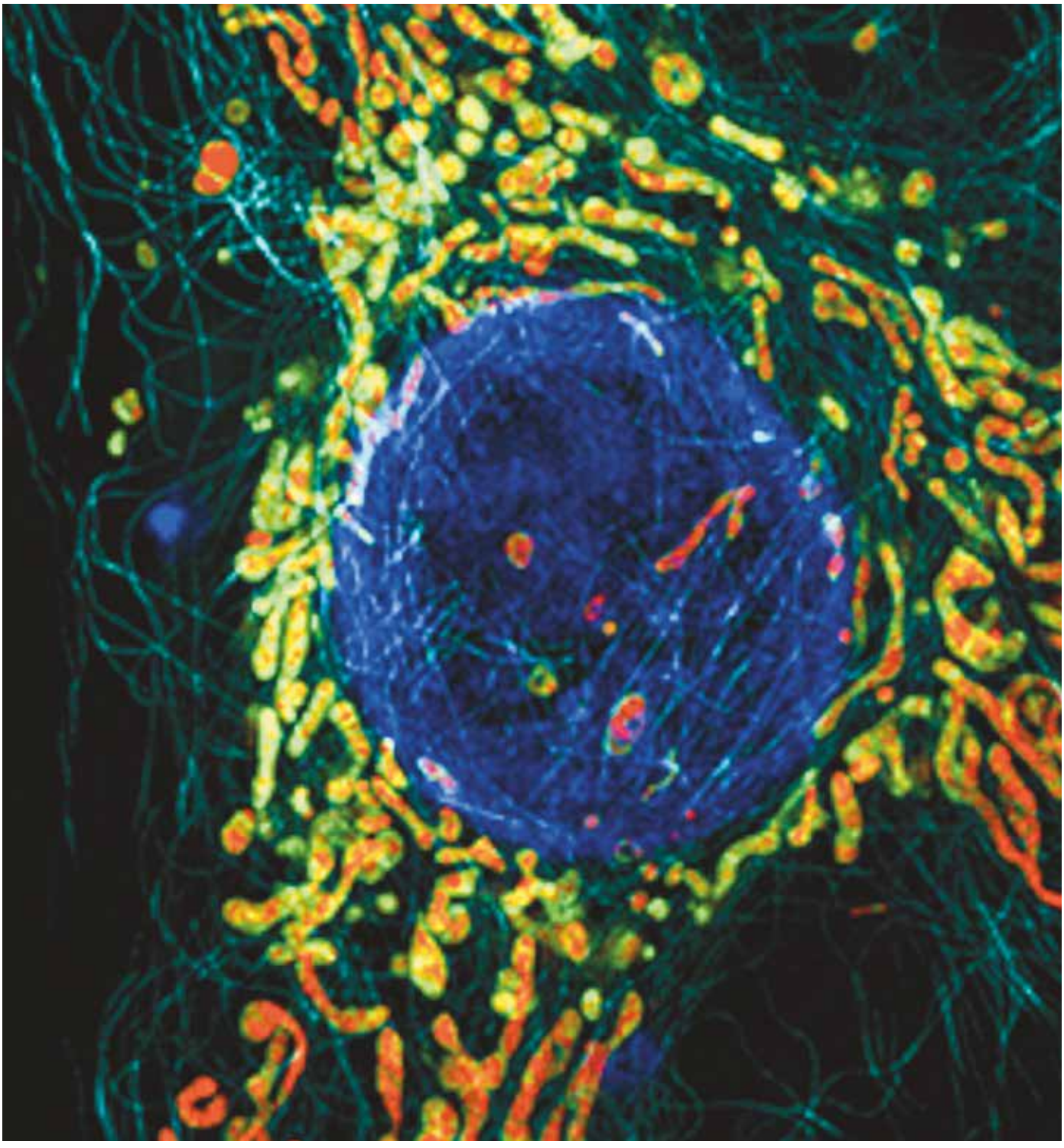
2021

BSCB Magazine

BRITISH SOCIETY FOR CELL BIOLOGY



BSCB

1st joint meeting of the French and British societies for cell biology

Cell la vie !

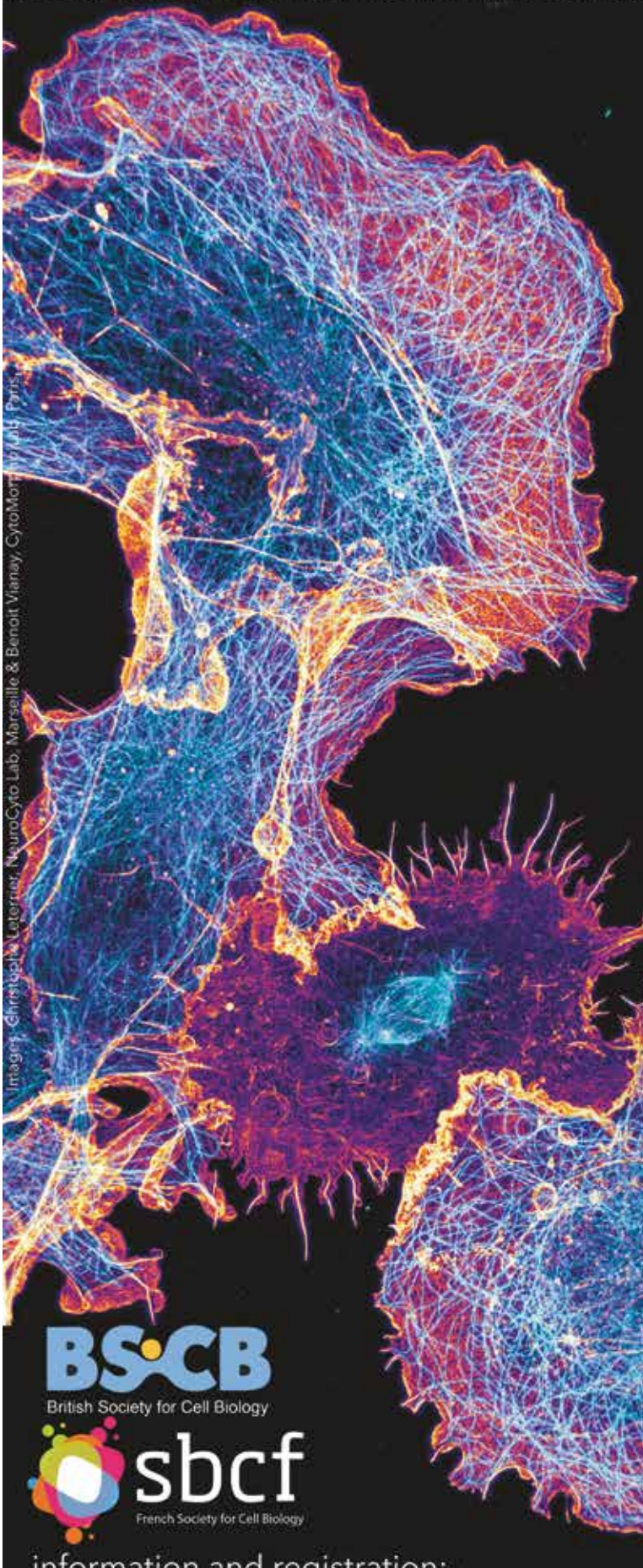


Image: Christophe Leterrier, NeuroCyto Lab, Marseille & Benoit Vianay, CytoMorpho Lab, Paris

21-23 September 2022
Institut Pasteur, Paris

Keynote speakers

Julie THERIOT
Pere ROCA-CUSACHS

Invited speakers

Simon BULLOCK
Christoph DANELON
Guillaume DUMENIL
Julien DUMONT
Annika GUSE
Jennifer LIPPINCOTT-SCHWARTZ
Roberto MAYOR
Stephanie MISEREY-LENKEI
Inke NATHKE
Jordan RAFF
Anne-Cecile REYMANN
Maria-Elena TORRES-PADILLA
Sara WICKSTROM

BSCB
British Society for Cell Biology

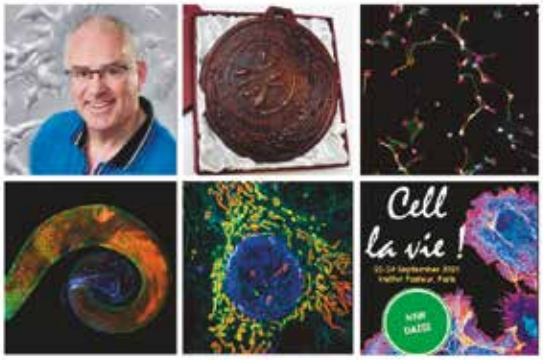
sbcf
French Society for Cell Biology

information and registration:
www.atoutcom.com/cell-la-vie/

33 selected talks from abstracts

Organisers: Jennifer Rohn, Anne Straube, Julie Welburn (BSCB), Christophe Lamaze, Nathalie Sauvonnet, Manuel Théry, Marie-Hélène Verlhac (SBCF)

BSCB Magazine 2021



Editorial

Welcome to the 2021 edition of the BSCB magazine. It's been an incredibly eventful year, full of challenges both personal and professional for all of our members. For the BSCB in particular it has been a major time of change. The first lockdown was announced so close to our Spring meeting in 2020 we ended up deferring it to 2021. Our Dynamic Cell meeting was jointly organised with the Biochemical Society and ran from 14–19th March 2021. As always, the remit of the meeting was broad, with a focus on cellular dynamics and stimulated novel collaborative approaches and the application of new technologies to established fields. The meeting was well attended and we would like to thank everyone who was able to make the meeting virtually.

Due to the ongoing pandemic, we have made the decision to change our plans for the *Cell la Vie!* Meeting with the French Society for Cell Biology again. The meeting in September will now become a one-day online meeting on 23rd September, organised by ECR's from both British and French Societies. Details are still being worked out and will be communicated when finalised as well as updated on the meeting website: https://www.atoutcom.com/cell-la-vie/. Please follow our the BSCB twitter feed @official_bscb for updates.

We have been really inspired by our members response to the Covid 19 pandemic. Several of our early career members have taken the opportunity to move seminars online and form new initiatives for scientific dfiscussion. This has resulted in a democratisation of science and widened access for discussion in topics such as cilia, molecular motors, cell motility and autophagy. Please see page xx for more information. Meanwhile in the BSCB we have continued working, albeit on zoom, and are delighted to launch our two new medals and announce the winners of these. We discuss how the medals were designed on page 4. As ever we also feature interviews with our Hooke and WICB winners on pages 6 and 9 and send both Ian Chamber and Yanlan Mao well deserved congratulations. We welcome new PhD and Postdoc reps to our committee, see page 5, as well as new committee members Dr Tom Nightingale, Dr Victoria Cowling and Professor Giampietro Schiavo. Sadly we also say goodbye to several of our time served committee members including Judith Sleeman our web editor, Andrew Carter, our Membership Secretary, Julie Welburn who managed the Honor Fell awards for several years this year Anne Straube will step down after excellent service as meetings secretary to be replaced by Susana Godhino.

Last summer, our summer studentship coordinator, Maria Balda, made a bold initiative of suggesting we continue to offer our summer studentships online. This resulted in some excellent but quite different projects to read about what our students got up to please see page 32. We also have meeting reports from the last few in person meetings our members were able to attend and look forwards to hearing your response to our online meetings and members survey in 2021.

Enjoy reading this issue of our magazine and hope to see you virtually at *Cell la Vie* online.

Ann Wheeler – Magazine editior

Front cover: Structured Illumination Microscopy (SIM) image of a HeLa cell expressing mScarlet localised to the mitochondrial matrix (red). Mitochondrial membranes are shown in green (MitoTracker Green), cell nuclei are labelled with DAPI (blue), and tubulin is shown in cyan. The image was taken using a DeltaVision OMX v4 imaging system (GE Healthcare).

The image was taken by Hope Needs, University of Bristol, and was the winner of hte BSCB Image Competition 2020. See page 14.

Above: Ian Chambers, Hooke award winner; BSCB medals; BSCB imaging competition winners; Cell la Vie meeting.

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BSCB website: www.bscb.org

Society News

BSCB President's Report 2020

I hope you enjoy this year's BSCB Magazine, which provides insight into the many activities that you can get involved in as a BSCB member. I want to take this opportunity to describe some positive BSCB events in 2020 and look forward to BSCB events in what will be happening in 2021.

We launched two new annual prizes in 2020: The Raff Medal for PhD students and the BSCB Postdoctoral Researcher Medal. There was intense competition for the prizes, with many excellent candidates, reflecting the high quality of research carried out by BSCB PhD students and postdocs. I am delighted to announce that the Raff Medal was awarded to Flora Paldi (University of Edinburgh) and the Postdoctoral Researcher Medal to Agathe Chaigne (Laboratory for Molecular Cell Biology, UCL). The medals will be awarded at our virtual Dynamic Cell IV meeting (14–19 March 2021), accompanied by a short talk by each of the medal winners. These prizes were proposed and championed by our BSCB committee PhD student rep Joyce Yu and our postdoc rep Gautem Dey. We are very grateful to them for their commitment and attention to detail from the first concepts to the advertising and awarding of the prizes. Joyce and Gautem finished their time on the BSCB committee at the end of 2020, and our new reps, Rowan Taylor (PhD rep) and Alex Fellows (postdoc rep) have coordinated the design of the two new medals, which will be ready to award to our medal winners in March.

The ongoing pandemic means that we now have a backlog of BSCB Hooke Medals and Women in Cell Biology Early Career Medals to award and celebrate. The 2020 winners were Ian Chambers (Hooke Medal, University of Edinburgh) and Yanlan Mao (WICB Early Career Award Medal, Laboratory for Molecular Cell Biology, UCL). Ian's research focuses on the mechanisms of stem cell pluripotency. Yanlan investigates the mechanics of tissue growth and regeneration, using an array of interdisciplinary approaches. We had originally planned to present the 2020 winners with their medals at our 2020 annual meeting. Sadly, we had to make the decision to postpone this meeting for a year, which would have been our first in partnership with a non-UK society, the French Society for Cell Biology (SBCF). It is now scheduled for September 2021 (see page 3 for more information). Instead, they will present their research and receive the medals virtually at our Dynamic Cell IV meeting.

I am also delighted to announce the 2021 Medal winners: Stephen Royle (Hooke Medal, University of Warwick) and Vivian Li (WICB Early Career Award Medal, Crick Institute, London). They will give their award presentations and receive their medals at our 22–24 September 2021 meeting in Paris, 'Cell Ia Vie'.

In contrast to most UK societies, we decided to go ahead with awarding our BSCB summer studentships for the summer of 2020. This enabled 12 undergraduate students to carry out 6–8-week research projects with the laboratories of BSCB members. Most of these ended up being data analysis projects online, which gave the students valuable experience in visualising and studying cell biological results – see reports from these students on page 32.

As a BSCB member, your registration fees for our meetings this year are substantially discounted, so please do take advantage of this benefit by registering for Dynamic Cell IV (March 2021) and/or 'Cell Ia Vie' (September 2021). If you are a PhD student or postdoc, you can apply for an Honor Fell travel award to help fund your registration costs and travel for any conference, meeting, or workshop relevant to cell biology, including a BSCB meeting. Group leaders who do not currently have any conference funds in their grants are eligible to apply for Company of Biology Travel Awards. We are also awarding these for registration for virtual online scientific conferences/ meetings. Please visit our website to find out more about these awards, as well as other ways you can get involved with the BSCB.

I enjoyed meeting many of you online at Dynamic Cell IV and look forwards to seeing you again at 'Cell Ia Vie' online in September 2021 and in Paris in 2022.

Anne Ridley
BSCB President

BSCB News

Lockdown did not stop the BSCB from working. Instead we moved online. During Lockdown the BSCB twitter feed provided a hub for the Cell Biology community's work in keeping scientific discourse and debate going. In particular several journal clubs and seminar series which sprang up.

Several BSCB events went online, including our summer projects. Dynamic cell which was postponed from last year is now happening online to find out more about what is happening please see our webpage.

The BSCB committee went fully online, as the committee membership is taken from the whole of the UK its not uncommon for one or two members to join our twice yearly committee meetings remotely. However for our November meeting everyone was online, providing a rare opportunity for us to be photographed, or captured in a screenshot together. If you are interested in getting more involved in the BSCB committee please contact our Secretary.

The BSCB opened two new medals, the Raff award and the Postdoctoral Researcher medal to applicants. Several applications were received and the winners will be announced at our Spring meeting.

To support researchers during lockdown the BSCB launched a Covid assistance fund – see below.

Due to the ongoing pandemic, we have made the decision to change our plans for the Cell la vie! meeting with the French Society for Cell Biology in September 2020. The meeting in September will therefore now become a one-day online meeting on 23 September, organised by ECRs from both British and French Societies. Details are still being worked out and will be communicated when finalised as well as updated on the meeting website: https://www.atoutcom.com/cell-la-vie/

The main Cell la vie! meeting will be postponed until 21–23rd September 2022, to be held at the Institut Pasteur in Paris as before. Full speaker list and registration details will again be advertised in due course.

Stephen Robinson, UEA, has taken over from Judith Sleeman as our Digital content, Imaging competition and writing competition manager; we would like to thank Judith for all of her work and welcome Stephen on board. Since we have had to postpone several of our meetings and labs have been affected by closures, we have decided to extend our deadline for the imaging writing competitions to 30 June 2021.

The Company of Biologists launches new journal websites

The Company of Biologists has migrated its leading journals to the hosting platform of Silverchair.

The websites of the five journals – *Development*, *Journal of Cell Science*, *Journal of Experimental Biology*, *Disease Models & Mechanisms*, and *Biology Open*. are available via https://journals.biologists.com and have been given an updated, modern design, with additional functionalities, such as split-screen view for easy data reference. Moving platforms has also given the Company's journals access to a range of partner integrations via Silverchair.

COVID Assistance Fund

The BSCB was concerned about the additional pressures the current and ongoing COVID restrictions are placed on those with caring responsibilities. To mitigate this, the BSCB announced an initiative to provide financial support for those in this situation, termed the Covid Assistance Fund.

This funding could be used to cover any additional costs incurred, for example to support extra childcare or carer support. We offered grants of £200, from a total fund of £5,000, with application deadlines every 2 weeks. Preference was given to students, postdocs, early career PIs, and those with extraordinary circumstances. The funding was well received, and we were able to provide support to five BSCB members when they most needed it.

Designing the Postdoc and PhD Medals

Our PhD reps, Alex and Rowan have taken on the challenge of designing the medals for our new Raff and Postdoc awards. To help them realise our aspirations they engaged the assistance of Beata Mierzwa, Postdoctoral Fellow and Science Artist at the Ludwig Institute La Jolla, USA. Beata is also an AAAS If/Then ambassador for women in Stem:

Beata Mierzwa, is a molecular biologist working on cell division of animal cells. She combines her two passions – science and art – to create unique and unconventional illustrations. During her research, she realized that these two have a great deal in common and that combining these passions creates a unique way to communicate science. She wanted to add some creativity to the conventional forms of scientific communication, with the aim to spark interest inside and outside the scientific community. Her drawings are designed illustrate scientific themes with an artistic twist, and aim to highlight fundamental scientific aspects in an unconventional way. She creates her drawings for everyone to enjoy – for scientists to appreciate biological findings in a refreshing way, and for non-scientists to discover the beauty in fundamental biological principles.

Beata says "Every drawing is an experiment! I create my artworks by making a detailed pencil drawing on paper with colors added digitally. For my microscopy fashion, I spend many hours in a dark microscope room and capture the most beautiful images I can find, and compile them into aesthetic patterns."

Designing the PhD award- Raff medal

"I tried to highlight several different aspects related to Professor Martin Raff's discoveries. The membrane and Ig receptor highlight his work on B and T cells, as well as the discovery of the fluid nature of membranes. The Schwann cell going around the medal refers to the first antibody markers that were able to distinguish neural cell types."

Designing the Post-doc research medal

"The aim here was to illustrate the international nature of excellence in science whilst also recognising that Postdocs contribute to the community in many ways. The words in Latin stand for 'knowledge', 'teaching' and 'community'."

To see more of Beata's beautiful work see https://beatascienceart.com/

Her shop is at https://www.etsy.com/shop/beatascienceart

Meetings Calendar 2021–22

March 2021

The Dynamic Cell
14– 19 March 2021. Online
BSCB Meeting
bscb.org/meeting/the-dynamic-cell-iv/

May 2021

Cell Dynamics: Host-Pathogen Interface
23–26 May 2021. Pestana Palace Hotel, Lisbon, Portugal.
Company of Biologists sponsored workshop
www.biologists.com/meetings/celldynamics2021/

September 2021

Cell La Vie
23 September 2021. Online
BSCB Meeting

October 2021

The Cytoskeleton Road to Neuronal Function
17– 20 October 2021. Wiston House, West Sussex, UK
Company of Biologists sponsored workshop
www.biologists.com/workshops/october-2021/

June 2022

Creative Science Writing Workshop
26–29 June 2022. Wiston House, West Sussex, UK
Company of Biologists sponsored workshop

September 2022

Cell La Vie
21–23 September 2022. Institut Pasteur, Paris
BSCB Meeting

BSCB-supported one-day meetings

British Microtubule meeting
Postponed to May 2021

Cilia meeting
Held as regular virtual meetings, in person meeting postponed to May 2021

North of England Cell Biology meeting
Transferred to monthly and virtual for this year

Our new Postdoc and PhD reps

ALEX FELLOWS

My research focuses on intracellular trafficking in neurons and how this process is regulated by the motor protein dynein. The precise movement and spatial positioning of cellular cargo such as mitochondria, RNA and endosomes are essential for the survival and maintenance of neurons. Consequently, perturbations of intracellular trafficking have been linked to both neurodevelopment and neurodegenerative diseases and thus represent an important area of research.

