that they now purchase many commonly used consumables in bulk, thus avoiding the need for multiple deliveries of multiple packages. The stores now only supply 100% recycled printer paper and lab paper rolls. For consumables that are not available in the Dunn School stores, the University of Oxford finance department pools the orders from different labs and departments to further consolidate deliveries and packaging.

Facilities: In collaboration with the Green Group, the Dunn School washing-up facility help wash and reuse plastic and glassware. Centralised glass-wash and autoclaving facilities avoid running half-filled washers and autoclaves, and we now wash and reuse glass serological pipettes, avoiding the use of single-use plastic pipettes. PBS, LB/TY, sterile distilled water and agar plates are made in bulk for the whole of the Department. The Dunn School has

established shared equipment, chemical and cold rooms to reduce manufacturing, transportation, maintenance, energy and storage costs.

Workshop: An onsite workshop helps labs to repair equipment, ensuring it can be used for longer. We have instituted a dedicated "Green Room" where any unwanted, but still functional, equipment and consumables are stored, allowing other groups to simply take any useful items free of charge (this has saved many groups a lot of money!). Any equipment that is not ultimately used within the Department is sold through the Unigreen Scheme, generating some funds for the department and minimizing waste. The Dunn School workshop also helps labs to regularly defrost their freezers so they consume less energy and extending their functional lifetime. All the Dunn School emergency ULT freezers are set at -70°C rather than -80°C, and we are monitoring how much energy this saves, and whether there is any adverse effect on the materials that are stored at the slightly higher temperature. Most of the Dunn School buildings now have movement-sensors that automatically switch lights on and off.

Central recycling initiatives: The Dunn School has clearly marked and easily accessible recycling points for many items, such as printer toner cartridges, batteries, bulbs, computer items, plastic tip boxes, uncontaminated gloves, face masks, gas canisters and uncontaminated mixed recycling (paper, cardboard, tins, plastic etc). Styrofoam boxes and ethanol/methanol bottles are returned to the supplier so that they can be reused.

General things: Most of the Dunn School labs now use electronic lab books. Staff are encouraged to attend online meetings and conferences, reducing the need to travel. The Green Group has initiated a bike doctor and bike hire scheme for the students and staff of the Dunn School. We have a sharing table in the café area where people can leave any unconsumed food and drinks from meetings or events, or from their home or garden/allotment for people to share so that nothing is wasted. Some of the Dunn School buildings have now been fitted with solar panels, and water butts collect rainwater that is used to flush the toilets. Hand driers have been fitted in all toilets and hand towels removed. The Dunn School has various mailing lists to make it easier to find and share reagents and equipment.

To make initiatives like these work, it is crucial to have institution-wide involvement and buy-in. Grass root groups like the Dunn School Green Group—comprising members at all levels from within the Department, such as students, lab managers, facility managers, PI's—have shown that working together can move things forward to help fight the climate crisis.

Above: Saroj demonstrating green initiatives in practice (photo credit: Jo Peel)

Graphical Abstracts – Sharing your science through good visual design

Cell introduced Graphical Abstracts (GAs) in 2010 as part of an effort aimed at making it easier to engage with papers published online and to attract a wide readership to each paper[1]. These single images present the main conceptual point of a paper for a general audience. While many chemistry journals had a long history of publishing GAs, they were not part of most papers in the biological sciences at the time. GAs now appear in numerous journals and are re-used as key visuals in talks and on social media platforms. As the images offer a gateway into a paper, keeping a few design principles in mind when creating them can greatly increase their accessibility and broaden the reach of the science.

Lara Szewczak, Deputy Editor, Cell

Phillip Krzeminski, Senior Illustrator, Cell Press

What is a GA and what are the goals?

Before attempting to lay out any best practices for how to make a graphical abstract, it is important to define what it is, and what it is (and is not) designed to do. Each GA should capture the main message of an article and provide an eye-catching entry point for readers from all areas. The GA complements other summarizing elements of a Cell article including the Highlights (up to four bullet points that reflect the key results) and the conventional Abstract or Summary. The GA appears prominently at the start of the article online and in the PDF.

From the start, we wanted the GA to be distinct from a conventional model figure. We thought it should convey the key conceptual point without needing to represent every dimension of the study. A good GA should draw attention, facilitate browsing, and help a reader quickly identify if a given paper is relevant to their research interests. Importantly, the GA should be readily understood without reference to text elements of the article.

Editorial input

Cell requests the GA from authors once the paper is on track to being published, and we provide guidelines for preparing the image. It is therefore not part of the peer review process. Editors work with the authors to refine the submitted image, offering feedback generally focused on the scientific content and the overall design of the image.

We offer a few points of advice frequently. In terms of the scientific content, GAs should give a clear sense of context – a "you are here" to help orient readers. This context could include organism, tissue, disease setting, cell type, cellular pathway or molecular process. Because we want authors to focus on the advance reported in the paper, we often recommend stripping away information that is tangential even though it may be part of the related literature. The image should also reflect the scope of the results and conclusions presented. For example, if a paper relies exclusively on results from model organisms, the GA should not include an image of a human even if the results may have eventual implications for human disease.

A key consideration when drafting a GA is reaching a general scientific audience. As a simple and straightforward step toward this, we encourage authors to use labels liberally. However, science is awash in acronyms and they can be confusing or impenetrable to those outside a field. Although it may take more space to write out "exon junction complex" instead of EJC, we think the gains in reader comprehension make it worthwhile.

Best practices in creating GAs

While journals and scientific fields may vary, the rules of good design apply to all forms of visual communication. Not every research team is going to have the funding or training to be professional level illustrators, nor does every journal have a dedicated art team. But scientists who are cognizant of a few broad design concepts can still vastly improve the legibility of any graphical abstract or figure. While beautiful art may be desirable, clarity and impact are the priorities for a good visual communication aide.

Conceptualization

The first step in creating any graphic is to establish a clear message (Figure 1). What is the key question your research is answering? What are the most important stages and results? What context and labels are needed for the viewer to understand what they are seeing? Assume you have a viewer's attention for 10-15 seconds and determine what you would want them to take away from your research given that short engagement.

After determining the focal points of the GA, it is just as important to eliminate redundant or unnecessary information. Streamlining the message allows communication of difficult concepts to a broader audience. The research article itself exists to explain the intricacies of the research along with the results and ramifications. While context is important, it is impossible to provide every salient detail while retaining legibility and impact.

Design

We recommend a few broad concepts that can be used together to improve the legibility, organization, and impact of any graphic.

1. A clear visual pathway

Nearly all apps, websites, and other daily technologies display information as flowing from top to bottom and left to right. You should endeavor to follow this pattern whenever possible. Graphics with convoluted reading pathways tend to frustrate readers, leading to disengagement from the material. Consider the order in which you want information to be viewed by your readers and insure there is a simple "visual pathway" for them to follow from start to finish.

2. Intentional grouping

The principles of grouping can be a powerful communication tool for a designer when used intentionally, helping the viewer quickly break down a graphic into manageable categories and synthesize a larger amount of information. The main rules of grouping as applied to design are proximity, similarity, continuity, and enclosure (Figure 2). These rules can be applied independently or layered as the concepts being presented require.

These tools are equally powerful when applied unintentionally and can easily lead the viewer to create false correlations. For example, if a cell in an image is colored red and red text is used to describe a negative effect, the viewer may unintentionally assume the red cell and red text are related, especially if they are in close proximity.

3. Text hierarchy

Text hierarchy is a means of using typography—fonts, font size, color, boldness, and layout—to help the viewer discern the relative importance and priority of text groups. Larger and bolder text draws the eye first and should be used to define titles, results, and other headlines. Medium text can be used for subsidiary information that has been categorized by larger text. The lightest text should be reserved for low-priority text like contextual labels and descriptive text that the viewer can take in once they have already assimilated the key information. As with grouping above, color of text can be used to create correlations between different elements, but should not be used for emphasis (that is what boldness and size are for). Other text styles should be used sparingly and for their appropriate function. For example, italics text should be reserved for its proper use in species or gene names.

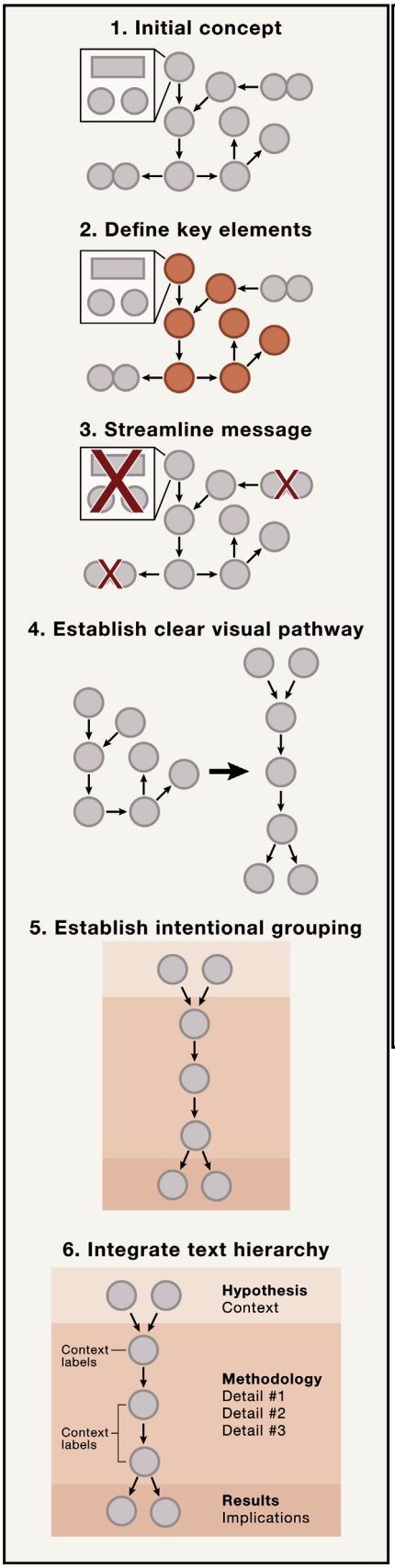


Figure 1.
Key principles for creating Graphical Abstracts, progressing from initial conception to the final visual.