I began working on intracellular trafficking during my PhD in the lab of Giampietro Schiavo at UCL. The Schiavo lab works to understand how axonal transport deficits lead to the development of the neurodegenerative disease amyotrophic lateral sclerosis (ALS). My work involved using light microscopy techniques both in cell and in vivo to measure transport in neurons. I uncovered a new regulator of intracellular trafficking, the insulin-like growth factor 1 receptor (IGF1R), which could be targeted to rescue trafficking deficits found in a mouse model of ALS. Interestingly, IGF1R influenced trafficking by altering the levels of BICD1, a dynein adaptor protein. In 2019, this work led me to join to the Carter lab (MRC-LMB) in Cambridge for my postdoc as I became incredibly interested in how dynein regulated this process and wanted to continue this research. I now combine in vitro reconstitution, structural and neuronal cell biology techniques to further explore this process.

'I'm really proud to represent the cell biology Postdoc community and want to help support it anyway I can. This will include continuing to promote the new Postdoc award, further developing the early career researcher section on the BSCB website and setting up new mini-symposium for ECR career development. If anyone has an ideas or ways they think I could help please get in contact.'

ROWAN TAYLOR

Rowan Taylor is a final year PhD student in the new Leeds Centre for Disease Models at University of Leeds, in the lab of Prof Colin A. Johnson. Her research is focussed on understanding the cellular and molecular basis of inherited retinal diseases (IRD) and ciliopathies. Rowan uses CRISPR/Cas9 gene editing in induced pluripotent stem cells to introduce disease variants in primary-cilia associated genes. These cells then undergo directed differentiation to form retinal and renal organoids, 3D cell models, in order to analyse the molecular bases of disease pathogenesis in a physiologically relevant cell model. She will be carrying out a placement in the lab of Prof Ronald Roepman at Radboud University, Netherlands later this year to work on introducing endogenous tags, such as SNAP-tag and HALOTag , to disease genes for advanced proteomics and microscopy.

Rowan also works as a STEM Educational Outreach Fellow at the University of Leeds. This role involves engaging with school students to encourage interest in STEM subjects by creating and delivering workshop content at the university and in schools. She hopes to apply these skills to the role of PhD representative at the BSCB to plan effective,

engaging events for the early career research members of the BSCB. Her key aim as PhD rep is to ensure postgraduate researchers are able to fully benefit from the network of peers accessible from the BSCB, to enrich their personal and career development. She is particularly looking forward to planning career workshops and the early career symposium for Dynamic Cell IV in the Spring.

Rowan is excited to work with the BSCB to is keen to hear from postgraduate researchers as to what she can do for them within this role. She looks forward to meeting you virtually at the upcoming BSCB events. You can follow Rowan's research and outreach activities on her twitter feed @ ResearchRowan.

Schools news: The BSCB/CIMR CELLpics website for schools

On 12 January 2021 the Adobe Corporation closed down its FLASH facility. With the demise of FLASH we have lost the joint BSCB/CIMR [Cambridge Institute for Medical Research] website for schools about cell biology.

Using its unique GridPoint alpha-numeric 'Cross-hairs' location device, students and teachers could locate precisely a particular point on the micrographs shown and highlighted. Examples included mitochondria, endoplasmic reticulum and Golgi apparatus.

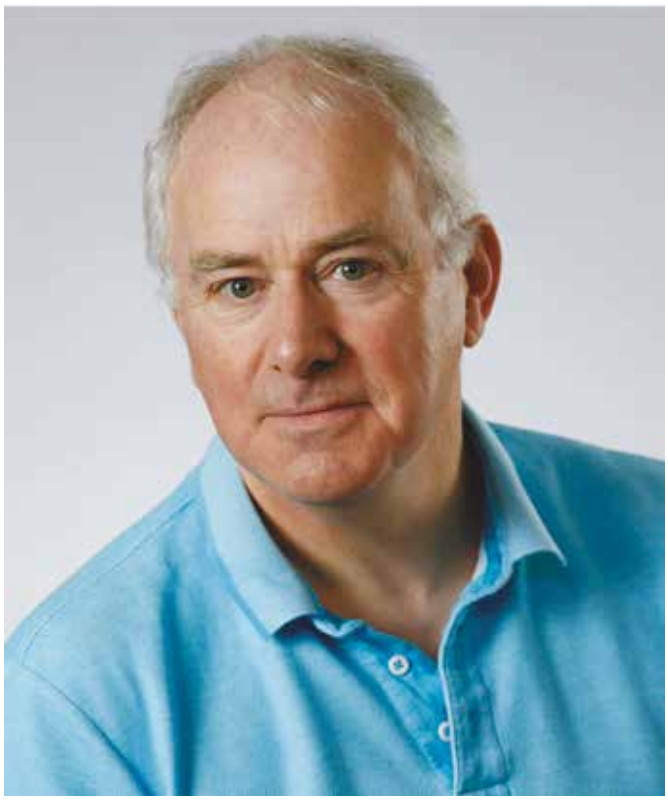
In its heyday (2015/16) it attracted nearly 7,000 viewers a year from the UK and a variety of other countries including the USA, Brazil, Malaysia, India and Australia where we enjoyed link with the Australian Society for Cell Biology. The text was translated into Norwegian and used on the website of the National Education Department. In the UK it was listed by the Open University for their students, on JISC and 'Merlot' in the USA. It was also referred to in a highly regarded textbook for students studying biology at A-level.

CELLpics had its origins in a request I made to the BSCB Committee for a facility to show micrographs in full colour with explanatory text and some sort of 'pointing device'. A big request! A then member of the BSCB Committee and Director of the Cambridge Institute for Medical Research (CIMR), Professor Paul Luzio, said "leave it with me". Paul magnificently supported the project by asking and permitting his extremely able Microscopy Facility Manager, Matthew Gratian, to help me. I would select the micrographs, many kindly supplied by The Wellcome Trust, write the text and explain what I would like to point to on the micrograph. I had it in mind that I would like to have a cross-hairs device coupled with the ability to define a grid reference point. Matthew came up trumps and 'GridPoint' was developed and Matthew added-in a useful highlighting device.

Sadly it has now all gone, and as far as we know there is nothing except very advanced graphics programmes that could replace it. Electronics can be a great terminator. Information from Ancient Egypt, Rome and Greece can be deciphered and read, but not CELLpics!

David Archer, Schools Liaison Officer.

Hooke medal winner 2020: Ian Chambers



Ian Chambers received the 2020 Hooke Medal, established to recognise an emerging leader in cell biology.

Ian studied biochemistry at the University of Strathclyde in Glasgow, and then did his PhD in the laboratory of Paul Harrison at the Beatson Institute for Cancer Research, also in Glasgow. He studied the control of gene expression during the differentiation of erythroid precursor cells, discovering that the amino acid selenocysteine is encoded by UGA, which until then was thought to work only as a termination codon. Ian did his post-doctoral work on the regulation of the human immunodeficiency virus (HIV) with Paul Berg at Stanford University in California, USA. In 1991, he returned to Scotland to work on stem cell regulation with Austin Smith at the Centre for Genome Research (later the Institute for Stem Cell Research) at the University of Edinburgh, UK. During that time, Ian identified the transcription factor Nanog, which directs efficient embryonic stem cell self-renewal. Ian started his research group in 2006 at the University of Edinburgh, where he is also a Professor of Pluripotent Stem Cell Biology.

Ian's laboratory tries to understand the regulatory networks and transcription factors that control the identity of pluripotent embryonic stem cells, and how these modulate cell fate decisions during the differentiation process. Ian is now the Head of the Institute for Stem Cell Research at University of Edinburgh, an EMBO member and a Fellow of the Royal Society of Edinburgh.

What inspired you to become a scientist?
Most of my schooling was in Ayrshire, and because Alexander Fleming was born in Ayrshire, we heard about penicillin from an early age. However, there was one instance in secondary school, when the chemistry teacher had everyone in the class around the front bench and he asked what would happen if he mixed two measuring cylinders, one with dried peas and the other with dry rice grains. He said, "I've got 100 ml of each, so if I pour one into the other I'll get 200 ml, won't I?" and I said "No, I disagree because there's space between the peas for the rice to fit in." He was talking to us about differently sized atoms and how space exists between atoms. I thought, "Anybody can do this, this is easy." Another thing that made me curious about science was a BBC television dramatization of Louis Pasteur's life, which I found very interesting, and it was through listening to it that I started thinking about what an amazing person Pasteur was. We'd all learnt about pasteurisation, but the fact that Louis Pasteur was able to use reason to discover the basis of a disease like rabies without being able to really see any of the causative agents involved was quite a profound thing for me. I still find it quite amazing that by pure reason he was able to advance knowledge.

What questions are your lab trying to answer just now?
We want to know, and this is something that many other people are trying, too, how a cell with more than one fate can choose to do one thing rather than another. Specifically, what we're interested in is how transcription factors work – how these molecules interact with other partner proteins and also with DNA to deliver function. And how these protein–DNA complexes connect to RNA polymerase is an important part of the puzzle that I don't believe has been fully worked out yet.

What has been the most influential publication or work in your field recently?

We're understanding more and more about many of the molecules that are involved in embryonic stem cell (ESC) self-renewal and the decisions to differentiate. Obviously, the most important experiment was the one that Kazutoshi Takahashi and Shinya Yamanaka did 14 years ago (https://doi.org/10.1016/j.cell.2006.07.024) [where they induced pluripotent stem cells from fibroblast cultures]. I think more recently, in terms of gene transcription, there has been a lot of excitement around the concept of phase separation in biochemical systems; this has received a lot of attention but it's not uncontroversial. The idea that high concentrations of molecules can somehow gather into a different phase, with separate physical properties from the liquid around them, and be important in controlling cellular events is interesting from the point of view of transcription. One of the experiments that has been used to support phase separation is shown in the paper from Takashi Fukaya and Mike Levine (https://doi.org/10.1016/j.cell.2016.05.025). They showed that a developmental enhancer placed between two separate promoters would activate transcriptional bursts from both promoters simultaneously. That certainly suggests that promoters are activated in response to whatever that enhancer-emanating event is, and people have used that argument to say that phase separation may occur, but I think there are other possibilities; for instance, local concentrations of regulators may be sufficient to explain that.

In terms of development, if I had to pick out one paper from the last ten years I would choose the paper from Emma Farley, again from Mike Levine's lab, which was published in Science in 2015 (https://doi.org/10.1126/science.aac6948). It talks about the sub- optimisation of developmental enhancers. It's a really great piece of work. They study a particular enhancer in the sea squirt Ciona, and show that if they increase the affinity of transcription factor-binding sites or optimise the spacing between transcription factor binding sites within the enhancer, the enhancer works better. That's no surprise, right? But then they show that development doesn't work properly and cells don't perform the way that the developing Ciona would like them to. I think that is quite profound and has echoes in other systems. For example, in ESC cultures, some cells self-renew while others differentiate. We can make self-renewal uniformly efficient by increasing the concentration of some pluripotency transcription factors, such as Nanog, or by halving the concentration of another pluripotency transcription factor, Oct4. What this means is that the normal transcription factor circuitry in ESCs is suboptimal and that the demise of the pluripotent state is encoded within the network of transcription factors that are required to maintain pluripotency. In the embryo, the cell type that is equivalent to ESCs is transient and differentiates quite quickly, which of course, is what is required developmentally.

Have you had any 'eureka' moments, for example, when you discovered the selenocysteine codon or the transcription factor Nanog?

Well obviously, luck is a big part of this. Before we cloned Nanog, we spent quite a bit of time trying to clone a cDNA encoding an activity from a conditioned medium that modified ESC growth. What we ended up cloning was LIF, which everybody had known for over ten years drives ESC self-renewal. We still don't know how that plasmid got into the libraries. That was a wee bit of a setback. When we were designing the experiment that finally led to the cloning of Nanog, we decided that we would increase our chances of catching something by casting as wide a net as possible. We knew that self-renewal was more efficient when ESCs were grown on top of a heterologous feeder layer of fibroblasts. We didn't really know why that was at the time, but we thought it might be because fibroblasts need to be in direct contact with the ESCs in order to provide them with a signal that optimised self-renewal. Anyway, that worked. We cloned Nanog from the resulting library. There's nothing like failure to sharpen your mind. Thinking things through from a previous experiment helped us do things better. The 'eureka' moment was when we sequenced individual plasmids from the self-renewing colonies. There were multiple copies of a single transcription factor in there so at that point I knew that we had it. But I didn't talk about it and I didn't tell my boss about that for several months until it was totally nailed down.

The 'eureka' moment from my PhD was quite interesting. I was studying the basis of differentiation of red cell precursors by focussing on the control of gene expression of non-globin genes (many groups were already working on globin). We didn't know much about the gene I was working on. So, one of the things I had to do was sequence the gene. This was in the mid-1980s, so we were running our own sequencing gels. There was something that was puzzling me because I could see a stop codon right in the middle of the open reading frame. I thought it must be a mistake. We ran homology searches and found nothing. Finally, we got a match to a protein that had just been published, but we couldn't access the paper at the University of Glasgow, so I had to go across the city to the University of Strathclyde library, which was a 40-min bus ride. Once I had the photocopied paper, I looked at the sequence and thought 'there's this funny amino acid and it's sort of in the same position as this funky stop codon is'. I was a wee bit excited, so I zipped across the city back to the lab, which took me another 40 min, and by this time it was about eight or nine o'clock at night. I put it all together but at that point I think there was only one other PhD student in the lab. But that was definitely an 'eureka' moment.

You mentioned failure is an opportunity to learn. How do you mentor your students or postdocs to deal with mistakes or failures?

We just have to be rigorous and systematic. There's nothing wrong with failure; we learn more from our failures than we do from our successes, so it's an opportunity for 'growth and self-realisation'. We always have to try to look at the evidence as critically as we can and try to figure out what's gone wrong. Sometimes there are too many parameters to troubleshoot but we still have to try to approach things in a systematic manner. You need to look at your data critically and always be rational; one reason people can fail is because they don't always look at the evidence carefully enough. When you are doing something and you get a setback, it's easy to quit, but it's important not to.

What is the best science-related advice you ever received?

There are a number of them. Louis Pasteur said: "Chance favours the prepared mind", which just means read, read, read! And then when you find something odd, you're prepared to make sense of it. I also like a quote from

Left: Ian with his wife and fellow biologist Helen Wallace during a walk on Irvine beach, Ayrshire, with the hills of Arran behind.

Mohammed Ali. I have a poster in my office with a picture of him training, and it says "The fight is won or lost away from witnesses – behind the lines, in the gym, and out there on the road, long before I dance under those lights." I think it's important that people get this. Everybody wants to succeed. There was a mock version of the Lady Gaga hit, a few years ago, out of Baylor University (https://www.youtube.com/watch?v=FI4L4M8m4d0) about being stuck in a bad project. People want to have something interesting to say that means that they have succeeded on a project – something they can talk about, describe their fantastic findings at a conference and get feedback on from the top people in the field. But to get there you need to work hard and you need to put in the hours when many other people won't be there. People get lucky, but it's not all about luck, it's about work.

What is the most important advice you would give to someone about to start their own lab?

I think probably the best thing you can do is find a positive but critical and sympathetic mentor to talk things through with. That's not something that everybody does. There are also networks of new PIs. Not long ago, I went to an EMBO course on how to be a PI; maybe I should have done that a long time ago, but you can always learn something. Most of the people there were just starting their labs. This is a great opportunity to get together with people who are in the exact same position, leading to a network of support that might help take people through their earliest years.

How are circumstances different now for early-career researchers compared with when you started your lab?

I think many things remain the same; the biggest difference in the research landscape now is our [UK's] changing relationship with Europe. We don't know what is going to happen with the European Research Council funding going forward. We don't know about the Marie Curie postdoctoral fellowship scheme, which is a very prestigious fellowship programme run by Brussels; also the Erasmus mobility programme for much younger students. These things are unknowns and may limit who we can bring to the lab. I've had many more non-British than British people in my lab, including a lot of Europeans. I think there are going to be fewer Europeans in newly established labs [in the UK] in the future, which is a shame.

How did you and your lab cope with the lockdown due to the SARS-CoV-2 pandemic?

There's definitely been an element of fatigue that I couldn't have predicted at the beginning. At the very start, it felt like a great opportunity to get up early in the morning and follow Mark Twain's advice – he said something about getting up at 5 am and starting by eating frogs – I think he meant do the ugliest thing that you have to do first, and you'll feel better and be more productive. That worked for some time, but not for four months. One of the first things that we did was try to normalise our timetables so that we were meeting regularly. We couldn't really do lab meetings, but we did journal clubs every week. And at 4 pm every Friday, we had a virtual happy hour to try and talk over what we'd achieved during the week and just interact socially. Then we began to come out of lockdown and people are now back in the lab part-time doing experiments. Things are beginning to change.

You were due to receive your Hooke Medal at the British Society for Cell Biology annual meeting in Paris. Unfortunately, the meeting, like many others, was postponed, whereas others have gone virtual. How do you see the future of scientific conferences changing?

I was really looking forward to receiving the medal at the Institut Pasteur, as you probably could tell! But I'm looking forward to the meeting in spring in Bristol. I'm actually organising a meeting that was due to run in Kyoto in November, but we've had to postpone that until spring 2022. We now have the opportunity to rethink how we do things, and one thing we will be doing is offering the speakers the chance to deliver their talks remotely, rather than travelling to the meeting. That's as far as I've thought about it. But at [The University of] Edinburgh, we're changing our teaching to an online format, and thinking about other ways that we can engage students. Hopefully, there might be some new ideas for us to take forward to meeting organisation in the future, as we have to find new ways to deliver an experience that is good for all the participants.

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

When I left school, I didn't go to university straight away. I worked for three years in a local factory that made amoxicillin, which is a semi-synthetic penicillin. I worked in a chemical plant in the first year as a lab technician. The goal of the plant was to separate a racemic mixture of the D- and L-stereoisomers of p-hydroxyphenyl glycine, a synthetic amino acid. If you look at the -lactam group in penicillin, there is an organic R group at the side. In order to get a broad- spectrum antibiotic, that R group is taken off and, in the case of amoxicillin, is replaced by the D-form of p-hydroxyphenylglycine. The plant was the first industrial-scale processing plant on the planet, as far as I'm aware, that used this approach to separate out stereoisomers into pure D- or L-forms. Pasteur had separated D- and L-tartaric acid crystals using a microscope. So here I was doing something that connected Pasteur and Fleming. And that was quite something. I thought I was just going to work in a factory!

Ian Chambers was interviewed by Inês Cristo, Features & Reviews Editor at Journal of Cell Science. This piece has been edited and condensed with approval from the interviewee.

Women in Cell Biology Early Career Award Medal 2020: Yanlan Mao

Yanlan Mao was awarded the Women in Cell Biology Early Career Award Medal 2020. This annual honour is awarded to an outstanding female cell biologist who has started her own group in the UK within the last 6 years.

Yanlan graduated in Natural Sciences from the University of Cambridge, UK, followed by a PhD in developmental biology and genetics at the MRC Laboratory of Molecular Biology (MRC-LMB), Cambridge. During this time, she studied cell signalling and epithelial patterning in *Drosophila*, under the supervision of Matthew Freeman. For her postdoctoral research, Yanlan moved to the Cancer Research UK London Research Institute (now part of the Francis Crick Institute), to study the role of mechanical forces in the orientation of cell division and cell shape control in Nic Tapon's laboratory. She established her own research group in 2014 at the MRC Laboratory for Molecular Cell Biology (MRC-LMCB), UCL, where she addresses the importance of tissue mechanics during development, homeostasis and repair. She was awarded a L'Oreal UNESCO Women in Science Fellowship and the Lister Institute Research Prize in 2018. In 2019, she was awarded the Biophysical Society Early Career Award in Mechanobiology and also became part of the EMBO Young Investigator Programme.

What inspired you to become a scientist?
I think probably two things. First, as a child, I was always really interested in patterns in nature, such as the ones you find in leaves, flower petals or shells. I was always fascinated by the diversity and how beautiful nature is, just by walking around and seeing the world. Second, someone that's really influenced my career has been my dad. He's a mathematician, and he's very passionate about his maths. As a result, I grew up always trying to think of the world in a very mathematical way. He introduced me to physics, chemistry and maths very early on, as those were subjects he studied, but not biology. Maybe that's why I was drawn to biology; it was more of an unknown world, with more to be discovered. I really wanted to combine biology with maths, at some point in my career. In a way that's what I'm doing now: mathematical modelling of physical forces in biology, and still tackling patterns, shapes and sizes of systems.

Patterns can help deconstruct more complex systems. Does your interest in patterns come from a curiosity to understand the basics?
Absolutely. Although I don't exactly work on patterning per se right now, it is still a part of some of my current

work on tissue size and shape. The biophysics aspect is probably where the maths comes in; I want to break things down into simpler problems or first principles, and try to understand, in as simple a way as possible, how shapes and patterns form and how sizes develop. My PhD was in genetics; very hardcore, traditional biology, which was great to train me as a biologist, scientist and experimentalist. I think maths really helps to deconstruct things. We can't possibly understand all of biology. The important message that I always give to people is that trying to mathematically model something isn't about creating the perfect cell or the perfect fly; if you can get a perfect model then you already understand everything, so there's no point in making the model. You need to convert the problem into simple components and understand its basic core. Maybe it's just three interactions or four proteins. Is that sufficient to already give you 99% of the behaviour of a system? If so, then that already helps you understand a lot about the system. It's the logic of breaking things down and putting things back together, but through simplification.

So how did biophysics become the main aspect of your research interests and your current work?

I guess I got more into physical modelling because of my postdoc. A year before I started my postdoc, a beautiful paper was published from the lab of the late Suzanne Eaton and Frank Jülicher on generating a vertex model, a mechanical model of epithelial development. At the time, I felt this was the perfect kind of model for us to understand [*Drosophila*] wing shape. I actually learnt how to code by generating and adapting that model. Despite my background in maths and physics, I hadn't learnt any computer programming, which is a huge problem these days. That was what got me into biophysics, because the model was very much a physical model of tissues growing. To explore it, I had to learn biophysical experimental skills in order to test the predictions from the model and hypotheses, as well as generate new ideas with a biophysical spin. But I always linked back to my background in genetics and signalling. In a way, that's what I'm doing now in the lab – trying to combine the genetics and biology with mathematical and physical analyses to understand how changes in size, shape and form occur. Thinking back now, I'm not sure if it was an active and conscious decision. Maybe it was a lucky accident, this semi-conscious decision of moving into the field of tissue mechanics. First of all, I think I was very driven by the core question, which is tissue size and shape control – growth control. You need forces to move something. It's fundamental. Embryologists a century ago already knew that, even before molecular biology and genomics were available. Actually, they were doing what we're doing now, but just in a less technically advanced way. By the end of my postdoc, the 'renaissance' of cell and tissue mechanics really helped me define my focus. I was still in a fairly niche field and I could create my own little area of expertise. Since then, the field has increased more and more. People are starting to recognise and appreciate biophysics and mechanics again.

Biophysics is an interdisciplinary field. What is your advice on establishing good collaborations?

Great collaborations take initiative to make that initial connection so that you form a link. The good ones I've had have always been where the two groups have different skills. For me, that's the whole point – slightly different skills and different backgrounds, and then you come together with a common vision or a common goal to answer the big question. Then it needs nurturing, just like in any collaboration. You have to be reliable and keep communication going, especially if it's long distance, because that momentum has to be kept. That's very hard. I've had collaborations where you have that initial conversation and then nothing really happens. Everyone has different priorities, different interests, but you can't be shy. If that collaboration is really important, you've just got to keep nudging them, keep emailing them, because you might not be their priority. As with many things, if you really want something, you just have to keep trying. We honestly don't mind getting multiple emails. Well, to some extent!

Is this a quality that you also encourage in your PhD students?

Yes, perseverance. At all levels, you've got to persevere. Don't be shy about annoying someone. It just shows you're passionate about something, and that you really care about it. I think most busy PIs wouldn't mind that. Another piece of advice is to work smartly. I just had a conversation with my students about how, in some labs, you have to work 18 hours a day, constantly pipetting. It's true that more work means more outcomes, but smart work is the important aspect. I stopped working weekends quite early on in my career. I worked very hard during the week, when necessary. I'd be the first to open the lab and I'd leave on the last tube train. I also knew that I couldn't maintain that rhythm consistently, because I would just burn out. It's a marathon, not a sprint. But that meant smart working and designing my experiments properly. I can see that students sometimes feel the pressure to constantly work, but you don't have to if you work smartly. With every experiment you do, you should ask yourself, 'what was the point of that, what was the purpose, what was the question, what was the hypothesis?', so you don't waste your time. At the beginning there is exploration and freedom, but hopefully you should quickly become more targeted. Being selective and smart about what you do is really important. And this also requires reading enough to know your field, to help you know what is a smart experiment. It's your job as a scientist to learn to manage that, so you can design experiments that have the highest chance of giving you something interesting. After all, you have a finite period of time and you can't do everything.

What challenges did you face when you started your own lab?

The main one was probably hiring, and also learning to let go. Someone said to me once that you're only as good as your best postdoc or student. You rely on the staff you've recruited to do the core of the work, to generate the data and to push your ideas. But hiring is much easier said than done. How do you judge someone after a 30-minute interview, or even a day of interview? I've been saying this to postdocs about to start their own labs: if you know someone good, try to poach them if they're willing. Honestly, that's what I did! I offered a job to my first postdoc before I had my own job secured [laughs]. We still joke about that. I've always said people in my lab don't work for me, they work with me. That's really important. Once you hire well, trust the people in your lab to do their part of the teamwork. It's important to learn to delegate and to let go. When I went on my first maternity leave, which was about a year after starting my lab, I learned that I could let go for a bit. I wasn't completely hands off, but it meant that the students and postdocs didn't come running to me immediately with a question – they'd

Above: Keeping the kids entertained during lockdown: learning how to cook and bake lots of new things together.

solve it themselves and, most of the time, they would be fine. I think that really forced me to learn that it's okay to step back. If you trust them then, more often than not, you realise they will learn faster, they will own their projects and take them to places that you probably wouldn't have initially thought about. Give them space and freedom to develop as unique scientists; you don't want a whole lab of 'mini-mes' [laughs]! That's when science gets exciting.

How are the challenges that you're facing now different?
A huge challenge I had recently was to find bridging or extension money to give students and postdocs enough time to finish their papers properly and get them published. When everyone's money is starting to disappear, but the projects haven't finished yet, what do I do? Do I make them redundant? Who will finish those projects? A person finishing someone else's paper always takes longer. Most of the time, studentships are three years. That's not really enough now to finish. And postdoc fellowships are two years! There's no way. Most of our papers weren't published until about five years in, when you include the revision process. Finding the money to extend people's time in the lab was a huge challenge, as there are not many 'flexi-grants' out there, even though it's the most efficient use of the money: the students and postdocs can finish and leave with publications to help them find good postdoc or PI positions. Very fortunately I got the Lister Prize, which saved my lab, because without it I would have had to close pretty much the whole lab down – all those 2019 papers might have still been sitting on the bench waiting to be published. But I was able to use that prize money flexibly to bridge a lot of the postdocs so they could stay and publish. I think it's important to help the community by creating more of these 'flexi-grants' or extensions, which would really make the initial investment into students and postdocs so much more worthwhile. More and more, the funding timescale doesn't match the time it takes to publish exciting stories, especially in biology and especially for those starting labs. The funding bodies haven't really taken this into account.

What advice did you receive that was really important for your transition to a PI?
Besides hiring the right people, another piece of advice I got was from someone who wasn't my direct advisor but a scientist I really admire. He said something that really stuck with me when I was a postdoc: 'Don't be scared of hiring people smarter than you.' He really meant people who have different knowledge and skills from you. He said not to be scared of that because you will learn from each other. That really has shaped how I recruit people. I hire people from all different fields. There's no way I could be as good as the person doing the modelling, but that's fine. If I were scared of hiring them, then that part of the lab would never happen. Let the experts be the experts in their own mini- fields. I'm completely comfortable with the fact that I can't possibly be the expert in everything. But hopefully, I've had the years of experience and guidance to know how to point my staff in the right direction. Together, we work as a team to really complement each other, and I'm constantly learning from my team (and vice versa, I hope). And that has been super exciting.

How did you and your lab cope with the lockdown due to the SARS-CoV-2 pandemic?
We had ten days to plan. We had to get all our flies ready and flip them onto fresh food so that they'd be okay for at least a month, because we honestly thought it would just be a few weeks; we never thought it would go on for four months. When the lockdown did happen, though, we were okay to stay at home for a while. Everything was then Zoom based. We continued our lab meetings once a week, and everyone had their own tasks to do at home. Most of them still had data to analyse. We're a quantitative lab, so we can analyse data to death! They have also been writing PhD theses, papers, proposals or reviews. It was a matter of every person thinking strategically about what they can do that will help them in the future and save them time when we do go back. We also have Zoom socials and Zoom coffee breaks, just to keep spirits up. I think the hardest thing was keeping everyone's motivation going, especially some of the students and postdocs who are living on their own; it's very isolating. So I would check in on them and make sure that they were ok, but also give them their space and not push them too much at the beginning. I said to them that physical and mental health are the most important things, and if you don't have those, you can't do science. More or less, people are still making good use of their time and being productive. Although we are really running out of things to do [laughs]! After all, we are experimentalists, and we need to generate experimental data. Luckily, our institute was one of the first selected as a pilot institute to open, so there has been a lot of amazing work to get that ready. Hopefully, we can start getting new data again soon.

You have been quarantined at home with your husband and two children. Recently, a US-based study came out that suggests that female PIs have been less productive, posting fewer preprints and applying for fewer grants, during this pandemic. What are your thoughts on this?
It's probably true. My husband's great and we try to share everything, but for example, I have a one-year-old and I'm the only one who can do some of the things needed. My husband and I basically work two-and-a-half days each, but I have maybe five hours per day, broken up by lunch time, nap time, dinner time and bath time, rather than full days, to do anything, whereas the days that my husband works, he really works the whole day. Despite our best effort to achieve equality in the household, there are still natural imbalances. I can just about keep the lab going, but I haven't been able to think enough to write a new grant, even though I should. Yes, we finished papers, but most of them have been papers that were already under revision. The brain needs continuity and time to start

writing from zero, and I just haven't been able to do that with an hour or two here or there. My priority has been to make sure that everyone else in the lab is fine and happy. Basically, it's like another maternity leave for me. I've only been back in the lab since September, after my second child, and now I'm on 'leave' again! It's definitely a huge hit. It's hard to even quantify that. I just had to accept the fact that I was going to be less productive. It's a matter of adapting and taking on the right attitude. That's also something really important in science. You can always see things in a more positive way and then embrace it, and enjoy it. I have enjoyed spending more time with my children. That's been awesome and has kept me sane. Honestly though, the first day I was at home with my two kids full time, I thought, 'I can't do this!' Then, once you settle into a new routine, time goes very quickly.

Could you tell us an interesting fact about yourself that people wouldn't know by looking at your CV?
I'm actually quite a good ballroom dancer. Only at conference parties do you see that appearing. I was on the Cambridge Dancesport team for two years; I was a beginner, but doing competitive dancing meant I improved fairly quickly. That was really fun. I started that during my PhD because I needed something new to do. A lot of evenings I would leave the lab at 6 p.m. for my dance training, and I'd be at competitions on the weekends. That really made me more productive in the lab. And ballroom dancing is fun.

So let's hope the conferences come back so we get to see your ballroom skills!
Yes, I miss the real conferences and the conference parties!

Yanlan Mao was interviewed by Inês Cristo, Features & Reviews Editor at Journal of Cell Science. This piece has been edited and condensed with approval from the interviewee.

BSCB PhD Award – Inaugural Raff Medal Winner 2021: Flora Paldi

The BSCB PhD Award – Raff Medal was established in 2020 to recognise BSCB PhD students who have made outstanding contributions to UK/Ireland cell biology. The medal has been named after Professor Martin Raff who was the president of BSCB from 1992-1995. Martin was instrumental in setting up and running the first 4-year PhD graduate programme in Molecular Cell Biology at the MRC Laboratory for Molecular Cell Biology (LMCB) at UCL.

Flora obtained her BSc with Honours in Molecular Genetics from the University of Edinburgh in 2015. In the same year, she joined the Wellcome 4-year PhD Programme in Cell Biology, University of Edinburgh. Following a rotation year, she started her PhD in the lab of Professor Adele Marston at the Wellcome Centre for Cell Biology.

Flora's PhD focused on the role of pericentromeric chromosome structure in mitotic chromosome segregation. Using budding yeast as a model, her work deciphered the chromosomal structure in which kinetochores are embedded in mitotic metaphase, and the restructuring that is caused by microtubule attachment. She showed that the ring-shaped protein complex cohesin, together with centromere-flanking convergent gene pairs structure pericentromeres. As the resulting structure promotes accurate chromosome segregation, this constitutes an important conceptual advancement, establishing the linear arrangement of transcriptional units as a novel parameter governing genome transmission.

During her PhD, Flora communicated her findings to national and international conferences where her presentations were singled out on multiple occasions. Her work was recently published in Nature and created excitement in the field because it demonstrated a direct, causal relationship between the 3-dimensional organisation of a specific domain with cellular function. Besides research, Flora was also an active member of the scientific co mmunity, participating in peer support, student representation, public engagement and the organisation of local scientific events. Currently, she is working as a postdoc in the lab of Giacomo Cavalli (IGH-CNRS Montpellier, France), where she continues to explore the relationship between 3-dimensional genome organisation and transcription.

You can follow Flora @flora_paldi on Twitter. The medal will be awarded at a virtual medal lecture during the next joint BSCB/Biochemical Society meeting, Dynamic Cell IV Dynamic Cell IV which will be held on 14-19 March 2021.

Inaugural Postdoctoral Researcher Medal Winner 2021: Agathe Chaigne

The Postdoc medal was established in 2020 to recognise early career researchers who have made a major contribution to UK/Ireland Cell Biology during their postdoctoral training.

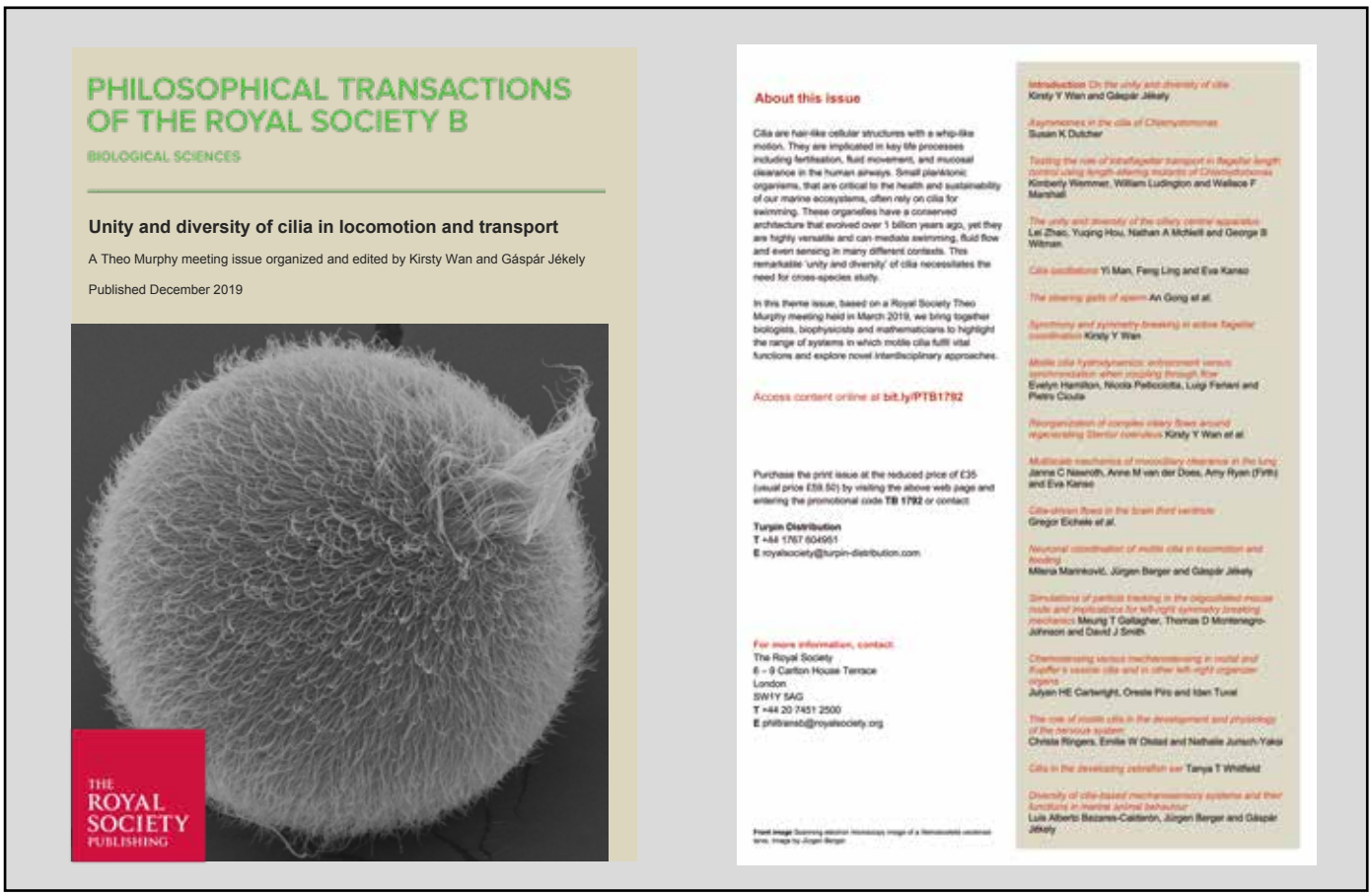
Agathe Chaigne is a Sir Henry Wellcome postdoctoral fellow at the MRC Laboratory for Molecular Cell Biology, University College London.

She studied in cell and developmental biology in Paris, first at Ecole Normale Superieure, then at Université Pierre et Marie Curie.

Fostered by her interest in cell division and biophysics, she received her PhD for studying the role of actin-mediated mechanical properties in asymmetric divisions of the mouse oocyte and embryo with Marie-Emilie Terret and Marie-Helène Verlhac at the Collège de France. For this work, she won a PhD prize from Le Monde and an early career award from the Fondation Bettencourt-Schueller.

She then moved to London to investigate the role of cell division in fate transitions using mouse embryonic stem cells as a model system under the superv ision of Ewa Paluch. There, she received an EMBO fellowship and a sir Henry Wellcome postdoctoral fellowship, and discovered a key role for the last step of division, abscission, in regulating exit from naive pluripotency. In her own lab, she is planning on investigating the mechanisms and roles of abscission modulation in multicellular animals.

You can follow Agathe @AgChaigne on Twitter. The medal will be awarded at a virtual medal lecture during the next joint BSCB/Biochemical Society meeting, Dynamic Cell IV in March 2021.



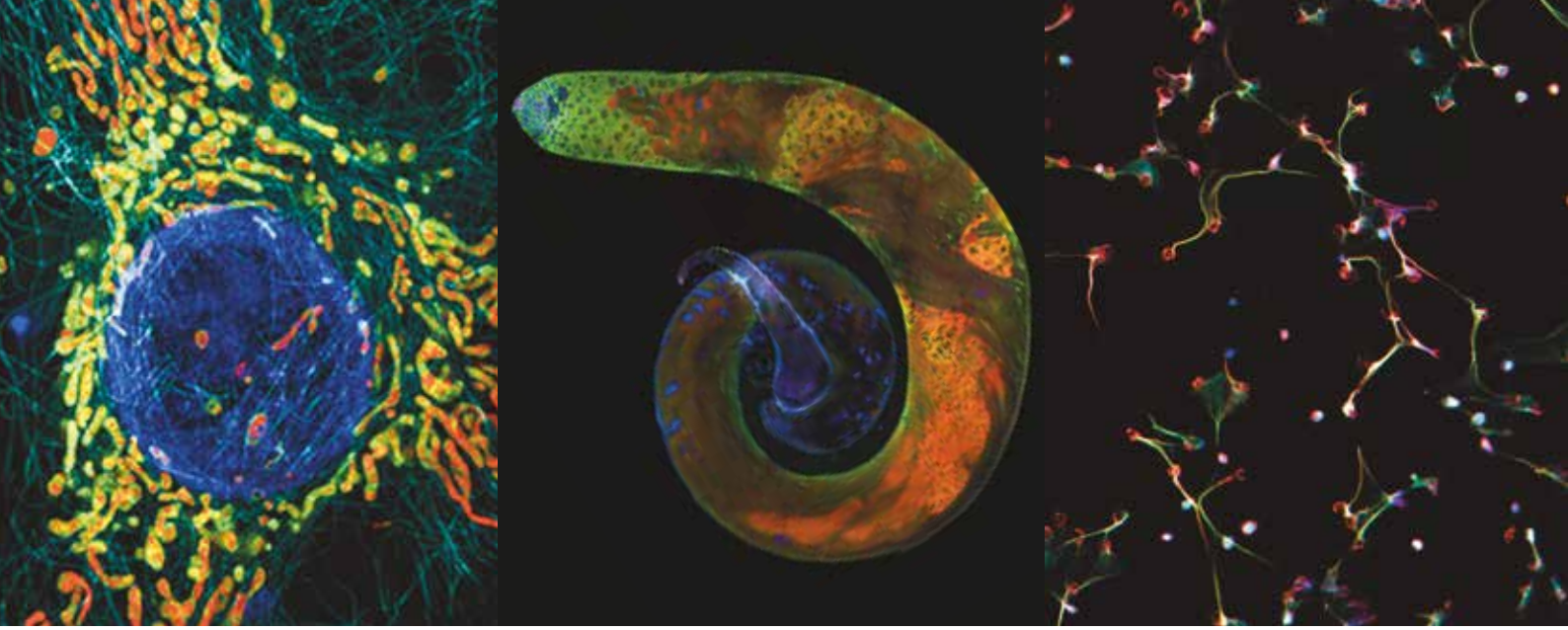


Image Competition 2020

1st – Hope Needs, University of Bristol
Structured Illumination Microscopy (SIM) image of a HeLa cell expressing mScarlet localised to the mitochondrial matrix (red). Mitochondrial membranes are shown in green (MitoTracker Green), cell nuclei are labelled with DAPI (blue), and tubulin is shown in cyan. The image was taken using a DeltaVision OMX v4 imaging system (GE Healthcare).