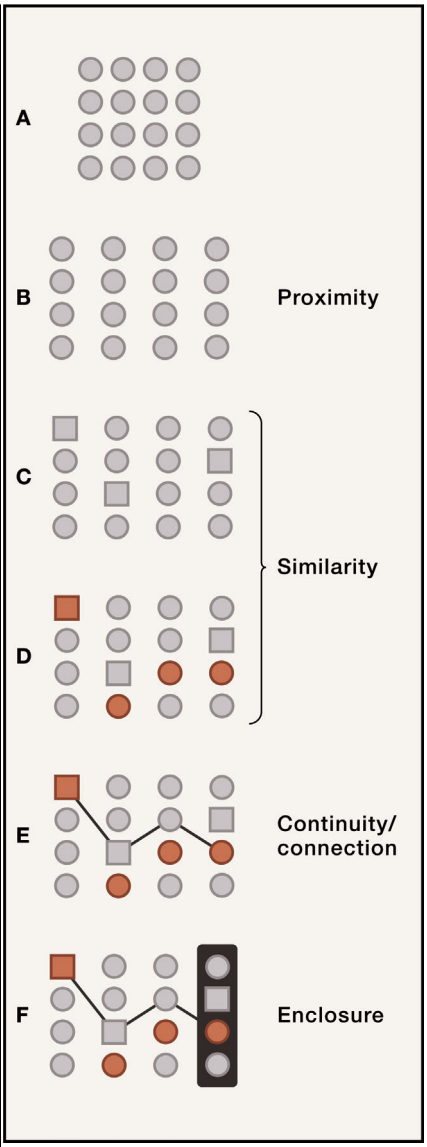


Figure 2. Using grouping
Even with abstract, unlabeled shapes, the perception of the figure shifts with application of different principles.

A) Close proximity makes the initial shapes appear as a single object or group. B) By changing the proximity, the initial group of circles becomes four distinct columns or subgroups.

C) Changing a few of the shapes into squares leads to sorting the objects by shape rather than proximity; the differences become the focus.

D) Adding color brings attention to a subset of objects and we view the red shapes as the relevant information.

E) By connecting several shapes of different types and colors, we override their differences and view them as a related sequence.

F) Enclosing the final column and connecting it to the others, we establish it as a major focal point, possibly even a result of a sequence.

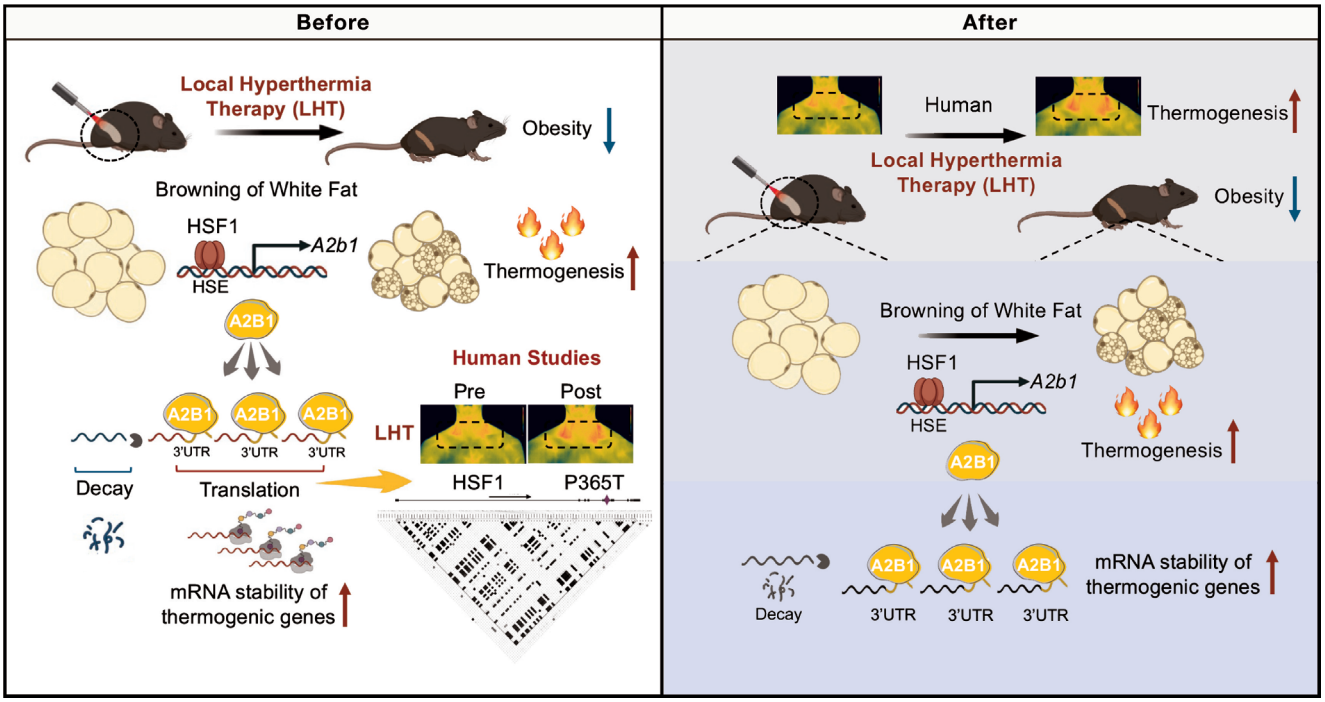


Figure 3.
Original author submission, left, and author-revised, published[2] image after editorial feedback, right. The original submission is included with the permission of the authors.

Putting it into practice

Most GAs (and figures) will not have the benefit of professional art support, and generally do not need it. Taking onboard the guidance above can enable any researcher to improve the quality of their graphics. That said, it can be helpful to have someone offer input who brings fresh eyes and perspective to "reading" the image. Figure 3 shows an example of a graphical abstract published in *Cell*[2] as it came in and after feedback from the editor. You can see some of the above principles being put into practice and how they improve the legibility and structure of the visual.

In this case, the editor advised the authors to 1) simplify by removing more peripheral elements, including a plot more reminiscent of data, 2) unify related elements by grouping physiological outcomes, 3) delineate the layers of information using colored panels, and 4) use distinct color choices for RNA and DNA strands. In this instance, the editor provided input. However, this constructive view could have come from anyone - a mentor, a labmate or a colleague from down the hall.

Graphical Abstracts serve as one modality for communicating scientific findings and ideas, and the basic principles underlying an effective GA are relevant for any image conveying scientific information. We hope that scientists will apply them to figures in research and review journals, to images for live and virtual presentations, and for other outlets of science communication including social media.

References

1. Marcus, E. 2010: A Publishing Odyssey. Cell 140, 9 (2010).
2. Li, Y et al. Local hyperthermia therapy induces browning of white fat and treats obesity. Cell 185, 949–966.e19 (2022).

Acknowledgements

We thank the *Cell* editorial team for discussions and comments.

Mind the Gap, Doors Closing (the 2022 A-level Exam results for England); All Change (in Wales)

'Mind the gap' and 'Doors closing' are familiar phrases for travellers on the London Underground, but can also be applied to the A-level exam system and results for England in 2022. Meanwhile, it's all change in Wales.

Mind the Gap - Geographical area

In a previous article for this magazine I wrote about the gap between pupils who have IT facilities at home [such as good access to the Internet], and those that do not.

There are also geographical divides. The 2022 A level results show that 40% of students in the South-East and London gained A* or A grades compared with 31% in the North-East of England. The 'league table' order, [descending] is: South-East, Greater London, East of England, South-West, Yorkshire and the Humber and West-Midlands tying with East-Midlands, and the North- East.

Mind the Gap - Type of School.

During the COVID pandemic in 2021 the A and A*level top grade results of students in independent secondary schools in England were ahead of those from secondary comprehensive schools. In 2022, the gap was less, but larger than in 2019. The grades achieved by schools classed as academies were slightly higher than schools classed as secondary comprehensives.

Mind the Gap – between STEM subjects and the Humanities.

Compared with results in 2019, the number of students selecting to study STEM subjects rose by 3.5%. The number studying humanities fell by 3.3%. English literature and geography were no longer in the Top 10 'A' level subjects in England.

In 2022 the Top 10 subject choices for A level were, [1], Maths, (same as in 2019), [2] Psychology, (up from 3rd in 2019), [3], Biology, (down from 2nd in 2019), [4], Chemistry, (same as in 2019), [5], Sociology, (up from 9th in 2019), [6], History, (down from 5th in 2019), [7], Art & Design, (down from 6th in 2019), [8], Business Studies, (up from below 10th in 2019), [9], Physics, (down from 8th in 2019), [10], Economics, (up from below 10th in 2019).

Doors Closing.

The Government in England was determined to reduce the grade inflation allowed in 2021 and bring the levels back to where they were in 2019. This was after the fiasco of the ill use of an algorithm in 2020 and the general effect of COVID on education during 2020/21. Students sitting A levels in England in 2023 might find exams results are graded at 2019 levels.