"After graduating with a BSc in Biochemistry from The University of Manchester in 2017, I began my PhD at the University of Bristol, as part of the Wellcome Trust's Dynamic Molecular Cell Biology programme. I am currently in the third year of my PhD, studying the role of mitochondrial protein import in neurodegenerative diseases, under the supervision of Professor Ian Collinson and Professor Jeremy Henley. This image was taken last year when I had the opportunity to spend two weeks at the University of Bielefeld working with Dr Wolfgang Hübner, where we used SIM microscopy to investigate the effects of blocking mitochondrial import on mitochondrial morphology and dynamics in HeLa cells."

2nd– Karl Norris, University of Leeds
Spermatogenesis in a *Drosophila melanogaster* testis: in contact with hub cells (testis tip, violet: Armadillo), the somatic and germline stem cells give rise to gonialblasts that undergo mitosis (green: Vasa), meiosis and spermiogenesis. The latter two stages are stained in red (Fmr1), nuclei are stained by DAPI (blue).

"I graduated from the University of Central Lancashire with a BSc (Hons) in Biomedical Science in 2013 and an MSc (by research) in Molecular Biology in 2014. I then undertook doctoral training in Dr Susan Campbell's lab at Sheffield Hallam University where I investigated the role of eIF2B bodies in translational control. After completing my PhD research in 2018, I took a short postdoctoral role in Dr Timothy Douglas' group at Lancaster University. I am currently a postdoctoral research associate in Dr Julie Aspden's group at the University of Leeds, looking into the structure and function of specialised ribosomes in the gonads of *Drosophila melanogaster*."

3rd – Drinalda Cela, University of Bristol
This light microscopy image shows neutrophil extracellular traps (NETs) in response to heme and TNF stimulation. NETs are composed of DNA (in blue), cytosolic proteins (such as neutrophil elastase, in red) and histones (in green). When neutrophils die via NETosis they release these web-like structures.

I hold a BSc degree in Molecular Biology and Genetics from Democritus University of Thrace, Greece. During my undergraduate studies (2011-2015), I undertook two summer placements abroad funded by European student mobility programmes. In summer 2014, I carried out research at Sorbonne University, studying the role of ROS, UPR and inflammasome signalling in atherosclerotic plaque formation. While in a conference in Paris, I was introduced to gut microbiota and their role in autoimmunity. I found the idea that microorganisms interact with our immune system fascinating and it was clear what I would study next. For my second internship, I visited Reading University to explore the impact of enteric microbiota in diseases. I graduated in 2015 and moved to the UK to investigate the interaction between the gut microbiome and mucosal immune system. Less than two years ago, I enrolled in a PhD programme at the University of Bristol aiming to unravel the intracellular signalling that drives neutrophils into neutrophil extracellular trap (NET) release. NETs were initially described as an antimicrobial response, however nowadays NETs are also associated with multiple inflammatory conditions. My mentor and supervisor is Dr Borko Amulic and my project is funded by the School of Cellular and Molecular Medicine of the University of Bristol and the MRC.

The closing date for entries to the 2021 Competition: 30 June 2021. **See page 39.**

Science Writing Prize Winner 2020 – Alexandra Bisia

One for all, all for one, or – what does it take to be multicellular?

When people think of biology, 'big' often comes to mind: elephants, whales, redwoods. A closer look, though, reveals that the vast majority of organisms are in fact unicellular: think bacteria, archaea, and countless algae and fungi. But what does it take for a cell to make the leap to become part of something greater than itself, a multicellular organism? Things get interesting when we examine organisms living on the cusp between uni- and multicellularity.

Meet Dictyostelium, a genus of eukaryotes containing species that can exist as both single-celled amoebae and multicellular aggregates. The life history of D. discoideum, the best-studied species of this genus, illustrates the challenges of living in multicellular structures. 'Dicty' cells can live a fully unicellular life, preying on bacteria and happily multiplying. But normally solo-operating Dicties sometimes find themselves in nutrient-poor environments, at which point they let loose a call for help in the form of a small molecule, cyclic adenosine monophosphate (cAMP). Nearby Dicty cells, sensing this desperate cry – "cAMP! cAAAAAMP!" – will migrate towards the signalling epicentre and form a large multicellular aggregate, charmingly called a slug. This slug migrates to a new location, where certain lucky cells form reproductive spores inside a 'fruiting body,' which is supported by a sterile stalk composed of considerably unluckier cells. The spores are released into the environment with the hope of reaching a more nutrient-rich location. But how do these cells decide amongst themselves which ones will get another shot at survival and reproduction in the form of spore dissemination? Since the cells are not genetically identical, their evolutionary interests clash – and the fittest ones, containing the most advantageous genetic variants, are likelier to produce spores (1).

For some time, the cells work as a single cooperative, albeit 'sluggish' unit: they move with coordination and purpose, tightly adhering to each other. However, competition between these genetically distinct cells arises pretty quickly, which poses a problem to becoming a bona fide multicellular organism – we'll come back to how such competition can be avoided. For now, we can turn to more concrete forms of multi-celled life to shed more light on what it takes to truly be multicellular…

A relevant group of organisms are the members of a lineage of green algae, the Volvocaceae. In this lineage, multicellularity is a recent development in evolutionary terms, with different species exhibiting different 'stages' of it. Chlamydomonas species represent the ancestral, unicellular form of the lineage, while individuals of the Pandorina species have 16 cells, and those of the genus Volvox have thousands. Therefore, the mechanisms by which multicellularity arose in this lineage can be traced by comparing its various members. Compared to their single-celled cousins, Volvox during their evolution repurposed genes to perform functions necessary to multicellular life. Additionally, they possess expanded 'gene families' that arose from single genes, with each 'family member' now carrying out a different function related to the organisation of their multicellular bodies (2). Thus single-celled organisms often already possess certain tools useful to multicellular life. With relatively minor changes to their genomes, they are able to evolve into more complex forms.

Animal genomes have been compared to those of their closest relatives that exhibit facultative (optional) multicellularity, including, but not limited to, the previously mentioned slime moulds, such as Dicty, and green algae, such as Volvocaceae. These studies suggest that key players in the early stages of acquisition of multicellularity were genes involved in cytokinesis (the physical separation of cells during cell division) and genes encoding components of the extracellular matrix (ECM – a collection of proteins found in the space between cells that provides structural and functional cohesion in multicellular organisms). Therefore, in animals and in plants, it is almost certain that clonal cells (daughter cells produced by successive cell divisions of a single, original cell) banded together through incomplete cytokinesis to form the first proto-animals and proto-plants respectively (3). This overcomes the 'competition' element that we observe in the case of aggregation of heterogeneous cells, such as in the case of Dicty. The single-cell 'bottleneck' imposed on each successive generation of animals and plants in the form of the zygote ensures streamlined genetics and evolutionary goals, reducing competition between cells of a single organism.

Acquisition of multicellularity often and rapidly leads to division of labour between different, cooperating cell types. Organisms no longer need to temporally vary their phenotype to meet the demands of a changing environment, as they allocate different functions to their different cell types. For instance, the most famous of the Volvox species, V. carteri, has two cell types: somatic and reproductive. With evolutionary time, organisms often develop greater numbers of increasingly specialised cell types, which are in turn much more dependent on each other. Division of labour therefore makes it difficult for organisms to revert to an ancestral unicellular 'multitasker' form, instead leading to increasingly complex multicellular lifeforms with interdependent cells (3).

It has recently been argued, though, that it isn't only changes in cells that drive the evolution of multicellular-

ity. It has been suggested (4) that the aforementioned ECM itself is not in fact simply a result of multicellular evolution, but that its presence actively promotes it. The ECM acts as a dynamic control structure, allowing the organisation of extracellular space and coordinating the intercellular processes of increasingly complex organisms. This challenges the cell-centric dogma of the evolution of multicellularity, as it isn't just cells, but also their immediate surroundings, that must undergo changes to become compatible with a multicellular lifestyle. Characteristically, ECM occupies the majority of the volume of V. carteri – what would this species be without its ECM?

Genetic uniformity, adaptation of the (extra)cellular environment, cooperation and functional specialisation may begin to explain what it takes for a cell to be able to form part of an organism greater than itself. No matter how well these principles are understood though (and there is still a long way to go), the intricate structures that relatively simple single cells can build when they form part of multicellular lifeforms will never stop being magnificent.

The closing date for entries to the 2021 Competetion: 30 June 2021. See page 39

References

1. **Castillo D, Queller D, Strassmann J. Cell condition, competition, and chimerism in the social amoeba Dictyostelium discoideum. Ethology Ecology & Evolution. 2011;23(3):262-273.**
2. **Herron M. Origins of multicellular complexity: Volvox and the volvocine algae. Molecular Ecology. 2016;25(6):1213-1223.**
3. **Brunet T, King N. The Origin of Animal Multicellularity and Cell Differentiation. Developmental Cell. 2017;43(2):124-140.**
4. **Bich L, Pradeu T, Moreau J. Understanding Multicellularity: The Functional Organization of the Intercellular Space. Frontiers in Physiology. 2019;10.**

About the Author: Alexandra Bisia studied Development, Regeneration and Stem Cells at the University of Edinburgh. She is currently in her second year of doctoral studies at the University of Oxford in the Chromosome and Developmental Biology Wellcome Trust programme. She is carrying out her research in Prof Liz Robertson's lab on mouse trophoblast stem cells.

Comments from our judge, Dr Jennifer Rohn (@Jenny-Rohn) on the winner of the 2020 competition: This year's winning entry is a tour de force of writing — nuanced, humorous and highly original.

FocalPlane

In July 2020, the *Journal of Cell Science* (JCS) and its publisher, The Company of Biologists, launched a new community website for microscopists and biologists. This is FocalPlane, a curated and centralised online meeting place to connect people, products, resources and information relating to microscopy.

The ability to tackle ever-more-refined biological questions is improving as microscopy and image analysis become increasingly more complex and sophisticated. However, this has made it difficult for non-experts to access user-friendly resources or tools tailored to their questions. Thus, there was a need for a platform for both microscope/software developers and researchers to exchange ideas and information to help the field develop and progress.

Since its launch, FocalPlane has accumulated a variety of content from the community, from showcasing a microscopy/bioimage analysis tool to interviews with experts (like the BSCB's very own Dr Ann Wheeler). In tSeptember we launched two blog series, one by Dr Emmanuel Reynaud and Dr Elisabeth Kugler covering the basics and troubleshooting of light sheet microscopy, and the other by Euro-Bioimaging, highlighting technologies offered by the Euro-Biomaging infrastructure. FocalPlane also organises regular events such as online journal club meetings discussing microscopy-related papers, and image competitions showcasing the work of our community members.

The website is hosted by JCS at The Company of Biologists, and is managed by a dedicated Community Manager, Dr Christos Kyprianou. With the help of the JCS in-house editorial team and a distinguished scientific advisory board, FocalPlane is reaching out to the extended microscopy community to encourage discussion and engagement with the website.

It's a free platform to present your work, communicate microscopy-related news and connect with the microscopy community.

For more information, see: https://focalplane.biologists.com/2020/07/01/origin-story-focalplane/

For any queries about the website, please contact FocalPlane Community Manager Dr Christos Kyprianou at focalplane@biologists.com.

I'm a scientist, stay at home

During the COVID-19 Lockdown, university staff and students have been keen to help school pupils stay connected with STEM – all without leaving their homes.

The BSCB fully appreciates the importance of engaging with the general public and schools to help increase understanding of cell biology and science in general. For several years the BSCB has supported *I'm a Scientist get me out of here* and promoted the creation of a Cell Zone for debate. In case you don't know I'm a Scientist get me outta here… is an online competition between scientists, where the students are the judges and scientists compete to be the most popular, a cross between a science lesson and the X-Factor. Usually Students challenge the scientists over intense, fast-paced, online live chats. They can ask the scientists all the questions they want to, and vote for their favourite scientist –which creates a series of Weekly Winners.

This year *I'm a Scientist, Stay at home* puts young people in direct contact with real scientists. Young people could:

- Chat with real scientists and with each other, in up-to-60-minute real time text-based chats
- Ask any questions they like to the scientists
- Vote for their favourite scientist of the week

Everyone can take part from home, so it's especially useful while schools and youth groups were closed during the Coronavirus pandemic. Over 13 weeks, between 20 April and 20 July, over 2,400 scientists, engineers and mathematicians volunteered their time to chat with school pupils within 12 science zones, including cell biology.

Many of our PhD and Postdoctoral scientist BSCB members were able to participate in this.

The BSCB is one of the organisations which supports *I'm a Scientist Get me Outta here*. For more information about how to get involved. please see: https://bscb.org/learning-resources/im-a-scientist/

NEUBIAS Academy

NEUBIAS Academy is a new initiative, aimed to provide sustainable material and activities focused on Training in Bioimage Analysis.

NEUBIAS Academy capitalizes on the success of 15 Training Schools (2016-2020) that have supported over 400 trainees (Early Career Scientists, Facility Staff and Bioimage Analysts), but could not satisfy the high and increasing demand (almost 1000 applicants). A team of about 20 members will interact with a larger pool of hundreds of trainers, analysts and developers to bring knowledge and bleeding-edge updates to the community.

After the success of NEUBIAS Academy in 2020, we're happy to start 2021 by hosting a "Image Big Data" webinar series, starting in January. Even if you can't make it to the webinars the seminar materials will be hosted on our Youtube channel

www.youtube.com/channel/UC-oy7UpEhRfHQ-5ePCviKFg

Over the course of 5 weeks, with one 90 minute webinar each week, our invited experts introduce you and guide you through the advanced features of the tools and frameworks they develop, customize or use daily to handle "BIG DATA"!

You'll be taken on a journey starting with an overview of different file formats and important pre-processing steps, continuing with registration and stitching and finally analysis workflows adapted to the unique challenges of BIG DATA. Then you'll learn about the latest developments in visualization, annotation sharing in the cloud, before concluding with a showcase of REALLY BIG DATA.

What has COVID-19 done for the division in education?

A quick reply to this question is that it has increased the rate at which a divide in the education system has turned from a crack into a crevasse. For those that can bridge the divide it may bring rewards. For others there is potential danger. Some will fall into the crevasse. Others will not attempt to cross and may well survive but in a more isolated way.

Apart from teaching, COVID-19 is having a marked effect on young people learning about other young people, how to relate to them, the importance of facial expressions and gestures and a concern for the wellbeing of others and themselves. Some have also been affected by not experiencing 'rites of passage' from one educational stage to another and events associated with college graduation.

At present the evidence of the effect of the pandemic on education is mainly anecdotal. [Where possible, sources are named].

When educational establishments were closed and teaching and learning became remote, the greatest widening of the crack was caused by the digital divide. Other factors also affected the formal school-based learning process, including, [1] type and style of schooling, [2] home schooling environment, including socio-economic status and [3] epi-familial factors.

In view of the ongoing situation it is important to consider [4] what can we do for our own children, especially the next group in assessment years.

In an afterword, and at the Editor's request, some thoughts have been added about the whole issue of education and training, teaching and learning, exams and continuous assessment.

The digital divide

Of all the divisive factors affecting education during the pandemic the digital divide is probably producing the greatest schism, and not only at school level. One part of this, at personal level is the economic factor of the 'haves and have-nots'. Many children have a smart-phone, good for social connecting, but for on-line learning a laptop or desktop computer is needed. Children in homes with limited means will not have computer facilities. A study by King's College, London (UK) found that of eight million people in the UK who don't use the internet, 90% of these are disadvantaged socially, economically or both.

The UK Government said they would supply laptops to pupils, but the distribution was patchy and 80% of that funding has now been withdrawn (October 2020). But this is not the end of the story. A broadband connection is needed and a provider with generous limits on data downloads. This could mean more expense. Knowledge about internet sources, and guidance on how to access and use information (and misinformation), termed digital literacy, is also useful. This may not be available. In January 2021 more laptops were purchased by Government for use by disadvantaged pupils

In some rural, isolated areas in the UK, broadband availability may be very poor or non-existent. Signal availability is also hampering all stages of education in developing countries (BBC World Service radio and Research Information Mag). This again creates a divide and across all socio-economic groups. Increasingly we are also witnessing a geo-political digital divide where access to some internet sites/systems are being denied or censored for political purposes. Multinational companies too can also manipulate both the information available and how it is presented.

A further 'digital' problem is caused by equipment and programme updating or scrapping. The evolution of digital equipment and systems is understandable but this is leading to information becoming un-retrievable. This presents a divide between those who can afford to upgrade and update and those who cannot. - Clay tablets need a translator to read them, not a redundant device.

[1] Type and style of schooling

During the school closure periods many teachers and schools are doing an excellent job with online teaching, but both provision and uptake was variable. Remote learning was aided at some levels and in some cases with additional online material. This was provided by the BBC (example: Bitesize), and other organisations. Central Government provided some finance for this, but not all providers gave Open Access.

Some school attendance for vulnerable children, those without a computer or a broadband link, and those of key workers, was available but patchy. Funding was also provided for some additional tutoring. Over time it became evident that pre-closure pupil class size, and whether the subject required practical work, became a divisive factor. Many independent schools usually have smaller class sizes. Sometimes this enabled a more individual

approach than could be used with large classes. Interestingly remote teaching enabled some pupils the opportunity to ask questions that they might have been too shy or embarrassed to ask in the presence of other pupils (Pers.comm). It has been reported that many fostered children gained from school closure by the availability of increased bonding time with their fostering family.

'Mind the gap'

Since schools re-opened another learning divide has emerged in some situations. Pupils who were less able to study well at home (see later) were thought, as at 7th June, to be doing, about 30% less studying, amounting, by then, to a loss of about 7 days of schooling over 2.5 months (BBC). Schools are trying to close the gap, but in some situations this has resulted in pupils who studied well at home 'marking time', while others catch up (pers. Comm.TB). – Good for 'levelling up' but a disincentive for those who studied well at home.

During the first 'lockdown' the number of school days lost varied; 11 in Scotland, 12 in N. Ireland, 13 in Wales and 14 in England. (BBC). The amount of on-line studying also varied. In London, the S.E. and S.W. of England 25% of school pupils studied for at least 4 hours/day. In Wales, Scotland and N.Ireland., 15% did. (BBC).

[2] Home schooling environment, including socio-economic status

As a result of the pandemic many people have had the experience of home working, of turning a guest room into a home–office or study room. Fine if you have the space, but imagine the situation for an eldest child in a single parent family with a three other children, one of whom is a toddler, and living in a two/three room, high-rise flat without a broadband connection. Then things are very different. As the eldest, you might also be given the task of keeping an eye on the toddler who might be pulling things off the table. The table will be also needed by others, and for meals. The list of distractive elements present is enormous.

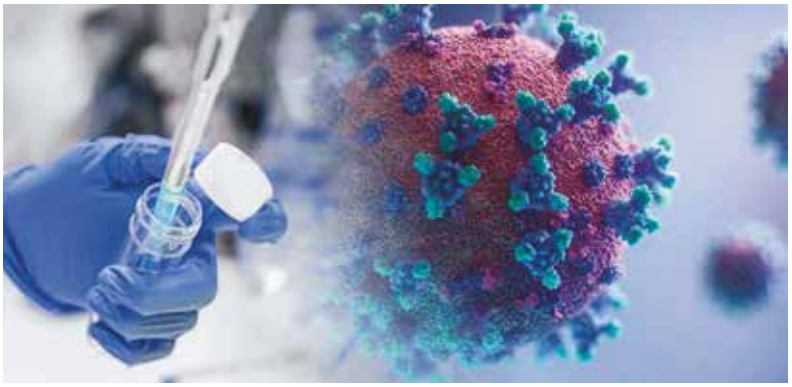
Compare this with a home school environment in which a child has a bedroom of their own, or perhaps shared with one other sibling, but in which the individual has a desk, suitable lighting and seating, a computer of their own with good broadband/WiFi facility.

Elsewhere in the house a supply of books and perhaps also a parent working from home who may also have a printer. This presents some divide! A further divide is seen depending on whether the pupil is boy or girl. Some findings show that, in the main, girls are more conscientious than boys about studying at home. Boys tend to be 'minimalists' and easily distracted. - But these are generalisations. There are subject differences too with practical subjects presenting greater problems than non-practical ones.

There are of course exceptions and many able, talented or self-motivated individuals who use education to the best of their ability. Here is one example: Just before Ann Frank started writing her diary, a four year old boy was roaming the streets looking for food and shelter after his mother was imprisoned in Dachau, Germany. He learned to read at age nine and in 2007 jointly won the Nobel Prize in Physiology or Medicine. His name; Mario Capecchi.

[3] Epi-familial/home factors:

There are several factors about a child's family and home situation beyond those already mentioned, that can influence their education. These factors can hardly be planned for as they are often the result of the 'life course' and 'life experiences' of the family. Examples include: whether the child is female or male (see later), the number of knowledgeable older people in the household or nearby; grandparents, aunts and uncles and older siblings that may provide time, guidance, personal experience, inspiration and encouragement and possibly act as a role model. The grandparent who, in response to a question by a child they collect from school says "I don't know, but we can go to the library on the way home" or "we will look together on the Internet", helps enormously. What members of the family do and talk about, and have as their own interests or hobbies, is influential too.



The Norwegian Jens Stoltenberg could not read until the age of ten. His parents were very involved in politics and often entertained people from all round the world to dinner round the family table where they talked politics. Jens thought this sort of conversation was normal for families. As a boy he imbibed the talk and atmosphere. Jens is now Secretary General of NATO, having already served as Prime Minister of Norway.

Oxford vaccinologist Sarah Gilbert's 21-year old triplets are all studying biochemistry. I wonder if they were exposed to 'science talk' when they were young? Jordan Raff and Robin Perutz are also following in their father's footsteps. But beware; sometimes 'home talk' can put children off completely. Parents tread a fine line!

Some home factors can cause unhappiness. Family stress, break-down, long term illness and bereavement can take a toll on a child's education. Some children will be badly affected. Others will have more resilience, like Mario Capecchi, and some, who have had long periods of hospitalisation, seek careers in medicine. This resilience is called 'post traumatic growth'.

The provision of good nutritious food on a regular basis, coupled with the minimal use of 'junk' food, is also vitally important, but easier said than done. Good quality adequate sleep is also needed for growth and studying.

Another epi-familial problem has arisen during the COVID-19 pandemic in the U.K. It concerns Case Conferences held as part of the Child Protection Procedures of vulnerable age children. Parents normally attend these face-to-face meetings with people from many agencies. These have gone on-line but although social workers have brought laptops to the child's home, a good signal has not always been possible. (King's College, Nuffield Report. BBC4 Woman's Hour).

[4] What can we do for our own children, especially the next group in assessment years?

(a) The learning atmosphere.

First and foremost make sure learning about anything is normal all the time. Take your children to a variety of places and events. Engage children in appropriate conversation and ask their opinion. Praise them for good work. If their work is mediocre or poor, don't condemn it outright; praise the good

bits and approach the poorer bits with a positive slant, for example "I have seen you do better diagrams before".

(b) The learning environment.
You can learn anywhere, but when it comes to studying something in greater depth, the study environment matters. At home, resources (usually money) permitting, ensure that [1] a suitable environment is available for at least some of the time. This includes suitable ventilation and heating, appropriate chair, table/desk space of suitable height, especially if a computer is in use. [2] Appropriate lighting conditions are available at all times. A soft glow relaxing bedroom light is not conducive to study. [3] Appropriate electronic equipment, and Internet facilities, are available and working. Although many young people have a smartphone and/or a tablet, and use YouTube and social media, a laptop is probably better for home/school working. [4] Good quality adequate sleep is encouraged. It is needed for both growth and studying. Too many children are exposed to 'blue light' from smartphones and TV screens and some LED lights during the 30mins before bed. This impedes the brain relaxing. Studies show that teenagers also benefit from 'morning sleep', so don't be too hard on your late-rising teenager. They are not lazy, they are responding to their physiological needs.

[5] Exams, continuous assessment and course work.

The COVID-19 pandemic certainly upset the external examinations routine taken by school pupils throughout the UK. There was much muddled, hurried thinking resulting in a dreadful experience for students and knock-on effects for both would-be employers and the tertiary education sector. There has always been a debate about the usefulness of exams. In the case of schools, I think the Government is in danger of using exams to measure school performance and not very much about the pupil, except the carrying capacity of their brain. This has been trained to carry (or not) prescribed information to be unloaded during one and a half to two hours on a particular day. For both government and schools, 'performance' in exams has become a target. In this respect, it follows Goodhart's law which states 'when a measure becomes a target, it is subsequently no longer a good measure'. I am not condemning exams, but I think a fairer and more balanced system should take into account continuous assessment, which can include mini-exams or tests and course work. This would tell selectors something about the candidate's enthusiasm, application, and ability to study and think critically. Teacher assessment is less objective than an exam, but it can be more informative about ability to do long term study, use of library and internet resources, and the searching for, and interrogating data; skills that are going to be so important. Taking account of continuous assessment would also help those candidates who are unwell on the exam day, including those who have suffered a family bereavement or friendship break-up. It is said the enthusiastic BBC scientist/presenter of things astronomical, Professor Brian Cox gained a 'D' in A-level maths. Fortunately somebody spotted his overall ability and enthusiasm.

Mary Beard presented a great programme on exams called 'You may now turn over your paper' available on BBC Sounds at:

https://www.bbc.co.uk/sounds/play/b07hwwbd

It is said that COVID-19 started in China. In her programme Mary Beard says that exams did too. In the 7th century A.D. exams in China lasted three continuous days and nights, Candidates could take, into a three-sided cell, a chamber pot and food. If you died from the ordeal you were removed, wrapped up in a sheet and tossed over the wall of the examination compound.- Survival, indeed, of the 'exam fittest'!

National assessments in 2021

Following the exam fiasco of 2020, in autumn 2021 each part of the UK decided on different assessment arrangements. At the beginning of January 2021 the Government in England announced that there would be no GCSE and a-level exams held in summer 2021 and that teacher assessment would be used. Currently (as at 14/01/2021) discussions are going on about the possibility of having some nationally moderated mini-exams/tests for schools in England! Moving targets are very stressful to many pupils who, in their teenage years, have more than enough to cope with. In other parts of the UK exams have been conceded in favour of teacher assessment.

It is very important for pupils and parents to keep in contact with the school and if possible look for the latest changes posted on the website of the exam institution that the school is using.

Afterword

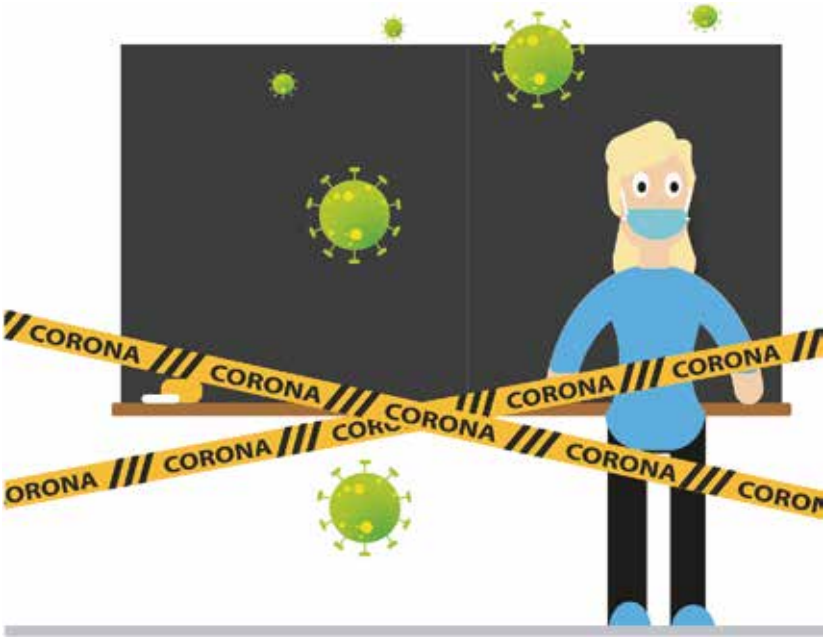
The issue of education and training, teaching and learning, exams and continuous assessment.

Definitions of these terms are not very precise. The writer considers education to be the process by which we learn through the senses and then assimilate and process this information to produce ideas and views of our own about life, our own life course, and that of others. The environment we live, about the universe we arrived into, and how it might be in future time. This knowledge, this information, is gained through self-learning, imitation and teaching (termed 'culture' by evolutionary biologists). Much of it comes from, and is influenced by parents, teachers, tutors, lecturers, mentors and role models. Some of this is taught in a direct way, but much of it is imbibed by contact with people, who influence you, and you react to. Dame Helen Mirren said "the main difference between live theatre and film is that in the theatre you react to the different audiences and they react to you" (BBC).

Film is 'flat' with no changing audience reactions sensed by the actors. In many ways knowledge acquisition is like this. Unless you share and discuss your knowledge and ideas with other people, and take note of their reactions and ideas, you become embedded in your own knowledge silo and ignore the context of your ideas.

John Dewey, the American philosopher and educationalist, writing in the early 20th century said "If our schools turn out their pupils in that attitude of mind which is conducive to good judgement in any department of affairs in which the pupils are placed, they have done more than if they sent out their pupils merely possessed of vast stores of information, or high degrees of skill in specialised branches".

At a very basic level training is a process in which an often repetitive skill can be taught, [or in some cases programmed], so that skill can be repeated, without change, time and time again. Robotic machines do this, and apparently dogs and rats have been trained, to use their olfactory organs, to detect the COVID-19 virus in people (BBC). Of course a dog cannot react if the training doesn't quite work, or advise you what to do next. A mix of edu-



cation and skill acquisition is therefore desirable. Humans can do this. Perhaps 'modifiable training'

Is what humans need so that they can more quickly adapt their training to what is needed in real-time, leaving robots to do purely repetitive tasks?

Teaching and learning.

These are the processes through which education and learning a skill are transferred to the receiver. In the case of education, it isn't a case of 'filling up' an individual with facts, but rather giving them information, experiences and 'know how' to establish and process their own observations and critical thinking to enable them to construct their own views and hypotheses and to communicate these. Skill training requires more adherences to set process routines, as in 'teaching' a robotic machine to perform certain actions. With people it is similar, but the educated skilled person will observe a process and question the established thinking and consider how it may be improved, speeded up, or made less wasteful. Some time ago Sir David Attenborough said that 'at all levels of the education system, training was being emphasised over true education'. True education contains an element of training, but it consists of a great deal more.

Exams and continuous assessment.

Exams. Consider for a moment what you think is the function of a traditional end of a period of study examination in the educational field, often called 'final exams'. Do you think it adequately fulfils this role?

Traditional reasons include ideas such as: providing a target event to work towards; a fairly objective way of quantifying how much you have learnt during the course, how much knowledge you can store, select, recall and communicate from the course, a test of your ability to use remembered knowledge to argue a case, i.e., to test your use of the knowledge; providing some evidence that you have been successful in the exam(s) by supplying a Certificate of some sort. This gives you status and stratifies you in a specific area of the knowledge society, perhaps placing you below some, but above others. In many cases this becomes an 'entry ticket' into an occupation or select group.

There is some evidence that the 'final exam' method is especially suitable for those who have very good memory retention and recall. Government advisors say that final testing is especially suited to able but disadvantaged pupils (BBC). It is also said that exams 'favour' boys who are good at 'just in time swatting', whilst continuous assessment 'favours' girls who work more consistently over time.

There are of course many arguments for and against final exams. 'Teaching to the test (exam)', and therefore excluding lots of knowledge and experience, perhaps being the most used argument against exams.

During the COVID-19 pandemic some parts of the UK have suspended the use of 'final year' testing in schools because different exam groups of pupils have been absent from school for varying lengths of time across different parts of the country. Exams have been replaced with continuous assessment of the specific work pupils have been able to do. Those in Government should be reminded of the words of sociologist William Bruce Cameron who in 1963 wrote 'Not everything that can be counted counts and not everything that counts can be counted'.

Continuous assessment. As the name implies the work of students is continuously assessed over a period of time, if not during the whole course of study. Assessment of this type can include regular monitoring using tests or 'mini-exams' at the end of a topic or period of time. These can be agreed upon and moderated to ensure a degree of objectivity and level of conformity to minimise mark elevation or depression.

Assessments can also be made (and quantified) about a student's attitude to work, such as persistence, enthusiasm, time keeping and ability to work in a team. At the end of the year or course an overall assessment is made with, if necessary, predictions made for extended absence due, for example, to COVID-19, illness, family bereavement and so on. Critics say this may cause leniency, but surely education should be about encouragement, not elimination. Building fences so high only a few can jump them, does not encourage life-long learning.

It will be interesting to note, but hopefully not at the expense of some pupils, any differences between the results, at the end of the tertiary sector of education, of pupils who were continuously assessed compared with those who sat tradition 'final year' exams in schools in, for example, 2019.

'Open-book' tests.

During on-line learning some teachers are using 'open-book' tests where students have recourse to books or on-line sources for information, but have to answer questions on-line and within a limited time. This innovative method works-round the potential for 'cheating' and at the same time tests the students ability to search for information/data, mentally process it, and answer the question. These are excellent skills for the workforce of today and tomorrow. But it is divisive, favouring those able to cope with the digital divide and who have access to books and other sources.

At the time of updating this article it appears that in the UK there will be no formal GCSE or A level exams in the Summer of 2021.The situation over BETCs and VTQs is unclear. In England however (in the middle of January 2021) there is now a consultation in progress to consider whether some sort of nationally moderated exam or test, should be produced for use in the summer 2021 to 'help teachers assess a pupil'. I can't help wondering how our 'next generation' of young people will portray us!

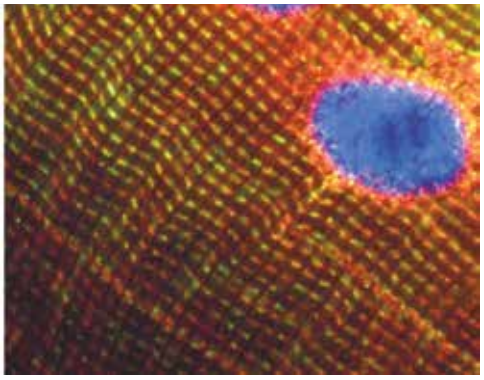
David F Archer.
Dec. 2020; some updating Jan 2021.

Carbon dioxide detection in biological systems

A new *Interface Focus* issue addresses the importance of detecting carbon dioxide levels across the animal and plant kingdoms. Jessica Miller spoke to the issue organiser, Professor Martin Cann at Durham University, about the current and future priorities in this area and the benefits of bringing different specialists together.

Can you briefly explain what you mean by carbon dioxide detection in biological systems?
Carbon dioxide is essential for life. It is at the beginning of every life process as a substrate of photosynthesis or chemosynthesis. It is at the end of every life process as the product of aerobic respiration and post-mortem decay. Therefore, it is not surprising that CO2 regulates a variety of diverse processes including cellular chemical reactions, transport, maintenance of the cellular environment and behaviour. Carbon dioxide is a strategically important research topic relevant to crop response to environmental change, insect vector-borne disease and public health. This issue investigates the mechanisms by which organisms and cells sense altered CO2 levels to enable an appropriate physiological response.

What is the aim of this issue?
The aim of the issue is two-fold. First, we want to demonstrate the commonalities in CO2-detection research, particularly between communities that would typically not be aware of each other's work. We were very keen that this issue, and the meeting on which it is built, covered both the animal and plant CO2-detection fields. Second, we want to demonstrate to others the tremendous progress that has been made in the CO2-detection field over the last few years. Anyone with a passing knowledge of the dissolved inorganic carbon equilibrium knows that an increase in dissolved CO2 corresponds to a pH drop. This issue will demonstrate quite clearly that CO2 is bioactive independent of acidity.



The papers span the animal and plant kingdoms - what can specialists in each kingdom learn from each other?
It is interesting to note that researchers from the animal and plant kingdoms investigate model systems in which the total inorganic carbon concentration is hugely different; tens of millimolar is common in animal systems while micromolar is typical in plants. Regardless, both animal and plant researchers face common problems. What is the identity of the sensor(s) that enable an animal or plant cell to detect and respond to CO2? What is the identity of the downstream signalling events in response to the activity of these sensors? How can we differentiate between the direct effects of molecular CO2 and altered pH? Researchers from the respective fields can understand how these problems have been solved and adapt them for their system.

How can research in this area affect medical practice?
Scientific consensus has considered CO2, at best, a relatively inert metabolic by-product, and at worst, a toxic molecule with severe clinical consequences if dysregulated. However, clinical observations demonstrate that elevated CO2 might be beneficial to patients in certain circumstances. There is clinical value in addressing the molecular mechanisms for the physiological effects of CO2. A large cohort study and retrospective analysis of the Acute Respiratory Distress Syndrome demonstrated the therapeutic benefit of elevated CO2. However, elevated CO2 can have harmful pathophysiological effects on the lung (alveolar fluid clearance and epithelial cell repair), skeletal muscle and innate immunity and host defence. Consequently, there is still research underway to understand under what conditions elevated CO2 might be therapeutically beneficial and/or detrimental.

What are the future areas for investigation in this field?
The field is so dynamic; there is a lot to look forward to, and a lot of potential for tackling fundamental problems. However, I would highlight three areas that I look forward to with interest. First, is there a common mechanism by which biomolecules interact with and have their activity altered by CO2? There is intriguing evidence for a CO2-mediated post-translational modification whose role requires further resolution. Second, as alluded to above, what are the clinical consequences of elevated CO2? Are there clinical benefits that can be exploited while detrimental side effects are mitigated? Third, how do crops respond to elevated CO2? Understanding these mechanisms can identify targets for crop breeding under climate change.

Keep up to date with the latest issues of Interface Focus by signing up for content alerts, and browse previous theme issues on the journal website. Image credit: Garfield Kwan, Till Harter, Martin Tresguerres; see the article 'Molecular and biochemical characterization of the bicarbonate-sensing soluble adenylyl cyclase from a bony fish, the rainbow trout Oncorhynchus mykiss' (https://doi.org/10.1098/rsfs.2020.0026) published in this issue.

Written by Jessica Miller, Editorial Coordinator, Interface FOCUS and Professor Martin Cann, Head of Department of Biosciences, Durham University

Building Bodies – Knowable Magazine

Knowable Magazine, a journalistic publication based in California, is dedicated to making scientific knowledge accessible to all. It is published by Annual Reviews, a nonprofit publisher dedicated to synthesizing and integrating knowledge for the progress of science and the benefit of society.

From a single cell, a human embryo grows into a collection of tens of trillions of highly integrated, highly specialized functionaries. How does it do it?

Biologists have long been obsessed, and we have become so, too. The result is this special report on Building Bodies. It includes a taste of the captivating things that scientists have learned about the principles and strategies that go into sculpting animal and plant forms — and the many puzzles remaining.

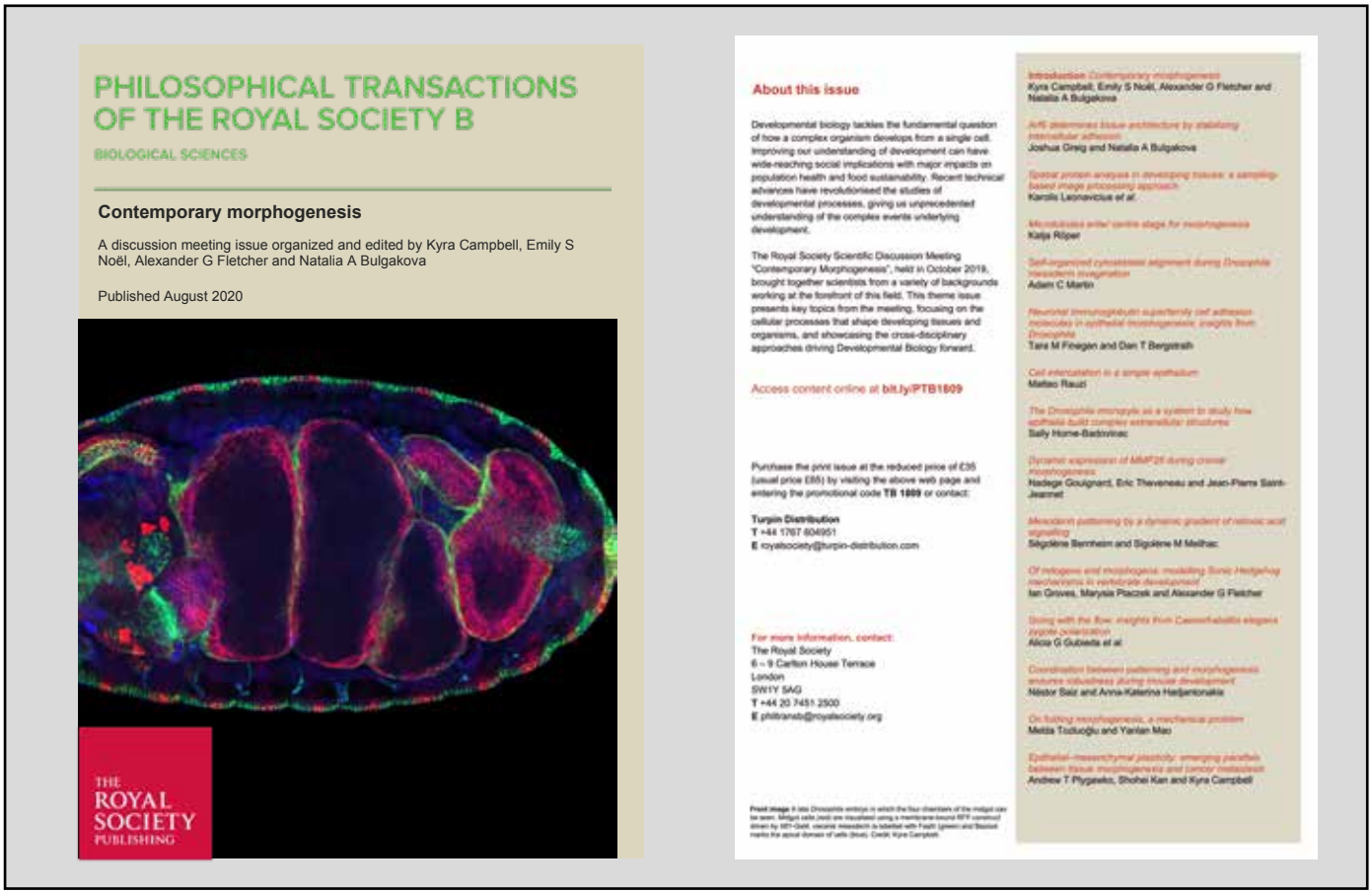
In this report, we look at unseen forces that push and pull cells from a naïve state to sophistication. We examine the body as a bag of branching tubes and ask how those structures are fabricated. And we lay out simple-seeming questions, such as: How does the embryo know top from bottom, or left from right? How does a spleen or a lung know how big it should grow to be? There's an elegance to the answers that scientists are unearthing.