Intentionally the 2022 assessment levels have not yet returned the system to the 2019 levels. This was to avoid a sudden drop at the end of a time when many students had experienced study difficulties.

During the school year 2020/21 pupils were mainly assessed by teacher led continuous assessment with girls outperforming boys. Other factors may have contributed to this such as teacher influence and grade deflation. In the 2022 exams girls performed less well or, as The Guardian education reporter put it 'The return to an exam-based marking system has favoured boys'.

The doors are therefore closing on the more liberal assessment standards of 2021 and to a degree for girls, with regard to the type of assessment Plans are in motion for A and A* exams to return to the 2019 standards in 2023 using end of session final exams. There are concerns about this since many teachers have been absent during the current academic year due to being ill with COVID.

Data sources credit: Joint Council for Qualifications, The Guardian, Ofqual, England only.

Change Here. Wales.

Yes it's all change in Wales where a complete overhaul of the school curriculum is taking place. Changes are taking place, year-by-year until 2026 when the cohort will have reached the current GCSE stage. 'Progress Steps' will replace 'Key Stages' and will be developed by each school around 'four purposes', namely, [A] ambitious, capable learners, [B] enterprising, creative contributors, [C] ethical, informed citizens, and [D] healthy, confident individuals. In designing their curriculum each school will have to conform to a total of 27 (six in the science group of subjects) mandatory 'What Matters' statements.

It is not known at this stage what will replace GCSEs as consultations are on-going as the curriculum evolves.

Info credit: Helen Dearns, 'Update on Curriculum changes in Wales', School Science Review in Practice, June 2022, 103, 385 p26 [Association for Science Education Member's Magazine]

David Archer

Meet the BSCB Committee

Daniel Booth (University of Nottingham)

I am a BBSRC David Phillips Fellow at the University of Nottingham Biodiscovery Institute, where my lab focuses on chromosome structure and dynamics in health and disease. My love of cell division started during a Wellcome Trust PhD studentship with Steve Royle, investigating a novel role of clathrin at the mitotic spindle. This interest further expanded during post-doctoral work with Bill Earnshaw at the Wellcome Trust Centre for Cell Biology, Edinburgh. Here, I established and applied numerous advanced imaging and proteomics techniques to investigate fundamental properties of chromosome structure and composition. To add more translational impact to my work I next undertook additional post-doctoral training at the Centre for Discovery Brain Sciences, with Dies Meijer, generating and exploited transgenic animal models to dissect the molecular pathways linked to a variety of disease states. Collectively, these experiences/skills prepared me for an independent research path aiming to bridge discovery science with translational research.

In 2020 I was awarded a Nottingham Research Fellowship, to establish my own team at the brand new Biodiscovery Institute - an endeavour that houses ~1000, academics, clinicians, researchers and PhD students across five floors of state-of-the-art laboratories and research space.

In 2021 I was awarded a BBSRC David Phillips Fellowship and this year promoted to a UoN Principal Research Fellow. My fellowships are being used as a platform to expand our team, continue developing advanced cell biology tools, and using these to answer important cell biology questions – with a particular focus on the enigmatic chromosome periphery – the least understood chromosome compartment.

The BSCB has influenced my career in numerous ways since starting my PhD in 2008 - not least through its generous travel awards. I am both excited and proud to join the BSCB committee where I hope to contribute to its long-running success of supporting ECRs.

Simon J. Allison (University of Huddersfield)

I am a cancer biologist working at the interface of cancer cell biology and cancer pharmacology/drug discovery. My current position is as a Reader in Cell Biology and Pharmacology within the School of Applied Sciences at the University of Huddersfield. As well as research and getting into the lab to conduct experiments, I also contribute to undergraduate and postgraduate teaching and enthusing the next generation of budding scientists about cell biology and research! I first caught the 'bug' for research and how fascinating cells are during a summer placement in Edinburgh as undergraduate where I first saw apoptotic cells down the microscope. Whilst my research is principally focused on trying to understand in more detail how cancer cells differ from non-cancerous cells and how we may exploit these differences to selectively induce the cancer cells to die, I have a passion for cell biology per se in all its different guises!

My first degree was in Natural Sciences (Biological) at Emmanuel College, Cambridge after which I returned to Scotland, this time Glasgow, for a PhD on the regulatory control of RNA polymerase III transcription and its dysregulation in cancers. This was followed by postdoctoral cancer research positions at the University of York within the laboratory of Prof. Jo Milner and research spells at the University of Leeds and then at the University of Bradford as a Yorkshire Cancer Research-funded PI before I joined the University of Huddersfield in 2015.

I have over 20 years' research experience in the cancer field with a particular interest in cancer cell metabolic and molecular addictions, the influence of the pathophysiological tumour microenvironment on cancer cell behaviour - and therapeutic challenges and opportunities these may present. As part of my research interest in phenotypic drug discovery and the puzzle of understanding the underlying biology, I also enjoy working with scientists of other specialisms including chemists and pharmacologists. I am strong believer in the importance of collaborative and interdisciplinary research, sharing of ideas and skills, and of science being inclusive and providing opportunities and support for scientists of all career stages, not least those just at the very start of their cell biology journey or research career.

I am honoured to join the BSCB committee and I look forward to contributing to its activities in supporting the cell biology community and in promoting and celebrating the wonders of cell biology in any way I can!

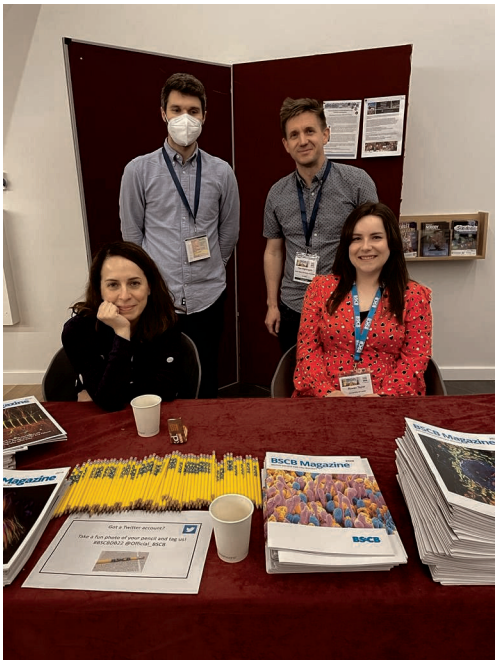
Meeting report

#BSCBDB22 meeting report – an online perspective

The annual BSDB meeting is always on the 'must-attend' list for the team at Development. This year was, of course, extra-special because it was our first in-person meeting for two years. For me, it was particularly exciting as it was meant to be my first in-person meeting in my new role as Community Manager of the Node. I was looking forward to catching up with old friends and introducing new researchers to the Node community. Unfortunately, the in-person part was not meant to be, as COVID caught up with me the day before the meeting started. However, in light of the ongoing discussion surrounding conference accessibility and sustainability, it was an excellent opportunity to check out the virtual experience of the joint meeting with the BSCB.

Of course, the fact I got to 'attend' the meeting at all was my first big thumbs up for the hybrid concept. I found that it was possible to feel the excitement of the attendees even without being there (and I was only slightly jealous!). Almost every speaker started their talks with 'I'm really happy to be here presenting at my first in-person conference for two years,' and the delight in their voices prevented any feeling of the phrase becoming repetitive. The meeting kicked off with a plenary lecture from John Wallingford, who wisely got the whole audience onside by telling us that we are all developmental biologists before going on to explain that he would be talking entirely about cell biology featuring the ignoreome, which is composed of completely uncharacterised genes.

The next talk was the BSDB Cheryll Tickle medal lecture from Emma Rawlins. Unfortunately, Emma was also stuck at home because of COVID, but we went smoothly over to her live-streamed presentation. Emma gave us a whistle-stop tour of her career before focusing on the latest work from her lab on human lung development. The first evening concluded online with the BSCB Raff medal lecture from Florence Young, who presented her PhD (and ongoing) work on microtubule-based cargo transport in neurons. Although I was disappointed to not be able to follow up these excellent talks with more discussion with colleagues, the main thing that I missed was the laser pointer, which was an ongoing problem throughout the meeting. A few of the speakers did use the computer mouse, but for the talks I attended, only Dolf Weijers had a laser pointer set up to show for the online and in-person audience. Fortunately, however, this issue should be an easy fix for future meetings.



Day two of the joint meeting highlighted another couple of advantages of virtual attendance. Firstly, it was possible to jump between the two parallel sessions without disturbing anyone. Another advantage was that I didn't need to queue for my comfort break or caffeine and cookie hit. However, Mike Fainzilber pointed out on Twitter that great collaborations can be set up in 'caffeine-queues'.

This brings me nicely on to social media: I also followed the meeting on Twitter using the meeting hashtag #BSCBDB22, which I did manage to get wrong a couple of times while tweeting about the meeting – I'm blaming 'COVID-brain'. I would recommend following conferences on Twitter, especially if you are attending virtually. I think that it helped me feel more connected with the in-person attendees. People were tweeting about the talks, posters and the social side of the meeting. On the other hand, the 'biggie' that I was sad to be missing on the second day was the poster session. It was great that the posters were available online and it was possible to type in a question for the author, but it is just not the same. At in-person meetings, posters are where

discussion happens, ideas for experiments are formed and new connections are made. Sadly, I don't think that we have found a way to replicate this online.

Day two concluded with the announcement of the Wolpert and Waddington medal winners awarded by the BSDB. This year's Wolpert medal for extraordinary contributions to the teaching and communication of developmental biology was awarded to Andreas Prokop. Instead of giving a medal lecture, the prize comes with funding for a small number of lectures around the country. Andreas has been a big supporter of the Node, contributing numerous articles, as well as allowing us to host the resource page that he curated for the BSBD. The Waddington medal for major contributions to any aspect of developmental biology in the UK, was awarded to Val Wilson. In her medal lecture, Val took us on a tour of her favourite embryos, including 'the embryo that Rosa liked', describing some of her most important contributions to the field.

Day three, aka the day of the disco, saw me taking advantage of my virtual attendance to jump between the sessions again. The link ups to the speakers unable to attend the meeting in person continued to work seamlessly. The flash talks were outstanding, and their inclusion meant I could hear a little more about the research that I was missing out on by not being able to physically attend the poster sessions. The science part of day three concluded with the BSCB Hooke medal lecture from Jeremy Carlton. Jeremy presented selected highlights from his research journey, focusing on his work on the many membranes abscission events that are dependent on the ESCRT proteins. Day three concluded with the conference dinner and disco. Always a highlight of these meetings, it was a shame to miss out, but the tweets and videos showed everyone having a good time and the dancing was as good (enthusiastic!) as ever.

The organisers had saved the 'big guns' for the final morning (possibly to ensure that everyone had vacated their rooms by 9 am as promised to the conference venue), with plenary lectures from Anne Straube and Jody Rosenblatt, and medal lectures from Laura Greaves (BSCB Women in Science medal), Adam Shellard (BSCB Postdoc medal) and Guillermo Serrano Najera (BSDB Beddington medal for an outstanding PhD thesis). I was meant to be conducting my very first in-person interview with Guillermo, which unfortunately couldn't happen, but we managed to catch up over Teams and I will be posting the interview on the Node soon. Guillermo has so many different interests and this was a really fun interview. Hopefully this comes across in the final article!

Overall, I really enjoyed attending the BSCB/BSDB joint meeting. Do I think the virtual experience is the same as attending in-person? No. Would I have preferred to attend in person? Yes, but I think hybrid meetings should be an ongoing feature of major conferences. There could be any number of reasons a delegate can't attend in-person, such as sustainability considerations, financial reasons, family commitments, health reasons, etc. and the virtual experience is a great alternative. Being able to follow the meeting via the conference platform and on Twitter still made it a worthwhile and enjoyable experience. Thanks to the organisers from the BSCB and BSDB!

Helen Zenner

22nd International Vascular Biology Meeting

13–17 October 2022. Oakland, CA, USA

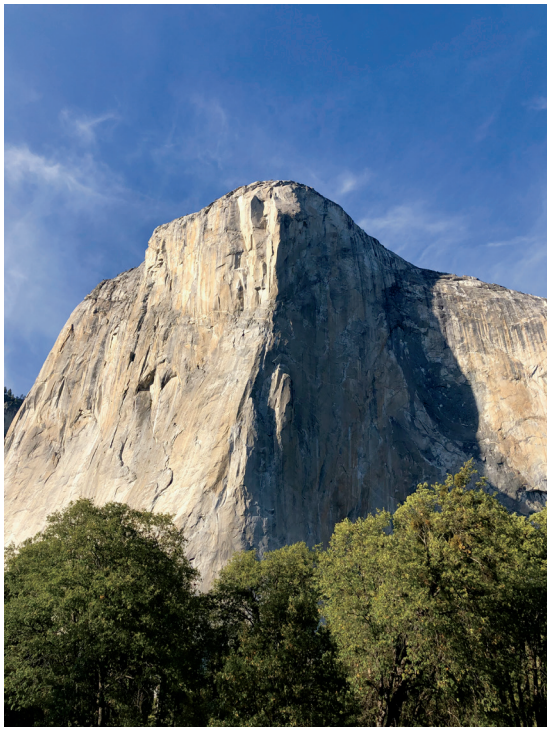
The 22nd International Vascular Biology Meeting was held in Oakland, CA, USA from October 13-17th 2022. Hosted by the North American Vascular Biology Organization, and with the participation of many national and international cardiovascular societies it brought together researchers from around globe to share their research.

Whilst there was not a stated theme for the biennial conference, there was a collective interest in vascular heterogeneity. In his keynote lecture Christer Berholtz (Uppsala University) explored how single cell RNA sequencing identifies three primary axes of endothelial heterogeneity: organotypic, aterio-venous and active-inactive. Christopher Chen (Boston University) presented exciting findings from 3D-cell culture showing that different endothelial subtypes exhibit distinct responses to compressive force – with differential regulation of junctional and matrix interactions. A particular highlight for me from the talks was the Folkman Award lecture from Stefania Nicoli (Yale School of Medicine), who described scaffolding roles for untranslated protein-binding RNAs. From the more junior researchers, we enjoyed Roeben Munji's (University of California San Diego) talk on the blood-brain barrier's role in sequestering circulating L-DOPA from the brain by catalytic conversion into endothelial dopamine – with subsequent effects on murine social behaviour. These elegant stories showcased some excellent cell biology

Outside of scientific themes, there was a strong focus on equality, diversity and inclusion. The inaugural Florence Sabin Award winner, Omolola Eniola-Adefeso (University of Michigan), gave a moving and compelling lecture on the importance of diverse voices within research, and the gaps in medical research arising from their exclusion. The organisers included a specific session for trainees on overcoming barriers to underrepresented groups in academia and highlighted that over 50% of presenters were women. Whilst population figures such as this often mask an under-representation of women in senior positions, it is to the organisers' credit that this figure extended to keynote and award recipient lectures.

From the perspective of junior researchers, there were two major downsides to the conference.

Firstly, the less formal sessions were primarily organised as small group breakfasts for "trainees", with a PI at each table to lead the discussion. There is, of course, benefit to being able to speak with senor scientists in an informal setting. But the uniform, quite hierarchal atmosphere of the sessions meant there was limited opportunity to network with colleagues at a similar career point or give bottom-up feedback to PIs (particularly important giving the growing concerns about talent flight from academia). The programme could also have been rounded out with some less traditional sessions: social media training; alternative funding routes; changing paradigms in publishing are all increasingly essential training for junior researchers.



Secondly, the choice of venues was not ideal. Whilst California and the Bay Area have a rich scientific heritage, they are expensive enough to make a significant dent in all but the most generous travel grants. And if one was priced out of the adequate but uninspiring conference hotel, travel to the conference centre required walking in the dark through areas multiple local residents told us to avoid. Finally, the availability of refreshments especially at the paid Gala dinner left much to be desired.

However, the scientific content of the conference itself was excellent, and hopefully the peripheral issues can be addressed in the next iteration in Amsterdam in 2024.

We would recommend IVBM as an international conference for cell biologists. There is an extensive programme of in vitro research, but potentially more rewarding is the translational and clinical content – which is pitched perfectly to be engaging to attendees seeking to expand their knowledge outside of their traditional research area.

Tom P. Mitchell & Sammy El Mansi, QMUL

FASEB Protein Lipidation Conference: Enzymology, Signalling, and Therapeutics

31 July – 5 August 2022. Vermont, USA

Now 31 years since its launch in 1991, the biennial conference focuses on emerging areas of protein lipidation and cell biology. With particular interest in how lipid modifications regulate the function of target proteins and the outcome this has for both cellular function and disease. The international conference was comprised of nearly 100 attendees from all over the world, working at various professional levels from early-career researchers, to established professors and industry representatives. I was invited to present my research as a short talk and a poster, for which I was able to win a conference poster award.

Representing the Chamberlain lab, myself and my PI took a flight from Glasgow to Boston, MA, (via London) where we met up with three friends from the Greaves lab at Coventry University. We were able to spend two days exploring the city before travelling three-hours north by coach. The six-day conference took place at Vermont Academy, which is a traditional New England boarding school within a small, quaint, green mountain town called Saxtons River. Despite the basic dormitory style accommodation, the campus has the most unique venue, distinctive setting, and amazing food - one night was even New England lobster and prime rib!

The schedule of each day consisted of morning and evening talks from internationally renowned researchers, presenting cutting- edge results and innovative techniques. As well as afternoon career development roundtable sessions with experienced academic and industry professionals. My own research focuses on the interactions between a family of lipidation enzymes known as zDHHC's and a family of cell growth regulating proteins known as Sprouty/SPREDs. As the zDHHC enzymes are a core topic of this conference, I was able to gain better insight into the research of these enzymes including ideas for new experiments, exposure to new techniques, alongisde improving my professional network.

Every day came with its own free time, including a highlight of the week, which was an eventful canoe-trip on the stunning Connecticut and West rivers of Brattleboro, VT. In the evenings, attendees were able to network and/or wind-down around the fire-pit; an activity backdropped by night skies so clear, that the milky way was distinctly visible. The timing of the conference towards the second year of my PhD has offered a renewed motivation for my project and field of study. The sheer uniqueness and quality of this experience places its overall value and benefit above that of what a typical conference usually sets out to do. If I am lucky enough to have the opportunity to go again in two years' time, without hesitation, I will.