There are many common threads in the solutions that creatures like worms, flies, mice and humans have come up with to solve such problems — and through the decades, research in one has informed understanding of another. But our report also examines some stark differences. We look at the growing rules for trees, for example: Out of necessity, since they can't move around, their shapes are far more plastic than animals'. And with envy we delve into the prodigious ability of salamanders to regrow lost limbs. Maybe, through learning how they do it, we might one day duplicate the process in people.

Read on, enjoy — and let us know what you think on Twitter, Facebook and by emailing the editors. And if you want to track what *Knowable* is up to each week, an easy way to do so is to sign up for our newsletter. https://www.knowablemagazine.org/report/building-bodies

Rosie Mestel and the Knowable Magazine team

www.knowablemagazine.org/page/about-knowable-magazine



Meet the BSCB Committee: Ann Wheeler

Ann is the University of Edinburgh ESRIC facility manager. Her expertise is in advanced light microscopy, in particular Structured Illumination Microscopy (SIM) and Single Molecule Localisation Super-resolution microscopy (SMLM), as well as quantitative image analysis. She joined the BSCB Committee in 2015.

1) What's your role on the committee?

I have been the magazine editor for the past 5 years. As well as this I've worked on a sub committee to update our ambassadors and on the History of the BSCB project, published in the 2020 magazine.

2) Over the next year what will be you be up to for the BSCB?
Quite a bit less, I have almost reached the end of my 6 year term on the committee. I hope to attend the conferences this year but will be stepping down as magazine editor.

3) Aspirations for the BSCB?
I would love the BSCB to continue to provide resources and support for Cell Biologists at all stages of their career. I have been particularly inspired, during my time on the committee, by the hard work of our PhD and Postdoc reps to make the society relevant and representative of our Early Career and student members.

4) Could you describe your research in a nutshell?

Its been a little while since I did any! At the moment I am the manager of the advanced imaging resource at the Insitute of Genetics and Cancer in Edinburgh. I went part time when I became a parent and am very fortunate to have a supportive manager who allowed me to do this. My research, when I have time to do it, is around applying novel light microscopy methods to questions in cell motility, in particular cancer invasion. I was one of the first to apply super-resolution microscopy to cell biology questions in the UK and run a Centre for Excellence for this called ESRIC as part of my day job.

5) What inspired you to come into Cell Biology?

I was very interested as an undergraduate in how cells communicated with one another to produce responses on a systemic scale and how this could become dysregulated in processes such as cancer..

6) What's been your best moment as a Cell Biologist?

There have been several, I most enjoy applying new methods to old questions. I probably enjoyed developing a method to visualise HIV behaviour in cells using super-resolution the most, although I was a collaborator in this project. Prior to the development of super-resolution microscopy it was impossible to visualise this. Seeing Cell Biology in its 3D spatial context is always interesting.

7) What do you feel are the biggest challenges facing Cell Biology?

There are so many new avenues and technologies we can use emerging in the past decade. I think finding interdisciplinary scientists who can work together to tackle the big questions and apply their knowledge from Chemistry, Infomatics and Physics together with Cell Biologists

8) If you were to start your PhD today what would be the emerging topic you would like to focus on.
To be honest I probably wouldn't change anything, there are so many interesting topics in the regulation of single cell motility and so many more interesting tools that are now available to use to dissect the processes occurring and regulation of these. I'd quite like to do my project again but using the cool new methods available.

9) At the BSCB meeting where would we be most likely to see you?

Networking or at any notable event, at the BSCB meeting I am a complete hack. There wouldn't be interesting stories to read in the magazine otherwise.

10) What's your favourite cell and why?

I particularly like the squamous cell carcinoma line I used to pioneer super-resolution methods. It is a very attractive cell with a nice cytoskeleton. It's the sort of cell which would happily gain the person imaging it prizes in imaging competitions

Meet the BSCB Committee: Tom Nightingale

Tom is a group leader at Queen Mary University of London. Research in his lab centres on the biology of the cells that line blood vessels (endothelial cells). He is particularly interested in the way in which key proteins are regulated by being moved intracellularly as a means to control dynamic changes in endothelial function, secretion etc. To monitor this, his lab uses live cell imaging, electron microscopy, molecular biology and proximity labelling proteomics.

1) What's your role on the committee?

I am one of the new people on the committee having joined at the very end of last year. My role at the moment is principally to get up to speed. To learn how everything works and to try and see which of the committee's roles I can help out on.

2) Over the next year what will be you be up to for the BSCB?

I am very much looking forward to the BSCB conferences that are coming up this year, particularly the Dynamic Cell meeting which is always great. I am hoping to learn a bit about how these are organised and help out in any way I can. Maybe by the end of the year we might even start having face to face conferences once again. Who knows…

3) Aspirations for the BSCB?

I would love to see the BSCB continuing to support emerging cell biologists. Both by funding new and bespoke conferences and by supporting students and postdocs who perhaps are struggling to attend such events (whether due to gaps in funding, child care issues etc.). The society can really help a community who are facing all sorts of new challenges. This has never been truer with scientists trying to maintain research whilst working from home, home schooling or taking on challenging online teaching.

4) Could you describe your research in a nutshell?

My major interest is in how the cells lining the blood vessels control physiological responses (including inflammation and blood clotting). I am particularly interested in how intracellular trafficking is important for this, allowing junctions between cell to disassemble as needed (allowing leukocytes and cytokines to enter the underlying tissue) or by secreting key factors into the blood stream.

5) What inspired you to come into Cell Biology?

I have always loved microscopy and visualising what is going on inside cells. I did my best to take up a PhD and post doc positions where this was supported and I still try and use any new piece of imaging equipment that comes my way.

6) What's been your best moment as a Cell Biologist?

It's got to be those moments when you finally find out or see something new. When my old institute got its first spinning disk microscope we finally started to visualise actin movements associated with clotting factor secretion. This answered lots of questions we were interested in and opened up loads more.

7) What do you feel are the biggest challenges facing Cell Biology?

I think harnessing big data, we are more and more likely to ask bigger questions and end up with giant list of potentially interesting hits. These all need to be validated and put in the context of the cell, tissue or organism. I sometime feel there is so much information out there that is slipping through the cracks.

8) If you were to start your PhD today what would be the emerging topic you would like to focus on.

Gosh there are so many interesting and emerging topics to address. I find the whole mechanics of cell function really interesting and there are loads of cool new ways to model these processes. There is also interesting research on how cell crowding constrains cellular processes. When you first do electron microscopy the first thing that strikes you is how much "stuff" is in every cell. It's amazing.

9) At the BSCB meeting where would we be most likely to see you?

Meeting with new scientists and learning about their interesting research or catching up with all the scientists who I haven't seen for a while. This sort of thing normally happens next to a poster or with a beverage.

10) What's your favourite cell and why?

The endothelial cell. Blood transport wouldn't be the same without them (they are also nice and flat for imaging).

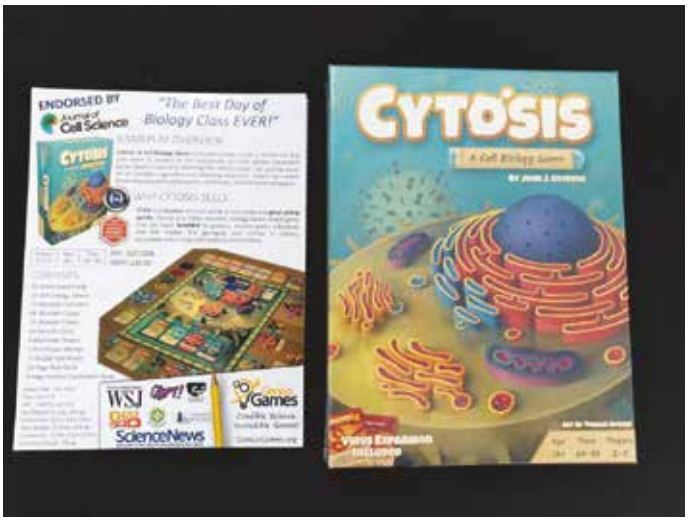
Book and game reviews

Lab closed, looking for home entertainment? With many labs closed for 'wet' research many of us have been at home. Between data analysis, lab meetings and online seminars here are some other ways to while away the hours.

Something to look forward to in 2021

Molecular Cell Biology, Ninth edition will, COVID delays permitting, arrive in the UK in March 2021. The textbook has been updated, some topics re-arranged and a few chapter headings altered to improve clarity. Previous time and student-tested features, including medically relevant advances and modern experimental techniques, have been retained and a gives 'Molecular Cell Biology' a unique and extra aspect to the study of cell biology.

It will arrive with a new online learning platform that Macmillan Learning are calling 'Achieve'. No doubt this was in planning before COVID-19, but the features have clearly been designed with some degree of remote learning in mind. These features include material for pre-class preparation, in-class active learning, post-class study and assessment, and access to digital resources. [A Test Bank will be available soon]. With the book in both print and E-book form and the 'Achieve' online learning platform, the publishers are aiming at presenting a pre-planned complete course.



Cytosis – A Cell Biology Board

Cytosis – A Cell Biology Board game launched in 2017. Cytosis takes place inside a human cell, the aim is to build and maintain a fully functional cell. Players being with a number of 'worker' cards. Every turn, each player places a workers in an available location within that cell. Some locations provide resources, such as; mRNA or ATP. Others with actions (e.g. synthesise energy, make resources – which are cards that can be collected). The resources then build enzymes, hormones and/or receptors, which score 'Health Points'. To win the game you collect the most Health Points.

"*Cytosis is a lovely, interesting, dare I say educational, worker placement game. Complex enough to engage and require thought, yet also relatively simple to play. It is a well-designed, fast playing, introduction to the genre. As such Cytosis receives a firm recommendation*." Neil Bunker

Centre of the Cell

Centre of the Cell is a unique, cell-shaped science centre suspended above a real biomedical research laboratory in the heart of London's East End. This digital interactive public engagement project is based in the Blizard Institute at the Whitechapel medical and dental campus of Queen Mary University of London.

Since opening in September 2009, over 100,000 people have participated in Centre of the Cell activities. The Centre of the Cell has five main aims: to inspire the next generation of scientists and healthcare professionals; stimulate dialogue, interest and excitement about biomedical research; raise aspirations, especially in the local community; widen participation in further and higher education and to help improve health and wellbeing especially in East London. org. While it isn't possible to visit during the pandemic the website hosts a variety of games and learning experinces suitable for homeschooling or light relief.

There have been over one million visits to the interactive website since its launch, www.centreofthecell. The game titles range from basic cell and tissue biology e.g. Explore a cell; Mitosis Movie; Cell Turnover; Organ Surgery to Applications is biomedicine, although perhaps 'Flu Pandemic' is a little too close to home this year.

https://www.centreofthecell.org/learn-play/games/

For those who prefer screen free entertainment 'Cell Trumps' are available from the online Centre of the cell Shop. https://www.centreofthecell.org/product/cell-trumps-1-pack/

Rebel Cell by Kat Arney

Cancer starts when cells revolt, throwing off their molecular shackles, and growing and dividing out of control in a shambolic mockery of normal life. This is why we can't avoid cancer: because the very genes that drive it are essential for life itself. The revolution has raged, on and off, for millions of years. But it was only in the twentieth century that doctors and scientists made any significant progress in understanding and treating cancer, and it's only in the past few decades that we've finally begun to kick the mob's malignant arse. Now the game is changing. Scientists have infiltrated cancer's cellular rebellion and are finally learning its secrets.

Geneticist and science writer Kat Arney takes us to the dawn of life on planet earth right up to the present day to get to the heart of what cancer really is and how by be

Meeting reports

American Society of Cell Biology (ASCB)–EMBO Annual Meeting

7–11 December 2019. Washington D.C.

The American Society of Cell Biology (ASCB) holds an annual meeting in conjunction with the European Molecular Biology Organization (EMBO) each December, which in 2019 was held at the Walter E. Convention centre in Washington D.C.

The ASCB-EMBO meeting is the premier cell biology conference in the world and brings together researchers from all aspects of cell biology. With over 6000 attendees, the meeting showcases the work of cell biologists through varying symposiums, lectures and poster presentations. The meeting also holds professional development sessions for undergraduate and postgraduate students alike as well as a variety of networking events and receptions.

We were both fortunate enough to attend the meeting to present posters on our research, network within our fields and get feedback on our research. We are based in a lab that studies the cytoskeleton (the structures which help cells maintain their shape and organisation), but our research has both taken us in different directions. It was therefore really useful to talk to other researchers in our particular areas of cell biology and get specific project advice. It was brilliant to have top researchers come to our posters, discuss our work and provide suggestions for future directions. We both received lots of feedback and guidance that has really shaped our research direction.

The meeting has such a wide breadth of cell biology talks and posters that there are sessions to interest everyone, whatever their research focus. If anything, there are too many great sessions to choose from! Some of our talk highlights included Adam Horn's presentation on mitochondrial fragmentation as a mechanism for localised signalling and Wei Guo's talk on the role of the exocyst in cell migration and tumour invasion. Hot topics at the 2019 meeting included phase separation, BioID (a screen for identifying protein-protein interactions) and atomic force microscopy. It was a great experience to listen to so many knowledgeable speakers and learn about emerging cell biology techniques and themes.

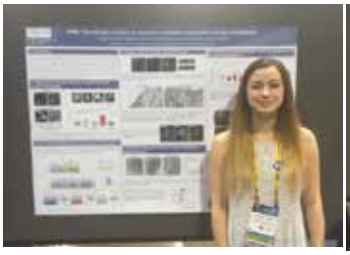
As part of the annual meeting, the ASCB also offers a one-day Biotech course for graduate students and post-docs. The course was extremely insightful and informative and allowed us to learn about how the Biotech industry works. We went through case studies to understand how investment in Biotech works, heard from a panel of speakers in different industry positions, and had a workshop on how to tailor your CV and interview approaches for individual job adverts.

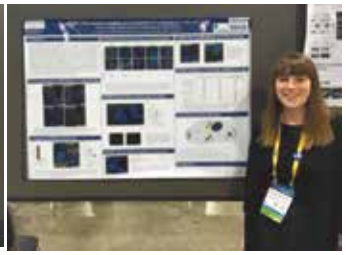
In addition to the conference, we had the chance to explore some of Washington D.C. We visited Capitol Hill, the White House, the Washington Monument and Lincoln memorial as well as Arlington National

Cemetery in the neighbouring state of Virginia. It was brilliant exploring Washington D.C at Christmas, as there are Christmas markets, and beautifully decorated streets. We even managed to go ice skating!

The meeting enabled us to meet other cell biologists from a host of worldwide institutions and was an excellent opportunity to find out about cutting edge cell biology research to inform our future career plans. We are extremely grateful to the BSCB for awarding us Honor Fell travel grants which allowed us to attend this ASCB-EMBO meeting.

Bethany Dean (MbyRes Student) and Lauren Adams (final year PhD student) at the University of Exeter





14th ACTIN 2019 meeting

13 December 2019, Bristol

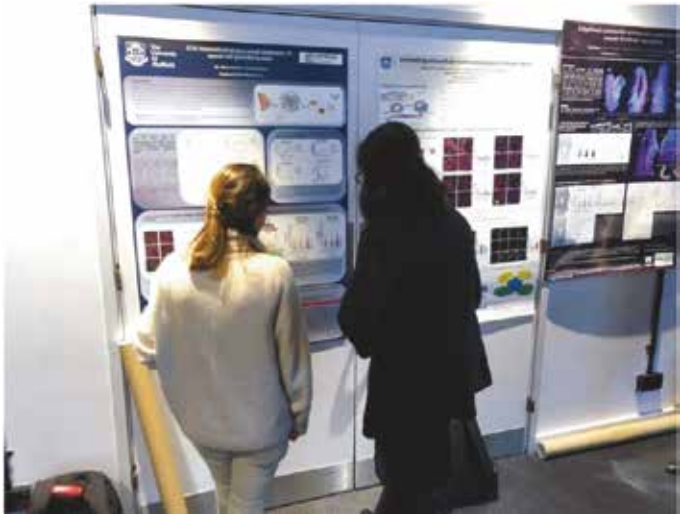
The ACTIN meeting organised by Professor Harry Mellor sets the perfect stage for a day of informal talks and discussions by early career researchers. For many of us, this meeting marks the imminent end of the academic year and eases into the Christmas holidays.

Organised in the relaxing ambience of the Watershed complex at the harbourside in Bristol, the meeting has longish coffee and lunch breaks allowing us to get immersed in the posters and discuss our work. Scheduled invariably on a Friday each year, this meeting enables attendees from across the UK to explore Bristol during the weekend and also pivot to London for another one-day meeting the following Monday (Membrane Trafficking). We had about 150 attendees this year from diverse fields employing a range of different approaches to understand the organisation of the actin cytoskeleton. We had insights from the development in flies to studying intracellular pathogens hijacking cellular actin machinery, across scales from understanding individual actin filament organisation to collective cell migration in cancer. The meeting sponsored by BSCB, the Royal Microscopy society and amply supported by Lonza, Promenga, Cytosmart, Thermo and Merck allowed for entire labs to attend and exchange ideas.

The first session, chaired by Harry Mellor, started off with an amazing talk by Davide Carra from the Crick Institute. He described a new subset of the well-known actin nucleating complex Arp2/3 can be utilised by cell to depolymerise actin filaments. The surprising results came from the observation that cells lacking a particular isoform of Arp3, when infected with Vaccinia virus, produce longer comet tails – structures that is used by the virus to move around. The next talk was by Megan Chastney from the University of Manchester. By using the rising technique of Proximity-dependent Biotinylation in combination with proteomic and interactome analysis, she showed that the technique was able to recapitulate both the structures as well as discover many new interactors of the focal adhesions. She aimed to take this finding into the context of pancreatic cancer to explore how do the cancer cells utilise these structures to interact with the surrounding matrix and eventually metastasise. The last talk of the first session came from Lotte de Winde from University College London presenting us with an answer to the dual, seemingly contradictory functions of fibroblastic reticular cells (FRCs) in regulating lymph node expansion. She showed that the function of the protein podoplanin is important for the functions of FRCs, and that the interaction with CLEC-2, another protein on dendritic cells can switch the functions of it.

After a short break but with a lot of exciting science chats, we're back with session two of the day chaired by Sophie Acton. Opening this session was Evelyn Garlick from Birmingham talking about using single-particle super-resolution microscopy to study the dynamics of membrane receptor Adenosine-A2B. By using different methods of image analysis and processing, she showed us how these receptors interact with the actin meshwork underneath the plasma membrane, and how they could be confined by the actin filaments. Next we had Willow Hight-Warburton from King's College London studying the effects of two Integrins alpha 4 and 9 on the collective migration of epithelial cells. She showed that these integrins localised to distinct locations on the cell membrane and losing them led to morphological changes of migrating epithelial cells. And finally, we had Alexia Hervieu from the Bart Cancer Institute showing us how RAC1 can regulate cell migration and growth through Met-receptor.

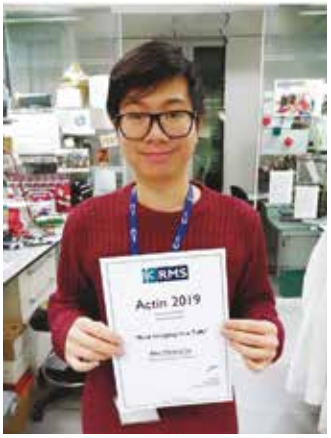
After lunch we had the third session chaired by Brian Stramer. The first talk in this session was from Anh Hoang Le from Prof. Machesky lab at the CRUK Beatsons Institute. Anh explained the role of the Rac interactors, CYRI-A and CYRI-B isoforms in integrin trafficking and cancer



cell invasion and migration. Anh had some mesmerising videos and images of cancer cell migration and was deservedly awarded the RMS sponsored best image prize. Following Anh, we had Brian Hon-Man Sit, from Iskratsch lab at KCL, who showed us the novel roles of Cofilin in mechanotransduction at podosomes. Next up, Josiah Lutton from the University of Warwick explained the intricacies of light sheet microscopy and its use in identifying and quantifying macropinosomes in the Dictyostelium.

In the final session of the meeting, chaired by Prof. Anne Ridley we had 3 talks focussed on the adhesion of cells to the extracellular matrix. We had Mona Nazemi, from Elena Rainero's lab at the University of Sheffield who described how cancer cells internalise ECM proteins as an alternate source of energy during starvation. Next we had Sashi Singh from Robert Insall's group at the Beatson's Institute who described novel SCAR/WAVE phosphorylations in response to cell adhesion elucidated through optimised low-bis SDS PAGE gels. The phosphorylations on SCAR/WAVE altered the complex recruitment and efficacy of migration in cells but surprisingly was dispensable for activation and actin regulation by the complex. The final talk by Anantha Sundararaman from Prof. Mellor group at Bristol demonstrated the role of a less studied RhoGTPase, RhoJ in the regulation of endothelial fibronectin remodelling. She spoke about the contradictory roles of RhoJ and its ancestral Cdc42 protein in regulating matrix remodelling through a competition for shared downstream substrates. The talk was awarded the BSCB sponsored best presentation prize.

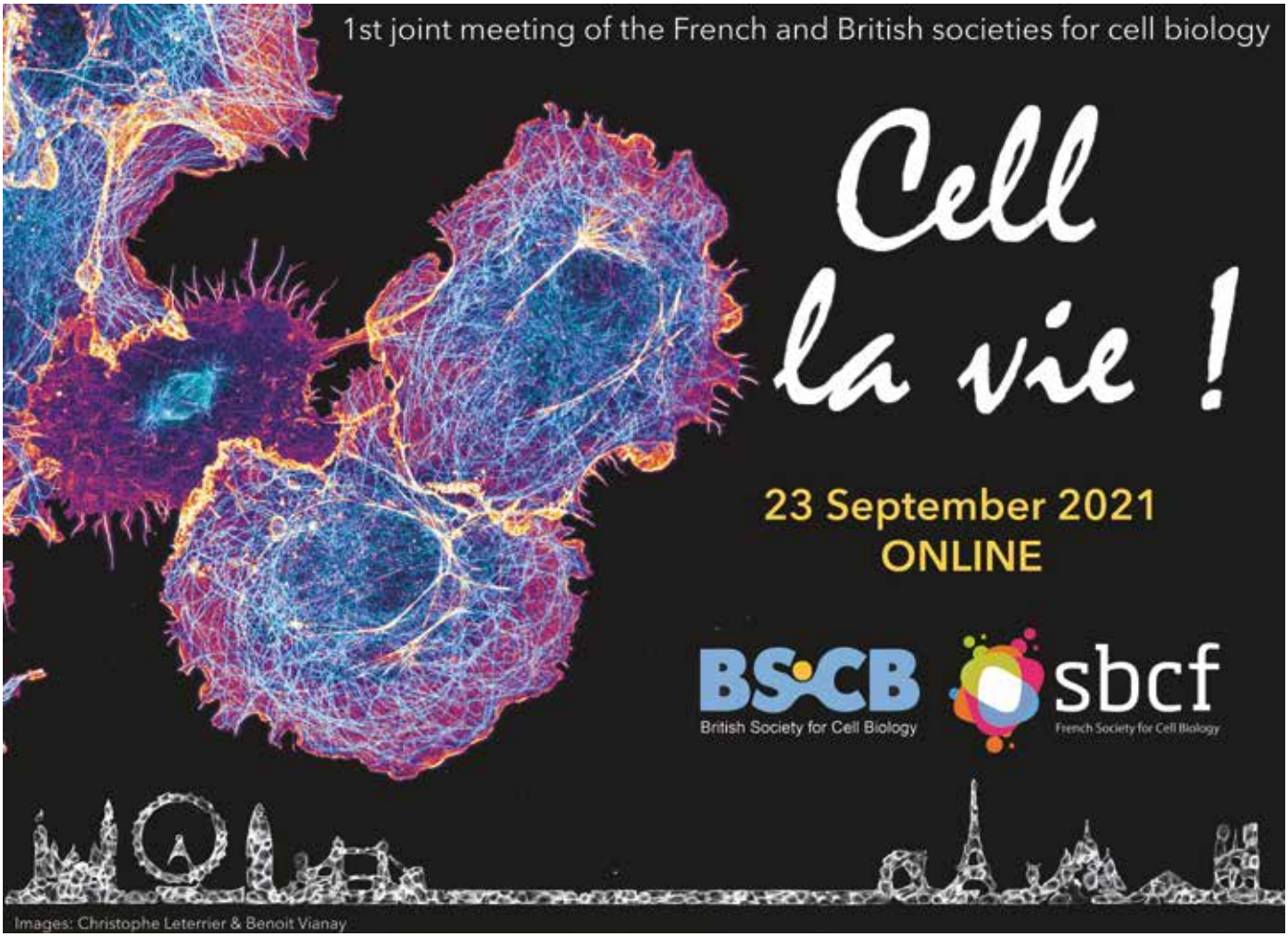
The poster sessions this year were held during each break with coffee and snacks. We had more than 70 posters covering a diverse array of actin biology. The meeting itself provided an opportunity for all attendees to present, discuss and collaborate in a friendly and relaxed atmosphere. Keqian Nan, from Elena Rainero lab who is working on ECM-dependent



focal adhesion turnover for invasive breast cancer cell migration, was awarded the best poster prize.

Overall, the 2019 ACTIN meeting provided an exciting forum for presenting actin biology-related research across the full spectrum. The authors would like to take this opportunity to express our appreciation and gratitude to all the organizers and sponsors for their invaluable contributions to the organization of the meeting. In addition, we would also like to thank all the attendee for their excellent presentations and the active participation in discussion during the meeting. This is the one meeting that should not be missed by any cell biologists, biochemists, developmental biologists, or anyone interested in the rich and exciting biology of the actin cytoskeleton. Hope to see you in the next meeting!

Anh Hoang Le, Ananthalakshmy Sundararaman, Keqian Nan



Meetings in Lockdown – 2020

2020 was the year of online discussion for the BSCB community. Immediately following the national lockdown in late March 2020 due to the COVID-19 pandemic, the BSCB were unfortunately obliged to postpone their annual meeting. Our one day events flourished, the move away from in-person meetings allowing much more of an international flavour to these meetings. The North of England Cell Biology meeting and the Cilia meeting were both extremely well attended and were a credit to the tenacity of the organisers.

Some of our meeting organisers saw the online format as an opportunity, inviting speakers globally. The Cilia meeting, for example, opened with a talk from a Japanese PhD student and had a much more international flavour than the BSCB one-day meetings would usually have had. It will be interesting to see which direction our one-day meetings take going forwards.

18th BSCB GenSoc UK Cilia Network e-symposium

Open to all, registration for each of these free events in advance was required. The meeting was run under the ethos of the UK Cilia network – '**sharing unpublished data from emerging talent favouring talks from students, post-docs and early career researchers**'.

The goal with this online event was provide an opportunity to support our young researchers during social distancing, and to stimulate discussion and feedback among our community. Talks where speakers agreed were cloud-recorded and processed for 48 hours of on-demand viewing available to registrants only. This was an excellent way of protecting our ethos of sharing unpublished data whilst acknowledging the many competing demands for our audience's time – including childcare, teaching and time zones.

"The meeting had 100s of attendees at each symposium, and we were thrilled to this event continued to grow in popularity despite all the challenges 2020 has given us."

https://www.cilialab.co.uk/ciliameetings

The rise of the virtual forum

Despite several setbacks, buildings being closed and bench research effectively having to stop or slow down, our enterprising BSCB members were able to find new ways to collaborate, share ideas and promote scientific debate.

Many of our Postdoctoral members rose to the challenge that lockdown presented by providing new, exciting, international platforms for discussion in specialist disciplines. The webinars made the most of social media platforms such as Youtube, Twitter and Slack to publicise events to draw an international audience and promote debate. Previously, participation in field-specific 'clubs' was often limited by geography, both in terms of who could attend and who could speak. The BSCB promoted Motors in Quarantine, Cell Migration Seminars and Nucleus Science talks, all of which had excellent speaker line ups worthy of 'big meetings' such as our annual BSCB conference. Aall content was recorded and available online, effectively democratising scientific debate and making our Cell Biology community more inclusive.

A comprehensive list of webinars, virtual talks and events is hosted by the Node: https://thenode.biologists.com/list-of-virtual-talks-seminars-forums/events

Some of the groups we have been promoting this year on our twitter feed are discussed below.

Motors in Quarantine

This is a weekly webinar series on Wednesdays at 16:00 UTC, organised by the Straube and Koster labs at Warwick University (UK). The format is two 15 minute presentations plus 15 minutes Q&A. There is a 'meet the speaker' afterwards for a more informal chat and to ask questions in a smaller group using a breakout room.

If the speakers agree to being recorded, the webinar is available on-demand for 48 hours after the live event. Speakers are selected from the sign-up form with the aim to balance gender, geography, career stages and topics. As well as weekly presentations online we also feature a Slack Space for community chat.

http://mechanochemistry.org/whatson/MiQ/#tab=up
Twitter: #MotorsInQuarantine

Cell Migration seminars:

Since May 2020, we have been running a once-a-week one hour seminar on the topic of cell migration featuring the latest work from group leaders, postdocs and PhD students from around the world. Seminars take place on Zoom and YouTube Live.

Register online to receive weekly seminar information including links to attend live. Zoom is in the email for those registered. These interesting talks were organised and curated by Adam Shellard, Jennifer Mitchell and Becky Jones who are Postdocs and a PhD student in the Mayor, Fredburg and Patel labs UCL, London.

https://www.cellmigrationseminars.com/
https://www.youtube.com/channel/UCQI0OwJIn8TdvM0_z_HCLrw/live
Twitter @CellMigration

AutophagyUK Network

To fill the gap in the Autophagy UK network activity caused by the delay of the annual meeting to 2021, a webinar series covering a range of topics relevant to network members began in October 2020. The first talk was by aJon Lane, University of Bristol, and has been followed by national and international speakers weekly.

https://autophagy-uk.com/2020/09/29/348/
Twitter @autophagyuk

Nucleus Science Talks

This was one of the first online webinar / seminar series, starting in April 2020. The organisers are based in Paris, so talks are set at Central European time. The resource comprises webinars and virtual meetings that are relevant to gene regulation. The Ttwitter feed is full of lively debate and links to papers. There is a Slack channel for questions and discussion by community members.

The format has recently expanded to give an opportunity to early career scientists to present their work through short, 20-minute talks.

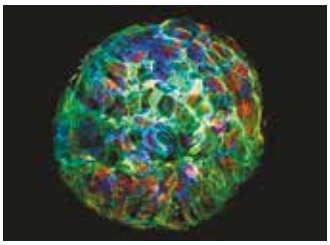
The resource is curated by Dr Patricia Davidson, @patriciadavidso, previously a postdoc in the Cadot lab, and currently working on R&D at 4D Cell, and Dr Bruno Cadot, Centre of Research in Myology, Paris France. @cadotbru.

https://generegulation.org/event/nucleus-science-talks
@NucleusSciTalks

CRICK London Cell Motility Club symposium

The next CRICK London Cell Motility Club symposium will be again a virtual online symposium; please see https://cytoskeleton.wixsite.com/londoncellmotility for more informaiton and the Zoom link

Thursday, 27 May 2021
14:00-17:00, (BST)



Invited Speaker: **Xavier Trepat**, IBEC, Barcelona, Spain
https://www.ibecbarcelona.eu/integrative

Title: "**Collective cell migration in intestinal organoids**"

If you are a PhD student or Postdoc and have an interesting story, please fill in this short form with a title and short abstract by April 29th, 2021, Thursday midnight (deadline) to be selected for one of the 3 short talks or one of the 5 flash talks.

https://forms.office.com/r/GpHKZiRMJg

Schedule for virtual half day symposium:

14:00-14:45	**Keynote talk: Xavier Trepat, IBEC, Barcelona, Spain**
14:45-15:05	Discussion over BYO coffee
15:05-15:15	Short break
15:15-15:45	Flash talks: 5 Flash talks by PhD students and Postdocs each 3 slides in 5 min
15:45-16:00	"Coffee break" with 5 parallel breakout rooms for discussions on these Flash talks
16:00-16:45	Three short talks (12 min) by PhD students and Postdocs
16:45-17:00	"Wine and beer happy hour - BYO" with 3 parallel breakout rooms for discussions on these talks

Image above: Breast cancer cells attached to a surface rich in collagen. The actin cytoskeleton can be seen in green, coated with active myosin (ppMLC) in red, and the cell-cell junctions (E-cadherin) in blue.

Summer studentships

Are the top 5 candidates from a DUB siRNA library screen of TEAD4 expression linked to TEAD4 or Hippo signalling?

I applied for the BSCB scholarship to financially support me during my summer studentship programme. This funding was intended to help cover my travel costs from Manchester (where I live and study) to the research lab at the University of Liverpool. However everything changed because of Covid, so instead the funding was vital to help me obtain better technology and software necessary for a bioinformatics project.

After doing a cell signalling module at university, I decided that I wanted to further explore signalling inside a cell, and in particular how this is dysregulated in cancer. The lab I chose to work with is researching the role of deubiquitinases (DUBs) in signalling pathways, and their expression in various types of cancer. This was an opportunity not only to expanded my knowledge of cell signalling, but also to see how the application of scientific findings at a molecular level can reveal potential targets for cancer therapeutics. I had not previously met Prof Judy Coulson, who supervised my project together with Oliver Busby and Dr Francesca Querques from her lab.

My research question was 'Are the top 5 candidates from a DUB siRNA library screen of TEAD4 expression linked to TEAD4 or Hippo signalling?' Although we had previously planned for a lab-based project, I found that the related bioinformatics-based research I did instead was equally interesting. I was able to investigate each of the 5 selected DUBs and their potential role in TEAD4 or Hippo signalling through looking at already known interactors (using BioGrid), their cellular localisation relative to TEAD4, and their genetic status and protein expression in cancer using cBioPortal (TCGA data) and UALCAN (CPTAC data), respectively.

I enjoyed exploring databases which I had not yet used during my university experience. As a biochemist, I enjoyed using BioGrid as I could see the potential interactors of the selected DUBs, through protein-protein interactions. In addition, the final part of my project involved using proteomics-based pan-cancer subtyping (UALCAN) in relation to the Ovarian Tumour-related proteases (OTU) family of DUBs. This was particularly interesting as an alternative method of testing the involvement of DUBs in cancer, through viewing each subtype as a particular molecular signature, rather than a cancer type. It highlighted potential DUBs that we had not yet considered as having a role in Hippo signalling.

One of the main problems I faced whilst compiling information was the lack of protein data existing for some less abundant DUBs. This prevented me from mapping the pan cancer subtypes of every member of the OTU DUB family, and I could not explore the relationship between protein expression of TEAD4 and certain candidate DUBs from the siRNA library screen. Despite this, the research project was overall highly effective, uncovering that the two top DUB candidates interact with components of Hippo signalling (YAP1 and MOB4) and show a positive correlation with TEAD4 in Head and Neck cancer. Using pan cancer subtyping, we also found that two OTU DUBs were highly statistically associated with pan-cancer subtypes exhibiting overexpression of YAP target genes. This research therefore revealed new potential novel regulators of TEAD4/

Hippo signalling. I will keep in touch with the lab to see if my predictions hold true in future experiments!

Due to the COVID-19 pandemic, the labs in Liverpool were closed to undergraduates and I was living in an area where local lockdown measures were still in place, so our research project changed from an in-lab based experience to a bioinformatic project. Although this meant that all contact between myself and the lab team was only online, through email, Zoom and Microsoft Teams, this worked effectively. I was even able to give a powerpoint presentation summarising my findings to the research group in an online lab meeting.

I will now be going into Year 3 of my undergraduate degree at the University of Manchester and, knowing that I have a particular interest in cellular physiology and signalling, my Year 3 modules will be directed towards such areas of research. This BSCB funding has enabled me to take part in a research experience that I would have otherwise struggled to fund due to living in a low income household. I am grateful that I was able to have the opportunity to not only explore areas of research I was interested in, but also reveal 'bioinformatics' as a post graduate research field I had not yet considered. Once I complete my undergraduate studies, I plan to apply for post-graduate research courses.

Emily Edwards

Hijacking of membrane contact sites by intracellular pathogens

A penultimate Biological Sciences student with the intent of going into cellular research, last spring I was searching for an internship opportunity. I wanted to gain more experience and further develop the organisational and problem-solving skills I obtained during my third-year research project that focused on analysing the prevalence of Microsporidia in selected host samples. Microsporidia are intracellular parasites that infect some protists and almost all animal phyla. The project supervisor, Dr Williams, does research on their adaptation to the host environment. Through discussion, we aimed to collaborate with Dr Joseph Costello, a member of the British Society of Cell Biology, and whose research involves organelle interactions and their impact on cellular signalling. I found the BSCB internship perfect, for it involved both my interest in cellular biology and a professional experience in a team of experts.

The research aims were encompassed by the title "Hijacking of membrane contact sites by intracellular pathogens". Research suggests that protein interactions between nearly all organelles allow material exchange, vital for organellar function. Some intracellular pathogens, like Chlamydia species, were observed to hijack these mechanisms and obtain host lipids. Microsporidia do not have peroxisomes, so my research question was whether they use membrane contact sites between Endoplasmic Reticulum and peroxisomes to obtain host peroxisomal material. Since microsporidian organellar biology is not well-described, the project involved the investigation of the peroxisomal loss in them. The project partly focused on peroxisomal machinery traces in the "transitionary" form of Microsporidia, Mitosporidium daphniae.

Firstly, I screened the literature for any evidence of peroxisomes, then made genomic comparisons using alignment/search tools and Excel. A discovery I made was BBEdit, a useful tool for comparing the relatively conserved peroxisomal targeting sequence 1 motifs. I then"Blasted" human peroxisomal proteins (www.peroxisomeDB.org) against Cryptococcus neoformans, four microsporidian species of choice and three earlier-branching species to identify any homology. I additionally did the same for four genes that are regarded essential for peroxisomal presence: PEX3, PEX10, PEX12 and PEX19, but of ten fungal species, as the closer relatives of Microsporidia than Homo sapiens. Using the results, I created BioRender "pathway maps" for non-microsporidian species (peroxisomes present), Microsporidia in general, and M. daphniae. The latter appears to have peroxisomes, meaning it and earlier-branching species would likely not require contact sites for material uptake, whilst other species might. The maps are preliminary: the data cannot be experimentally tested, which is an aspect I wish were different. Another is time: we did not have enough for me to analyse electron-micrographs(EM) for potential microsporidian peroxisomes.

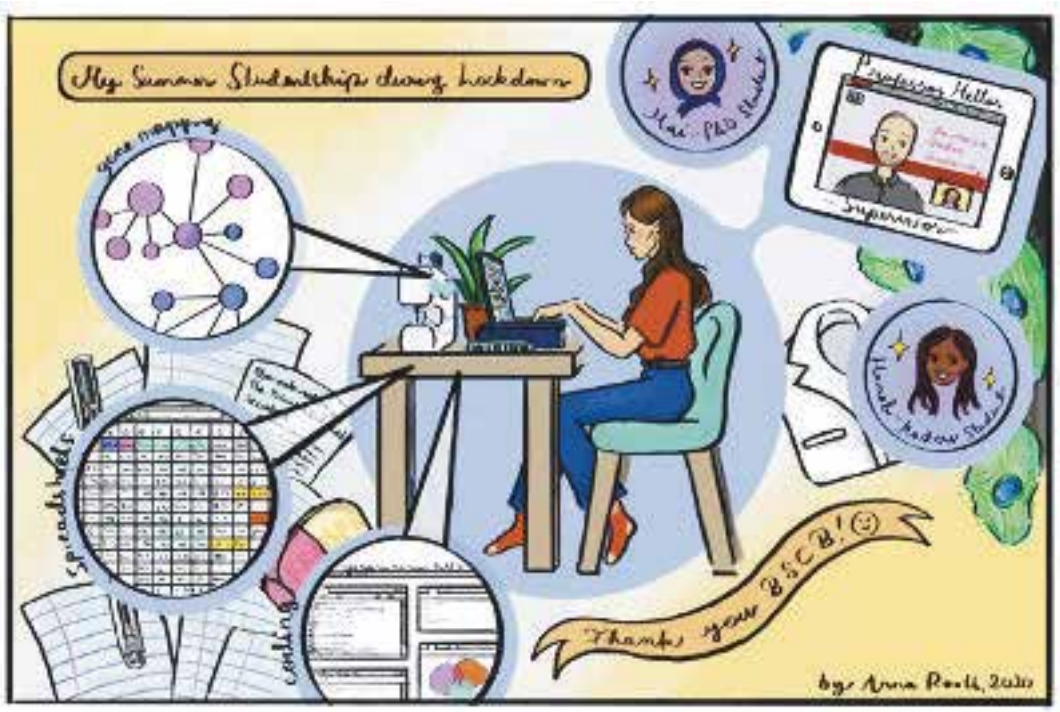
My journey as an intern was well-planned: it consisted of daily discussions with my supervisors, which helped to create a daily plan based on previously done work. It also included workshops given by researchers with expertise (ImageJ, BioRender, R, EM analysis), further accentuating our successful adaptation to remote research – given the inability to gain research skills in the lab. This internship also allowed me to be a part of the project design: we modified the plan throughout, and it was invaluable to experience the student-to-researcher transition, even for a month. I enhanced both interpersonal, like team working and communication, and scientific skills, which I can apply in future research projects that I hope to undertake, especially next year's master's project on infectious disease.

I am grateful to have had the opportunity to do research in the current situation with the COVID-19 pandemic. When I started, I had not been home or seen my family for five months. The internship during this turbulent time and uncertainty gave me an opportunity to not only learn new things, but to do something meaningful in a time when few things seemed so. The team and our work inspired me and made me think about the kind of scientist I want to be. I would like to continue on the path of doing cellular biological research in the form of a PhD – the internship helped me understand that, to work on a project for longer periods of time (such as multiple years), one naturally needs to have a strong interest in the project, and also a professional and supportive team of researchers.