Liam Butler

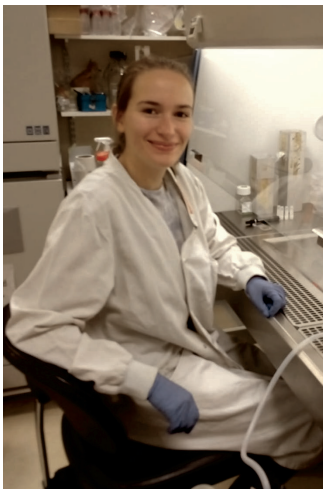
Summer studentships

The structure and regulation of myosin 10: a filopodial motor protein

Ameena Naji undertook a studentship with Prof. Michelle Peckham at the University of Leeds

I undertook a placement with the University of Leeds' Contractility Group, with research focusing on the cytoskeleton. The group's interests include the structural and functional characteristics of the myosin family of motor proteins, which have various cellular roles, and the dysregulation and dysfunction of which are implicated in several diseases. I chose to work in this group as it would allow me access to practical techniques used in structural biology; I am particularly interested in molecular mechanisms of disease, and this field is extremely important for understanding the roles and interactions of biological molecules.

My project was split into two halves, the first of which focused on the expression and purification of myosin 10 for structural studies. We were able to express myosin 10 using an insect cell expression system, but unable to purify the protein, most likely due to improper protein folding. The other half of the project focused on the effect of calmodulin-like protein 3 (CALML3), a protein able to bind to myosin 10, on myosin 10 regulation. For this, we used transfected mammalian cell lines to observe effects of interaction between CALML3 and myosin 10 on filopodial formation. Using confocal and light microscopy, we observed that CALML3 interaction with myosin 10 negatively affected the number of filopodia formed by the cells. However, this is contrary to published work, and further investigation and fine-tuning of the experimental design is required. Being able to observe cells through microscopy in this way was one of the highlights of the project, as I found it extremely rewarding to visually see the results of my practical work.

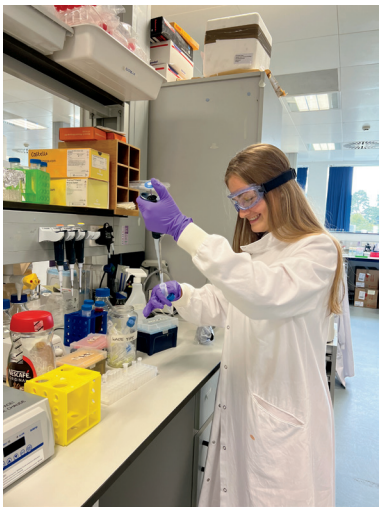


Although I had previously attended lectures on cytoskeletal motor proteins as part of my undergraduate course, I did not have any detailed knowledge of the proteins involved in the project or laboratory training in the techniques used. I therefore found undertaking the project mentally challenging and stimulating; I gained a vast amount of both technical and theoretical knowledge, which I will now be able to apply in further research. This aligned with my expectations of the project, which I also found to be very enjoyable, especially after I completed the initial training and could carry out work independently. I especially liked that I was able to work on various practical techniques throughout the project, giving me a good foundation of skills that I am now comfortable carrying out. Although the COVID-19 pandemic limited the lab experience available in my second year of university, the project allowed me to make up for it in this way.

ALS-linked mutations of VAP proteins and its implications on organelle membrane sites

Courtney Townend undertook a studentship with Dr. Joseph Costello at the University of Exeter

During the internship, I experienced a diverse selection of researcher tasks, including conferences, international collaboration meetings, journal clubs and weekly presentations. The ability to shadow a post-doc both in and out of the lab, provided me with a more holistic view of being a researcher. A considerable eye-opener during the internship was the requirement for constant adaptability as a researcher. It is essential to be able to analyse results from an experiment and identify areas in the protocol which may require alternations or repeats. Working alongside leading experts not only taught me applied lab techniques but helped develop my interpersonal skills. For example, attending weekly meetings with my supervisor strengthened my communication, problem-solving and active listening abilities. I am looking forward to putting these skills into practice, such as in upcoming MRes interviews.



The funding from the BSCB was highly impactful as I normally require a part-time job during the summer holidays to finance my university studies. However, the BSCB's financial support allowed me to fully focus on my internship. The ability to utilise my out-of-lab time for additional background reading meant I was more aware of current literature surrounding the project, and thus believe this led to more successful results in the project.

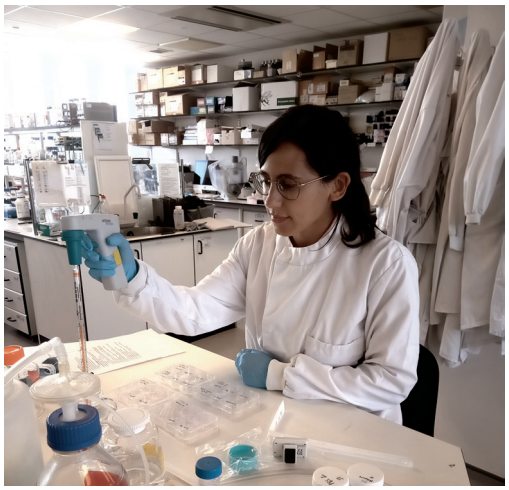
In September 2022, I will begin my third-year dissertation project looking at ACBD5 tethering proteins in disease, which will also be supervised by Dr. Costello. Prior to this internship, I was nervous about undertaking the dissertation due to a lack of lab exposure during COVID-19 lockdowns throughout my first year at university. However, the internship has perfectly prepared me for this wet-lab project by helping me establish confidence in essential cellular biology techniques such as transformation, transfection and mutagenesis. Overall, the internship solidified my aspirations of a research-based career and has inspired me to pursue a pathway into molecular and cellular biology.

Roles of the USP9X deubiquitinase

Isobel Diaz worked with Prof. Michael Clague and Prof. Sylvie Urbé at the University of Liverpool

I am currently a student at the University of Liverpool about to start my second year of an undergraduate biochemistry degree. I applied for BSCB funding as I was keen to gain practical lab experience to prepare for my final year research project and help me decide whether I would like to pursue a career in research.

One of the topics I found most interesting during the first year of my course was protein homeostasis. We covered protein digestion, synthesis, and degradation which combined to provide an overview of how steady state protein levels are maintained within specific margins. This included the role of the ubiquitin-proteasome system (UPS) in regulating protein levels and the possibilities of targeting this system in treatments for cancer and neurodegenerative disease. Given the complexity and precision of the signalling pathways involved in protein turnover, I wanted to develop a better understanding of the methods that make it possible to study the dynamics of the human proteome. Professor Clague and Professor Urbé's lab have a particular interest in deubiquitinating enzymes (DUBs), which play an essential role in regulating protein levels, so I contacted them to see if it would be possible to undertake a project in their lab. I was very fortunate that they were able to accommodate me and apply for BSCB funding for an 8-week studentship focussing on a particular DUB called USP9X.



The project was divided into two parts: the aim of the first was to investigate the degradation of PCM1, a scaffold protein which forms a key component of the pericentriolar material surrounding centrosomes. Inhibition of USP9X using a compound called FT709 leads to degradation of PCM1, but the mechanism by which this degradation proceeds is not known. Degradation of proteins generally occurs either via the proteasome or autophagy, so the first research question was whether FT709-induced degradation of PCM1 occurs through the proteasomal or lysosomal pathway. To investigate this, we performed an siRNA knockdown of Atg7, a key autophagy gene, to see if this rescued PCM1 from FT709-induced degradation. We next used FT709 in combination with a lysosome inhibitor in parallel with a proteasome inhibitor to see whether inhibition of either system prevented PCM1 loss. In each case western blotting was used to analyse the extent of PCM1 degradation.

The results of these experiments suggest that FT709-induced degradation of PCM1 occurs via the proteasome, since FT709 has a reduced degradative effect on PCM1 in the presence of a proteasome inhibitor but continues to cause PCM1 degradation both when Atg7 is knocked down and when a lysosome inhibitor is applied.

In the second part of the project, we attempted to repeat the findings of a previous paper which showed that impairing autophagy through knockdown of Atg7 leads to the accumulation of large, abnormal centriolar satellites and the fragmentation of mitotic centrosomes, which can be observed using immunofluorescence microscopy. Centrosome abnormalities are often seen in cancer, and theoretically it may be possible to reverse this phenomenon using FT709 to degrade abnormal centriolar satellites. We were not able to replicate the findings, as the centrosomes appeared to remain intact in the treated cells. This was nevertheless a valuable experience, as it showed that negative results are part of the research process and can hopefully provide information which future work can draw upon.

I previously completed a degree in Japanese studies and, coming from a languages and humanities background, had few preconceptions about lab work. I enjoyed undertaking each stage of the experiments from beginning to end, including cell culture, making reagents, performing assays, analysing results, and preparing figures. During first-year practicals we were exposed to a fraction of the process of conducting an experiment, so it was valuable to think through the preparation and execution independently. This will serve as useful preparation for future practicals and for my undergraduate research project. I also had the opportunity to learn about the history of cell biology and engage with the existing literature on protein degradation and half-lives, which placed the project into context and gave me a better appreciation of the current state of the field.

I am currently preparing to go into the second year of my degree. I am still undecided about whether a career in research is the right path for me, but the project heightened my interest in cell biology, and I have a clearer idea of what a PhD entails and so can make a more informed decision about which direction to take after graduating. It was very inspiring to work alongside the members of the lab and I am grateful to them, in particular my supervisor Anne Clancy, for their time and guidance. I would also like to express my gratitude to the BSCB for funding the studentship, as I could not have undertaken the project without their generous support.

Rab GTPase function in a 3D spheroid model

Danielle Harte worked with Prof. Jeremy Simpson at University College Dublin

The aim of the research was to analyse morphological effects of Rab knockdown in 3D cell models (spheroids) and compare them to effects of Rab knockdowns in monolayer cultures. Rab proteins are small membrane-bound GTPases essential to the cell, functioning in membrane trafficking events throughout the endomembrane system. My project involved carrying out the knockdowns in spheroids, which would be compared to results from previous work in the lab using monolayer cells. In recent years, 3D cell culture has rapidly grown in popularity as it is believed to better recapitulate in vivo cell functions, and therefore provide a higher predictive power compared to traditional 2D monolayer cell culture. It has been observed by the Simpson group, and others, that knockdown of certain Rab proteins displays different effects in 2D and 3D cultures. We wanted to see if this also occurred with the other members of the Rab protein family, which consists of over 60 members in mammals.

At the start of the project I shadowed lab members and was taught essential skills for my project. After the initial 3 weeks I became independent in my own work, and had daily conversations with Professor Simpson and the other lab members to advise me on the next steps in my experiments. I optimised the culturing of uniform spheroids in 384-well plates and found that seeding 50 cells per well and growing them for 3 days gave the best spheroids for my experiments. I fixed and immunostained the spheroids,

using fluorescently-conjugated antibodies to stain for the Golgi apparatus, endosomes, lysosomes, and DAPI to stain nuclei. The spheroids were imaged on both manual and fully automated confocal microscopes. I was taught confocal microscopy and the techniques to acquire the best quality images. With the help of the lab's bioinformatician, I compiled the z-stacks and analysed the spheroid images in ImageJ software. From this we saw the staining needed improving. This was because these spheroids were bigger than those previously grown in the lab. To overcome these issues, I used new fixation and staining protocols, and I also employed different optical clearing methods. These optimisations improved the imaging quality of the spheroids. Then I trialled the siRNA knockdowns, tested different siRNA concentrations and times of transfection with both positive and negative controls to find the most optimal conditions. These optimisation experiments took most of the summer, but now the first replicate of the screen, depleting all the Rabs, has been completed, based on the protocols I established. The data are currently being analysed, and I am excited to see the results.

One aspect of the project I didn't expect was how much experimental optimisation would be required. It took up most of the time, and I would have liked to complete more replicates of the Rab depletions. However, these optimised protocols will be used by other lab members in the future to continue this work. Nonetheless, I am glad I experienced this aspect of research, as it is not unusual that experiments don't go completely to plan! Another facet of the project I didn't expect was to become so independent in my own work and confident in my abilities in the lab. I know this will really stand to me through my final year and my further career.

Overall, I really enjoyed my experience. I learned so much, and greatly improved both my dry- and wet-lab skills. I am now entering my fourth year and know all the skills I have attained will be of great benefit to my capstone research project. This internship has solidified my choice to pursue a career in research, and I'm now writing an application for PhD funding. I am immensely thankful to the BSCB, Professor Simpson, and everyone in the lab for this opportunity. This experience has completely determined the next steps in my career.

Novel approaches to stiffen nuclei to prevent cell invasion

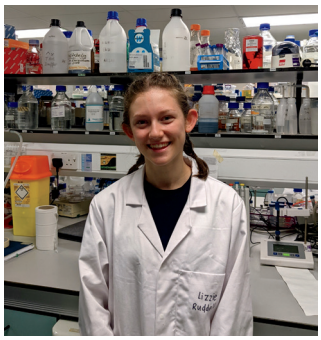
Elizabeth Ruddell undertook a studentship in Dr. Akis Karakesisoglou's lab at Durham University

The project I undertook investigated the effect of protein disulphide isomerase (PDI) inhibitors on nuclear stiffness and breast cancer metastasis. I used techniques to culture, treat and produce lysates from cells, then used western blotting and quantitative image analysis to investigate the difference in protein expression between control and PDI inhibitor-treated cells from the triple negative breast cancer cell line, MDA-MB-231. I also learned microscopy skills to support this.

By the end of the 8-week project I had run gels for around 15 different proteins in MDA-MB-231 cells under control conditions and dosed with each of 2 PDI inhibitors (16F16 and PACMA 31). For many of these proteins, I had triplicate data with 3 independent sets of lysates. I also had the opportunity to stain cells for various proteins we thought would be affected in quantity and localisation by PDI inhibitors, which I visualised with immunofluorescence. In particular, I found an interesting change in localisation with SUN2, which excited me.

The main difficulty in my project was finding a suitable loading control for my western blots, as PDI inhibitors seemed to affect levels of many common loading controls. The first few weeks of the project were also a big learning curve for me. Cell culture techniques in particular were challenging to learn, and it took time to understand the purpose of each technique and become confident carrying them out. Towards the end of the project the cells often wouldn't adhere to dishes, and so we had difficulty plating cells, and had to adjust my weekly plans. Through making mistakes I learnt that certain steps, such as dosing cells, required more focus so that I could be sure I had set up experiments correctly.

The main result from my project was that PDI inhibitors downregulate levels of most cytoskeletal components, LINC complex and LINC-associated proteins that I investigated, including lamins, keratins and SUN proteins. At the drug concentrations I used, PDI inhibitors may make cells softer and potentially more invasive. As this isn't the result we were expecting, Dr Karakesisoglou's lab will continue to characterise the effect of these drugs on breast cancer cells.



I'm now about to start my 3rd year at Durham University, where I'll learn more concepts and skills to support my understanding of cell biology, which will lead on to my 4th year, where I will undergo a 20-week lab project as part of my MBiol. This project will greatly help in my MBiol, as it has provided me with confidence in performing lab techniques and working collaboratively in a lab environment with other researchers, as well as teaching me how to experimentally approach a research question. Beyond this, the project has affirmed my aspiration to work on a PhD after graduating, and has provided me with great experience and skills to help me start my career in the future. I'm very grateful for the BSCB Studentship fund for allowing me to support myself over the course of the project, and to Drs. Karakesisoglou, Goldberg and Young, who provided me with thorough training and the opportunity to contribute to their research this summer.

Understanding the role of exosomes in chemo-resistance after therapy induced senescence in triple negative breast cancer cells

Sneha Sara Binu joined Dr. Helen Foster's lab at the University of Hertfordshire

A career in research has always been interesting to me. I moved from my home country overseas to pursue my career in research. Although my first year in university involved a lot of lab work, I was soon disappointed to learn that these valuable experiences would be restricted due to the COVID-19 pandemic. Following the completion of my second year and work placement, I attained a summer studentship at the University of Hertfordshire. I was more than ecstatic.

Therapy induced senescence (TIS) occurs due to the use of chemotherapeutic drugs. TIS can lead to a desirable outcome of stable cell cycle arrest and tumor cell suppression. However, it is also commonly linked with chemo-resistance due to its release of cytokines and other signaling molecules, a phenomenon known as senescence associated secretory phenotype (SASP). The aim of the project was to use MDA-MB-231 triple negative breast cancer cells as an in vitro model to determine if senescence/chemo-resistance biomarkers can be isolated and identified from exosomes.

This project was one of the best experiences I have ever had. Within the given timeframe, I was able to experience several laboratory techniques, all thanks to my supervisor and her relentless support. In addition, I attained new skills in bioinformatics and analysis software. I also deepened my interest and experience in cell and molecular biology techniques. Interestingly, cell culture was initially the most challenging technique for me. Now, I hope to further utilise cell culture assays within my research career.

The most exciting part of the project was that every day was different, and I didn't know what the experimental outcomes would be. If techniques or procedures did not go according to plan, I learned how to troubleshoot. One of the best outcomes of this project was learning to optimize techniques. I am indebted to the BSCB for giving me this incredible opportunity. I am also thankful to the University of Hertfordshire and all the technical and teaching team, specifically Dr. Lee Rixon for hosting me in their labs. Above all, I would like to thank my supervisor Dr. Helen Foster for providing me with the unforgettable experience, her patience and confidence in me helped me the most.

Cellular and molecular mechanisms of action of novel risk genes of Alzheimer's disease

Ece Urani worked in Prof. Giampietro Schiavo's lab at University College London

With the experience that I have been able to gain from this summer, I am hoping to move further into academics and get my PhD as soon as I can in a field that I love, and hopefully that can be neuroimmunology as well. The step-ups into academia that I would love to get are very rare and this experience was a tremendous step forward that would not be possible without the BSCB's as well as my supervisors', both direct and indirect, support. With this experience in my CV, I will surely be applicable to numerous more positions than I would have been otherwise in my near career, and for that, I would like to dearly thank the BSCB and my supervisors Prof Giampietro Schiavo and Dr Dervis Salih for opening the doors to infinity and beyond to me.

Investigating the biochemical basis for the poor survival of Tsc2$^{-/-}$ cells

Phineas Smith undertook a studentship with Dr. Berni Carroll at the University of Bristol

Having gravitated towards molecular cell biology during my time as a University of Bristol undergraduate I approached Dr Berni Carroll about working in her lab over the summer. The Carroll lab focuses on the mTORC1-autophagy pathway, BSCB gave me the opportunity to work with this lab group and get experience in cell biology techniques beneficial to my development as a research scientist. The summer project we proposed was part of a larger research endeavour in collaboration with the neurology department who are looking at how loss of TSC2 impacts brain development.

TSC2, part of the TSC1/2 complex, is a negative regulator of mTORC1 signalling. Therefore, loss of TSC1/2 function will result in cells with overactive mTORC1 signalling and cause/contribute to a variety of diseases – including the eponymous tuberous sclerosis. Recently, loss of TSC1 has also been linked to autism spectrum disorders. This is likely due to the reduction in cerebellar Purkinje cells – as observed in *Tsc1*$^{-/-}$ mice. The novel development of mice with a genetic knockout of TSC2 has been of interest to the neurology department at the University of Bristol. Dr Berni Carroll's lab is working with the neurology department to research the molecular basis for why Purkinje cells are sensitive to *Tsc2*$^{-/-}$ mutations.

I used *Tsc2*$^{-/-}$ mouse embryonic fibroblasts (MEFs) to test the hypothesis that *Tsc2*$^{-/-}$ cells die due to their failure to induce autophagy, particularly during mitochondrial stress. I measured autophagic flux in *Tsc2*$^{-/-}$ MEFs by lysosome inhibition or a control treatment. Western blotting showed the levels of autophagic proteins such as LC3 in the presence and absence of lysosomal inhibitors. A major challenge of this experiment was having to manage cell lines with different growth rates – an unavoidable reality of researching growth signalling! When seeding cells for experiments it was crucial they reached the same confluency at the same time, if they didn't the autophagic flux of the different samples would not be comparable. Learning to manage these different cell lines was a steep learning curve and a very useful skill for my research career going forward.

This experiment showed that, in comparison to WT MEFs, *Tsc2*$^{-/-}$ cells had lower levels of autophagic flux – as expected for cells with overactive mTORC1 signalling. Further investigation showed that autophagy was not dramatically induced by growth with galactose media in *Tsc2*$^{-/-}$ cells. Induction of mitophagy is an important mechanism to cope with mitochondrial stress, which would occur when cells are grown in the absence of glucose. *Tsc2*$^{-/-}$ MEFs' inability to induce autophagy strongly in these conditions may explain their sensitivity to galactose media. This hypothesis should be tested when the mouse neurons have been successfully cultured to explore why Purkinje cells are sensitive to Tsc2 mutations.

The larger scope of this project will offer a fascinating insight into how neuronal cells are sensitive to the loss of TSC1/2 repression of mTORC1 signalling and how this links to autism spectrum disorders. I am excited to see the data both the Carroll lab and the neurology department collect in the future. I am incredibly grateful to BSCB for the opportunity to work with the Carroll group – the skills I have developed over the summer would not have been possible to refine without the constantly available expertise of Dr Carroll, her researchers and the other two groups we shared a lab with. Their camaraderie, friendliness and generosity will forever uphold a standard of lab environment I can measure against. I also doubt I'll ever be part of a lab that holds regular morning workout circuits again!

Mechanisms of synaptic protein homeostasis – what ubiquitinates SNAP-25?

Georgia Boothe joined Dr. Katrin Deinhardt's lab at the University of Southampton

I applied for the funding as I wanted the opportunity to expand my knowledge of neuroscience beyond the scope of my course and develop my skills in the lab. Over 8 weeks this placement provided me with skills that can be applied to a variety of experiments ranging from PCR to microscopy.

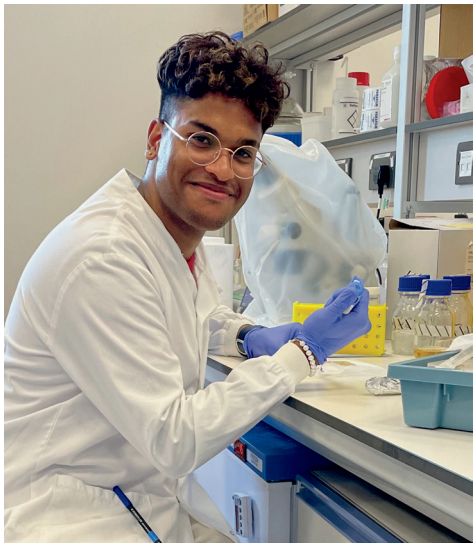
Throughout my studies so far, I have taken a particular interest in the cellular mechanisms that take part in short and long-term memory formation and how these mechanisms are disrupted in neurodegenerative diseases such as Alzheimer's. Dr Katrin Deinhardt's lab focuses on cellular and molecular neurobiology, specifically how neurons maintain themselves throughout our lifetime, which is why I was interested in working in Dr Deinhardt's lab. My research question investigated mechanisms of synaptic protein homeostasis- what ubiquitinates SNAP-25? I was particularly interested if there was a connection between E3 ligases and SNAP-25. E3 ubiquitin ligases govern the mechanisms underlying the selective recognition of specific crucial proteins or misfolded proteins through the ubiquitin-proteosome system. Our initial plans were to look at the ligase TRIM9 as this has been found to form a high affinity complex with SNAP-25. However, as TRIM9 is a large protein with multiple isoforms, I had trouble trying to amplify it through PCR. Instead, we used a construct of Nedd4, which is another E3 ligase, to see where it was localised in the cell and if it formed a complex with SNAP-25.

From this project I enjoyed building on my experiments from previous weeks. A frustrating part of this project was when planning PCRs that should have worked in theory but in practice didn't. Even though my PCRs for TRIM9 did not work, I learned how to optimize PCR conditions and I had success when making cDNA from RNA collected from different areas of the mouse brain. Over 4 weeks I was able to maintain a culture of PC12 cells and successfully differentiate them into neurons. From these experiments, I learned about the different sera that are used to maintain and differentiate PC12 cells. To see where Nedd4 was localised in the cell I transfected the PC12 cells with an overexpression plasmid containing Nedd4. From the immunostaining, it was clear that there was Nedd4 expression both in the nucleus and cytoplasm and that there was co-localisation of Nedd4 and SNAP-25.

During the placement I also had the benefit of attending a series of internal seminars given by the researchers and PhD students. I enjoyed attending these lectures, as it gave me a brief yet informative insight into the range of research that takes place at my university. Following on from this placement I am going to go into to my third year of my degree with a lot more confidence in my scientific writing and practical lab skills which is going to be beneficial for my independent lab project in the coming year. This placement has solidified my thoughts on wanting to do a PhD and having a career as a researcher in neuronal cell biology.

Investigating the fate of receptor–ligand interactions at the platelet synapse

Joel Baby undertook a studentship with Dr. Alice Pollitt at the University of Reading



I am an incoming third year medical student at the University of Cambridge. I applied for a studentship to allow me to pursue an opportunity to partake in cutting edge science, without having to worry about financial concerns. The cardiovascular side of medicine has always been a keen interest for myself; thus, I was on the hunt for a summer project which allowed me to pursue this interest. Having seen that there was an undergraduate research programme at the University of Reading, I reached out to my supervisor, Dr. Alice Pollitt, given her role in Cardiovascular Biology at the university and her specific areas of interest. The project involved the generation of plasma membrane sheets from HEK293T cells, upon which various ligands were stacked, terminating with a labelled recombinant fusion of the Podoplanin protein, followed by the addition of platelets and consequent imaging studies. Podoplanin has been implicated in the pathophysiology of major diseases, particularly cancer, but its overall biology is still poorly understood. Its interaction with platelets is mediated by the endogenous CLEC-2 receptor and is particularly important in the separation of the blood and lymphatic circulatory systems – an interaction that is also poorly understood. This study consequently hopes to establish an experimental in vitro replica – from which key insights about this interaction may be derived.

The experience was nothing short of phenomenal - it simply superseded my expectations. I was able to experience so many new aspects of scientific research and build up competencies with several different techniques such as cell culture and various microscopy modalities. Our project was successful and ended up obtaining proof of principle about how Podoplanin is either taken up or clustered by the platelet. One of the highs of the project was certainly the moment at which I saw the live cell imaging video! Although there were various lows in the time course of the project, without question, the overall experience was overwhelmingly positive, with (thankfully) minimal disruption from COVID-19.

During my project, there were often times when things went awry – it was important to think analytically about why this may have been the case and discuss these issues with my supervisor. Before coming to my project, I had framed research in my mind as stumbling by chance on a perfect research question and reaping the rewards. Now I realise that good research is more about deriving a reasonable hypothesis, understanding why things turn out wrong when trials are run, identifying the erroneous culprit, and implementing a solution which minimally impacts the scientific validity of the experiment and hypothesis. Without question, this experience has kindled the scientist within me, and I will strive to incorporate research into my future career as a doctor. Without the help of the BSCB or Dr. Pollitt, I know I couldn't have completed this project and thus, I am incredibly thankful to both parties for their support and assisting me to evaluate my affinity for experimental science.

Cellular studies on Shulin/DNAAF9 - a novel dynein assembly factor

Rhiannon Hughes worked at Dr. Girish R. Mali's lab at the University of Bristol

Given my interest in the molecular basis of disease and consequences of aberrant cellular pathways, I intend to undertake a PhD before pursuing a career in the pharmaceutical industry, contributing to development of therapeutics with positive impacts on patient lives. The molecular nature of protein-protein interactions and their impact on cellular function has always intrigued me, hence I was fascinated by lectures given by Dr Mali surrounding dynein function within epithelial cell cilia. The opportunity to undertake the project and contribute to research within Dr Mali's newly established laboratory in Bristol was incredibly exciting, particularly given the implication of such assembly factors in Primary Ciliary Dyskinesia.

This Studentship has provided me with invaluable experience, conducting experiments to produce data with real-world consequences, informing on cellular processes and their implications on human health. In addition to gaining confidence in using a various laboratory techniques, meeting and working with PhD students has been very enjoyable and consolidated my aspirations to pursue a PhD. The opportunity to become more competent in planning and executing experiments and study ciliary protein function during this studentship is one I have thoroughly enjoyed and I am extremely grateful to Dr Mali and the BSCB.

Does Fbxw10 regulate macropinocytosis?

India Oxley worked at the University of Sheffield with Prof. Elizabeth Smythe

There were many things that surprised me during this project such as I didn't anticipate how much optimisation is needed for experiments. I have also come to appreciate that a result is not always black and white and that there is often more than one way of looking at a result.

The project produced some interesting results: we found that when we knocked down Fbxw10 in HEK cells, it led to decreased macropinocytosis compared to the Control cells. This suggests that Fbxw10 possibly does have a role in regulating macropinocytosis.

This project has opened my eyes to working in a real lab and has provided me with essential lab experience that will make me more employable and give me an edge over other candidates when applying for a job.

Society Business

BSCB funding to support members throughout their careers

Full details of all schemes are on the BSCB website (https://bscb.org/).

The BSCB Honor Fell and Support Grants schemes continue to be popular and we ask that applications are uploaded at least 6 weeks ahead of time to allow for assessment and transfer of funds to successful applicants. We expect all successful applicants to acknowledge BSCB funding using our logos found on our website.

Honor Fell Travel Awards

Sponsored by the Company of Biologists, the Honor Fell Travel Awards provide financial support for BSCB members at the beginning of their research careers to attend meetings and courses. Applications are considered for any meeting or course relevant to cell biology. BSCB members may apply for funds for both an online and in-person conference in the same calendar year (these together will count as 1 travel award only). The amount of the award depends on the location of the meeting or course. Awards will be up to £400 for travel within the UK (except for BSCB Spring Meeting for which the full registration and accommodation costs will be made), up to £500 for travel within European and up to £750 for meetings and courses in the rest of the world. The application form and complete information about the scheme are available at https://bscb.org/competitions-awardsgrants/travel-bursaries/honor-fell-company-of-biologists-travel-awards/

Company of Biologists Support Grants

These grants are available for independent group leaders/ PIs with no current funds for travel to attend meetings, conferences, workshops, practical courses, PI laboratory management courses and courses to re-train. BSCB will also consider applications to attend virtual and online scientific meetings, conferences, workshops and courses. For detailed information and to apply please see https://bscb.org/competitions-awardsgrants/cob-support-grants/

Childcare Award

The BSCB now accepts applications to provide financial help with childcare or care for dependants when the applicant is presenting at a scientific meeting. For example, these claims can be for:

- Home-based childcare/dependent care expenses incurred because of meeting attendance (funds may not be applied to normal ongoing expenses).
- Travel of a relative or other care provider to your home to care for your child(ren) or dependent while attending a meeting.
- Travel of a care provider to the meeting with you to care for your child(ren).

For more information and to apply please see:
https://bscb.org/competitions-awardsgrants/travel-bursaries/child-care-award/

BSCB Imaging competition

THE BSCB runs an annual competition to shows the best of your research images.

Prizes: 1st Prize £200; 2nd Prize £100; 3rd Prize £50. Winners will be published on BSCB webpages and will also be used in the Magazine and other promotional material. Copyright will remain with the creator- if you do not agree that the images may be used as stated, you must state this on the entry form.

B Entrants must supply their name, address, email address, and BSCB membership number on entry. Entries must be sent by email (10 x 11.96 cm 300 dpi) to stephen.robinson@quadram.ac.uk). Only one entry per person is allowed. The subject matter of competition entries is flexible but must reflect current research in cell biology.

Further details:
https://bscb.org/competitions-awardsgrants/image-competition/image-competition-rules/

BSCB Science Writing Prize

The BSCB Science Writing Prize aims to encourage writing skill development in young researchers on topics of key relevance to cell biology. Entrants have either communicated their own research projects or science stories in the literature, in a clear and concise way aimed at a non-specialist audience, or written essays that were not be limited to research per se, but tackled a bioethical or science policy issue. The winner receives a prize of £500 and has their winning entry published in the BSCB magazine and online (both on the BSCB website and, subject to editorial acceptance, on the excellent www.lablit.com website).

Each year shortlisted entries are judged by an external expert. In previous years we have enlisted the kind help of Tim Radford (Writer and former Science Editor at The Guardian), Viv Parry (Science Writer and Columnist), Tania Hershman (Science writer, former science journalist and writer-in-residence at Bristol University), Dr. Jenny Rohn (a cell biologist at UCL, who is also a science writer, novelist, blogger, broadcaster, the editor of LabLit.com and the founder and chair of Science is Vital) and Barbara Melville (science writer, former writer-in-residence at the MRC Centre for Regenerative Medicine and board member with the Association of British Science Writers).

Remember: You must be a BSCB member to enter. The full rules and how to enter can be found at:
https://bscb.org/competitions-awardsgrants/science-writing-prize/

The British Society for Cell Biology

Statement of Financial Activities for the Year to 31 December 2021

	Unrestricted Funds	Restricted Funds	Total 2021	Unrestricted Funds	Restricted Funds	Total 2020
Income from:	£	£	£	£	£	£
Grants	35,000	–	35,000	35,000	62,500	97,500
Investments	36	–	36	887	–	887
Charitable activities						
Subscriptions	26,353	–	26,353	30,057	–	30,057
Other income	–	–	–	3,547	–	3,547
Total income	**61,389**	**–**	**61,389**	**69,491**	**62,500**	**131,991**
Expenditure on:						
Charitable activities						
Grants payable:						
CoB	–	3,109	3,109	–	4,650	4,650
Other grants	148	–	148	1,030	500	1,530
Studentships	29,719	–	29,719	20,865	–	20,865
Costs of meetings	2,537	–	2,537	3,374	–	3,374
Website expenses	728	–	728	588	–	588
Newsletter costs	4,049	–	4,049	4,075	–	4,075
Membership fulfilment services	11,609	–	11,609	13,724	–	13,724
Examiner's remuneration	2,950	–	2,950	2,760	–	2,760
Miscellaneous	163	–	163	219	–	219
Subscriptions	1,558	–	1,558	1,542	–	1,542
Insurance	1,423	–	1,423	1,117	–	1,117
Total expenditure	**54,884**	**3,109**	**54,884**	**49,294**	**5,150**	**54,444**
Net (expenditure)/income	6,505	(3,109)	3,396	20,197	57,350	77,547
Transfer between funds	–	–	–	–	–	–
Net movement in funds	6,505	(3,109)	3,396	20,197	57,350	77,547
Funds brought forward at 1 January 2021	246,010	81,485	327,495	225,813	24,135	249,948
Funds carried forward at 31 December 2021	**252,515**	**78,376**	**330,891**	**246,010**	**81,485**	**327,495**

BSCB Committee 2023

The Society is run by a Committee of unpaid volunteers elected by the Members. The Officers of the Society, who are all members of the Committee, are directly elected by the Members. The BSCB committee is comprised of eight office-holders (President, Secretary, Treasurer, Meetings Secretary, Membership Secretary, Magazine Editor and Web Co-ordinator) and up to 12 other ordinary members, including one PhD student representative, one postdoc representative and a schools liaison officer, who are coopted onto the committee.

The committee is always interested in hearing from cell biologists who wish to contribute to the society's activities. Members of the society are encouraged to nominate candidates for the committee or officers positions at any time. Formal nominations should be seconded by another member of the society. The committee is also happy to receive un-seconded informal nominations. Nominations should be sent to the BSCB Secretary.

The committee generally meets twice a year, at the spring meeting and in the autumn in London. Additional meetings are arranged from time to time. Items for consideration by the committee should be submitted to the Secretary prior to the meetings. The BSCB has charitable status (registered charity no. 265816). The BSCB AGM is held every year at the Spring Meeting.

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The BSCB Ambassadors are the society's advocates in the UK cell biology community. They should be your first point of call for information about what the society can do for you and also how you can get involved. They should also be the people readily available to ask about sponsoring you for membership.

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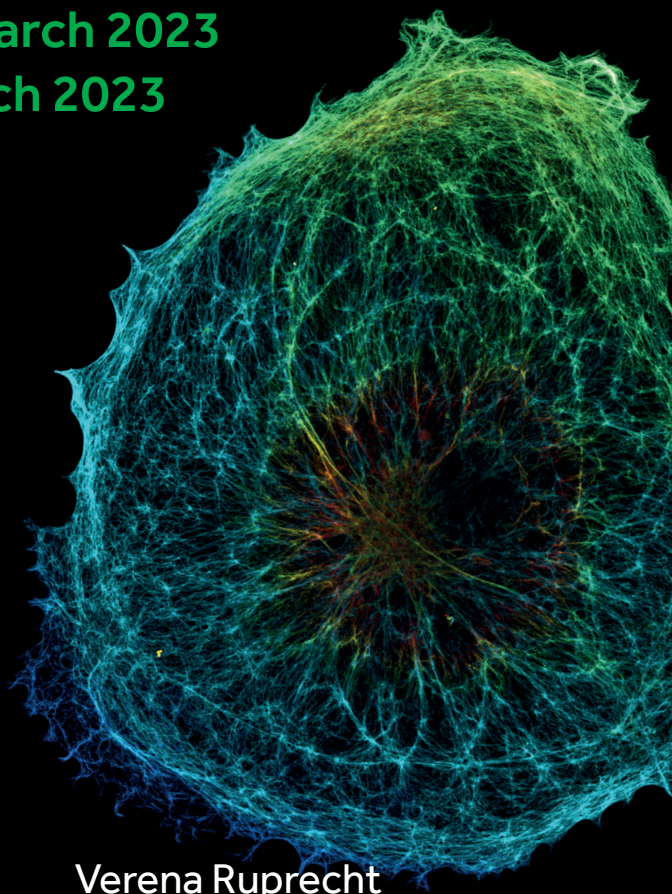

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