The summer funding was important as I usually have part-time jobs to sustain myself during the studies, and in the COVID-19 context they were all gone. Most of the funding and scholarships in universities that I came across required the student to be a British or European resident, so the funded nature of the BSCB internship was very helpful for me, a Kyrgyz Republic citizen. As the internship was paid, I had a certain "psychological safety" and didn't worry about the financial aspect of my well-being; I was working comfortably and confidently throughout. All things considered, I really enjoyed the process and hope to follow the future progress of the research we initiated with this internship.

Anna Maria

Investigating the Proteome of TNF-α Treated Endothelial Cells



We were asked to submit a photo of us in the lab but because of COVID I spent the whole summer studentship at my desk. I thought it would be nice to represent via a drawing what working during lockdown was like for me.

I first started looking for an internship in January during my second year of a BSc Biochemistry course at the University of Birmingham. I contacted Professor Harry Mellor at Bristol University and he was kind enough to help me apply for the BSCB summer studentship. Although the initial arrangement was to complete a wet lab project, as 2020 progressed it soon became apparent that the project would have to be adapted in order to be undertaken remotely.

The project's area of research was senescence of vascular endothelial cells, with experiments focusing on how the secreted proteome of endothelial cells changed after treatment with TNF-α. I joined the project at quite an early stage – they had two sets of data from cells had been treated with TNF-α for two days, as well as controls. To me that initially didn't sound like a lot, but I realised how much information that was when I saw the spreadsheet containing the mass spectrometry results!

The studentship ended up focusing heavily on data analysis, something I'd not spent as much time doing in the past, and the majority of the time was spent comparing our two-day TNF-α proteome to other senescence proteomes in literature.

There were several questions we wanted to answer – how was our two-day TNF-α endothelial secreted proteome similar to senescence proteomes in literature and were there any proteins that were consistently overexpressed? Are the differences found between proteomes unique to endothelial cells, or to cells treated with TNF-α? And how does the proteome of endothelial cells treated with TNF-α change with short term and long term exposure?

We hoped that through working to answer these questions we would gain a greater understanding of the pathways involved at different stages of the aging of vascular endothelial cells, as well as finding potential biological markers for this process that could be investigated further. Although after eight weeks we only had the start of some answers, I really loved being part of the process.

Whilst working on the project I enjoyed learning more about how to extract and analyse information from large datasets. Spending time on this allowed me to identify errors in a literature data set we were using, which had a large effect on our protein comparisons. As well as comparing different proteomes in Excel, I also spent time investigating ways to graphically represent our data, focusing especially on R Studio and Cytoscape. It was this aspect of the project that I enjoyed far more than I initially expected – it was very rewarding, and there was always an undercurrent of excitement that everything I was looking at was entirely new and I just had to find a way to make sense of it!

During the internship, I worked in a team alongside Maimounah al Mahrizi, a PhD student, and Hanah Batholomew, a Masters student. Despite spending the entire internship working from home in my room, I felt connected to the project and the people I worked with. This was thanks to weekly 1-to-1 Zoom meetings with my supervisor, as well as additional meetings each week with the whole team and a separate group chat with Mai and Hanah. These methods of communication helped me easily to engage with the project right from the very start and meant that I didn't feel lost at any point during the internship.

As a conclusion to the project, I wrote up my findings for my supervisor and had a final debrief over Zoom. Additionally, during the summer Professor Mellor offered me the chance to visit the lab for a few days during the Christmas holidays (if the coronavirus situation improves) to run experiments on proteins identified as potential senescence markers. Hopefully, I will have a chance to see first hand the experiments behind the data I've spent the summer analysing!

The eight weeks passed quickly. Not only has this studentship allowed me to explore an area of Biochemistry I hadn't covered yet at university, it more importantly gave me the experience of being part of a research group and helped me develop my confidence in working on my own and as part of a team. It has also further emphasised my desire to further my studies in Biochemistry and to pursue a career in research.

I am extremely grateful to the BSCB and Harry Mellor for supporting me during this internship – without them both I would never have been able to have this experience. Thank you also to Mai and Hanah who were lovely and helped me feel part of the lab despite being unable to visit it in person.

Anna Rooth

Effects of Phosphoinositide 3-Kinase (PI3K) Signalling on Microtubule Dynamics

Amid the COVID-19 pandemic and uncertainty about the post-pandemic future, receiving an 8-week Undergraduate Summer Studentship from the BSCB to work with Dr. Elina Vladimirou at the University College London (UCL) Cancer Institute was a unique opportunity to strengthen my scientific training.

In my second year as a BSc Biochemistry student at UCL, triggered by the interdisciplinary research conducted in the Chromosomal Instability Research Group, I contacted Dr. Vladimirou expressing my wish to gain experience in the imaging techniques used in the lab to study chromosome abnormalities in cancer. Alongside a Ph.D. student, Katie Dale, I started to acquire hands-on experience in live-cell imaging and widefield microscopy while working on chromosome missegregation, centrosome amplification and spindle polarity. These projects raised my interest in the mechanistic regulation of mitosis and its deregulation in cancer, and, given that PI3K signalling is frequently altered in cancer and a therapeutic target, I was keen on spending my summer answering a key question: what are the effects of PI3K signalling on microtubule dynamics? We knew that the BSCB was the perfect ally to support this cell biological project, since, albeit many mechanisms have been put forward to explain the promotion of tumourigenesis by the amplification of PIK3CA – encoding the p110 catalytic subunit of the class I PI3K enzyme – the effects of oncogenic PI3K signalling on microtubule growth dynamics remain elusive [1].

To answer this question, we activated and inhibited the PI3K signalling pathway in HeLa cells stably expressing EB3-eGFP, a microtubule polymerisation marker. Fields of interphase cells were imaged for 50 seconds in 2D at a rate of one frame per 500 milliseconds using scanning disk confocal microscopy. The MATLAB-based package u-track was used for microtubule plus-end tracking and quantification of the microtubule tracks from each field. In order to extract positional information of microtubule dynamics from single cells, images of single cells were cropped from the bulk populations using ImageJ. Custom-built MATLAB programs were used to determine the growth speed and lifetime of microtubule tracks. According to the classification adopted in previous work by Nishimura et al [2], individual tracks were classified as either slow (speed < threshold) or fast (speed > threshold), and short- (lifetime < threshold) or long-lived (lifetime > threshold), based on how their speed and lifetime compared with the respective thresholds, which were defined as the mean value of the corresponding control groups.

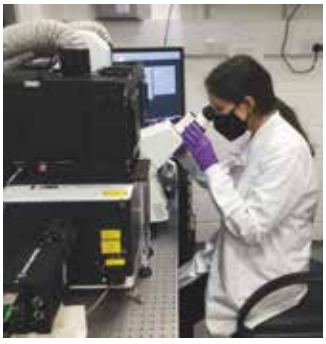
Activating the PI3K signalling increased the mean growth speed and reduced the mean growth lifetime of microtubules. The changes were significant but small in magnitude, however, there are thousands of tracks in mammalian cells [3] and even small changes in dynamics might have considerable global effects. Surprisingly, inhibiting the pathway showed the same trend however this might be attributed to a previously reported time-dependent re-activation of the pathway. We next focused on understanding the effects of PI3K signalling on the spatial cellular distribution of microtubule tracks from within single cells. PI3K is known to act at the leading edge of migrating cells stabilising microtubule dynamics [4]. We found no relationship between microtubule dynamics and their position within the cell. This could, nonetheless, be attributed to the fact that HeLa cells have indistinguishable leading and trailing edges. We established an RPE1 cell line stably expressing EB1-GPF and our preliminary experiments suggest that activated PI3K signalling results in a larger number of polymerized microtubules, a greater proportion of which concentrate at the leading edge. We are in the process of repeating these experiments imaging single cells at higher magnification using different drug concentrations.

Although I have thoroughly enjoyed working on a dry-lab project at the interface of microtubule biology and cell signalling, I missed being in the lab to acquire new data especially after getting results and posing new hypotheses, including imaging single interphase and mitotic cells and being able to investigate chromosome dynamics in response to PI3K signalling. When preparing the application, we were aware of possible COVID-19 access restrictions in August and September, yet upon receiving the news that I had been awarded the Studentship, I looked forward to carrying out a mixed wet-dry project. The initial disappointment was, however, rapidly replaced with enthusiasm about the critical thinking towards the literature and useful computational skills I have indeed developed. I am now back in the lab and I am excited about obtaining new results.

As I progress into the third year, I feel prepared for a Ph.D. and hope to keep learning about microtubule dynamics and the implications of aberrant PI3K signalling on mitosis.

I am thankful to the BSCB, Dr. Elina Vladimirou, Katie Dale and Dr. Jonathan Armond for the opportunity and support.

Maria Carreira



Mitochondrial trafficking and function in ageing dorsal root ganglion neurons

Last spring, I contacted Dr Alessio Vagnoni of the Department of Basic and Clinical Neuroscience at King's College London with the intention of carrying out a wet lab project in his laboratory over the summer. Dr Vagnoni's lab had done extensive characterization of mitochondrial function and trafficking in ageing sensory neurons in Drosophila and mice, and worked in an area of neuronal cell biology that I found very intriguing. Unfortunately, the spreading of SARS-CoV-2 and subsequent lockdown of numerous countries prevented a wet lab project to materialise, so instead, Dr Vagnoni offered me an in silico data quantification and analysis project. Their lab had obtained large amounts of yet unquantified data on mitochondrial trafficking, Ca2+ buffering and membrane potential from cell cultures of mouse dorsal root ganglion (DRG) neurons that needed to be analysed for an upcoming manuscript. I researched numerous summer studentship grants for undergraduates, but the BSCB Summer Studentship was the clear choice since Dr Vagnoni has been a BSCB member and the studentship also offered a generous stipend that is of tremendous help in a pandemic-riddled world.

During the project I quantified two different datasets using the imaging software Fiji/ImageJ and analysed the results obtained via Excel and GraphPad Prism. During the first five weeks I investigated mitochondrial trafficking in the axons of mouse DRG neurons as described in the project proposal. Straightened axonal segments were used to create kymographs that represented mitochondrial motile behaviour. Data on total number of stationary, as well as moving mitochondria (in anterograde, retrograde or bidirectional fashion) was acquired along with the organelles' run lengths and transport velocity. Statistically significant results indicated that DRG neurons from young mice had a higher percentage of anterogradely moving mitochondria compared to the cells from old animals, despite very similar retrogradely moving and stationary numbers in the two groups. Additionally, anterogradely moving mitochondria in young cells had longer run lengths than those in their older counterparts. Interestingly however, velocities in any directionality did not seem to be affected by ageing.

The last three weeks of the studentship consisted of quantification of fluorescent signal from dyes that specifically report on the abundance of cytoplasmic and mitochondrial Ca2+. The time-lapse movies in this dataset consisted of two channels, one recording the Fluo-4 dye that binds to cytoplasmic Ca2+, while the other visualizing the mitochondrial Ca2+-binding Rhod-2 dye. Upon application of 50mM KCL solution, the cells depolarized and the somas' and processes' response in the two channels was measured as relative increase/decrease of fluorescence over time (fold change) and the time it took for them to reach peak fluorescence (lag time). Statistically significant difference was seen between fold changes of Fluo-4 and Rhod-2 in the soma of young DRG neurons (higher Fluo-4 compared to Rhod-2), whereas old cell bodies had similar fold changes. The vastly different recorded lag times in cytoplasmic vs mitochondrial response (i.e. Ca2+ signal peaks earlier in the cytoplasm) in the same populations was expected due to the well-established chronological order of events in neuronal Ca2+ influx and subsequent mitochondrial sequestering. However, in old cell bodies, both the cytoplasmic and mitochondrial lag times were substantially longer than in young DRG somas.

In retrospect, the project was an overwhelmingly positive experience, as it helped me acquire invaluable skills in cell biological data quantification and analysis. Dr Vagnoni and I had numerous conversations throughout the project that made me feel welcome in their lab and helped me understand the biological basis of the data as well as the potential results. Although on occasion I felt frustrated with the monotonous workflow and was tired of looking at a computer screen throughout the day for weeks on end, it was certainly a very productive and useful way to spend my summer. I had the opportunity to have an inside look into cutting-edge research and to realise that the in silico aspect of science is just as important as the usually more interesting wet-lab side of it. The experience I gained will not only help me in my 3rd year thesis project, but will also prove to be a key component of my master's and PhD applications in the field of molecular and cellular neuroscience. Moreover, the BSCB grant will certainly elevate the level of my CV and show my ambition and dedication in pursuing a career in science that could be a deciding factor in getting the positions I aspire for.

István Darabán

Spindle pole body intrinsic asymmetry – quantitative analysis of SPB maturation by SIM

I am just beginning my third year of an undergraduate degree in Natural Sciences (Biochemistry) at the University of Cambridge. I have thoroughly enjoyed my studies so far and am keen to pursue a career in academic research, so wanted to experience what embarking on research is like first-hand. I was therefore excited to be awarded a BSCB Summer Studentship, allowing me to undertake a project with Dr. Marisa Segal's group in the Genetics Department at the University of Cambridge.

In one of my second year courses, Dr Segal ran a practical class involving imaging analysis of different yeast cytoskeletal mutants. Learning about yeast allowed me to appreciate their experimental tractability and importance as a model, prompting my interest to gain practical experience on the yeast cell cycle. The cell cycle is the ordered sequence of events underlying accurate cell duplication, with its control mechanisms highly conserved throughout evolution. Importantly, defective cell cycle control can disrupt development or promote cancer. We applied for the funding with both wet lab and dry projects in mind, and though I very much hoped to do the wet lab project with its promise for blending genetics and biochemistry, the Covid-19 situation forced me to undertake the dry project remotely, from home. This posed a number of significant challenges, from wifi problems and difficulties with online communications to the disappointment of joining a research group without stepping in the lab. Despite this, I still found the process fulfilling and enjoyable.

Saccharomyces cerevisiae (bakers' yeast) is a unique model to seek integrative understanding of fundamental controls in a cell dividing asymmetrically, which are also applicable, among others, to stem cells. One important aspect is the program linking spindle orientation with cell polarity. This centres on the yeast spindle pole body (SPB; the yeast equivalent of the animal centrosome), which duplicates conservatively and is then asymmetrically inherited — the SPB from the previous cell cycle (SPBold) is practically always targeted to the bud cell (1). Although we know that intrinsic and extrinsic asymmetries are involved (2), whether SPB asymmetry is governed by the cell cycle control core machinery remains mysterious. The SPB, while rooted in the nuclear envelope, organises spindle and astral microtubules (aMTs) from its nuclear and cytoplasmic faces, respectively. The aMTs are critical determinants for SPB asymmetric fate. One protein important to my study, Spc72, the cytoplasmic receptor for the gamma-tubulin complex, may link SPB history (old vs new) and fate by favouring the SPBold (3). Spc72 bias promotes preferential targeting of SPBold to the incipient bud cortex by aMT capture. More recently, cyclin-dependent kinase (CDK) has been implicated in SPB asymmetry. Indeed, disruption of S-phase CDK (otherwise consisting of Cdc28-Clb5) abrogated both Spc72 and gamma tubulin complex asymmetry, which decouples SPB history and fate.

My project involved implementing two-color structured illumination microscopy with single-particle averaging (SPA-SIM) using images previously acquired by Dr. Segal during her sabbatical leave in Sue Jaspersen's laboratory at the Stowers Institute for Medical Research to quantify Spc72 bias imparted by CDK. The project began with a short training period under Dr. Segal's supervision to recognize the landmark events along the spindle pathway and learn how to process SIM images. We used the software FIJI in conjunction with custom plugins and macros developed by our colleagues to perform 3-D SIM quantitative analysis (4). I also explored the literature to gain a better understanding of the broader context of my project. I then proceeded to analyse various cell cycle mutants that expressed two different fluorescently tagged proteins: a reference component fused to mTurquoise2 and a query protein, either Spc72 or Tub4 (yeast gamma tubulin), fused to Venus. Both of these query proteins showed asymmetric marking between the old and new SPBs in wild type cells. The key question was then how inactivation of CDK turned Spc72 symmetric in quantitative terms — e.g. was total label increased allowing for excess recruitment at the new SPB or was label shared between SPBs without overall increase?

My analysis revealed that in the mutant impaired for S-phase CDK activity, Spc72 total label was comparable to that measured in wild type cells, but marking of SPBs was more even, with intensities therefore intermediate to those found in wild type cells. This observation suggests that CDK may normally restrict Spc72 mobility between the two SPBs. These findings support a model recently proposed based on biochemical data (5) stating that CDK effectively enforces Spc72 bias by increasing Spc72 affinity toward the SPBold.

I'd like to thank the BSCB summer studentship scheme for making this project possible, as well as Marisa and members of the Segal lab for dedicating the time to teach me and being as supportive and welcoming as possible despite Covid-19 situation and the difficulties associated with carrying out a remote project.

Megan Hardy
Department of Genetics, University of Cambridge

References

1. Pereira, G., T.U. Tanaka, K. Nasmyth, and E. Schiebel. 2001. Modes of spindle pole body inheritance and segregation of the Bfa1p-Bub2p checkpoint protein complex. EMBO J. 20:6359-6370. doi: 10.1093/emboj/20.22.6359.
2. Geymonat, M., and M. Segal. 2017. Intrinsic and Extrinsic Determinants Linking Spindle Pole Fate, Spindle Polarity, and Asymmetric Cell Division in the Budding Yeast S. cerevisiae. Results Probl. Cell. Differ. 61:49-82. doi: 10.1007/978-3-319-53150-2_3.
3. Juanes, M.A., H. Twyman, E. Tunnacliffe, Z. Guo, R. ten Hoopen, and M. Segal. 2013. Spindle pole body history intrinsically links pole identity with asymmetric fate in budding yeast. Curr. Biol. 23:1310-1319. doi: 10.1016/j.cub.2013.05.057.
4. Unruh, J.R., B.D. Slaughter, and S.L. Jaspersen. 2018. Functional Analysis of the Yeast LINC Complex Using Fluctuation Spectroscopy and Super-Resolution Imaging. Methods Mol. Biol. 1840:137-161. doi: 10.1007/978-1-4939-8691-0_12.
5. Geymonat, M., Peng, Q., Guo, Z., Yu, Z., Unruh, J.R., Jaspersen, S.L., and M. Segal. 2020. Orderly assembly underpinning built-in asymmetry in the yeast centrosome duplication cycle requires cyclin-dependent kinase. Elife 9:e59222. doi: 10.7554/eLife.59222.

Motor control of VWF secretion

As a second-year medical student at UCL, I was eager to explore the field of scientific research and to get an understanding of the workings of a research laboratory. Through my course, I have been excited to learn some basic laboratory skills, I hoped to be able to develop these techniques and to broaden my knowledge of molecular biology and laboratory protocols. Through the first two years of my degree, I had developed a keen interest in the field of cell and developmental biology and I was eager to pursue it further during my intercalated year during my third year. Therefore, I decided to look for a summer project in this field. This is how I came across Dr. Tom Nightingale at the William Harvey Research Institute who was kind enough to grant me this opportunity to work on this project.

The work at the Nightingale lab focusses on endothelial cell biology and microvascular research during injury and inflammation. Endothelial cells contain specialised rod shaped organelles known as Weibel Palade Bodies (WPB) that contain pre-made, pro-haemostatic proteins. The most important content protein, in terms of haemostasis, is the glycoprotein Von Willebrand Factor (VWF). Upon stimulation, WPB are exocytosed, release their content into the vasculature allowing tubules of VWF to unfurl into protein strings that form sites for platelet attachment1.

The project that I was fortunate enough to be involved in was to investigate novel regulators of VWF secretion. The movement of WPB around the cell during formation, maturation and exocytosis is known to rely on a number of interactions with actin and microtubules. The majority of long-term anterograde movements are microtubule dependant3,4. However, the molecules that are necessary and that regulate the movement of the WPB are currently unknown.

The Nightingale lab had previously carried out proximity labelling proteomics to determine the proteins near to the surface of WPBs at rest and following endothelial stimulation, and have identified candidate kinesin molecules necessary for transport. My initial project was therefore to determine which of these were necessary for the regulated exocytosis of WPB. However, given the circumstances and the unpredictable nature of the COVID-19 pandemic, we were unable to carry out wet lab projects. As a result, a contingency plan was drawn up and instead I carried out analysis of existing mass spectrometry data to determine how the enrichment of candidate machinery changed during exocytosis and to identify new novel regulators involved in microtubule dependent WPB transport.

I made use of what was known of kinesin function in other organelle trafficking systems (melanosome, synaptic vesicle transport etc.) alongside analysis of the mass spectrometry data. This helped build hypotheses on the role of kinesins during transport and to model how changes in their function might be reflected as changes in protein level. I also used string analysis to identify known kinesin interactors, excluding and identifying likely machinery based on P-values and the fold changes of key proteins. New candidates included microtubule associated proteins, adaptor proteins and kinases. The data sets with and without stimulation allowed analysis of the potential function of these proteins and as to their means of regulation.

Some of the newly identified proteins were also associated with other endothelial proteins and structures including adhesion molecules, junctional proteins etc. and allowed us to predict how other cellular functions might relate to exocytosis. Future work would be to design primers for genes that encode some of the proteins that I have identified and carry out experiments such as siRNA depletion, ELISA, immunofluorescence and VWF secretion assays to test these hypotheses.

Having been given the hands-on opportunity to analyse mass spectrometry data has taught me that scientific research can be extremely tedious and that it's not always necessarily glamorous. As I was unable to get any wet lab experience, I will continue to look for practical work, my experience doing a remote project and analysing mass spectrometry data will hopefully help me get a lab project in the future. In conclusion, I would like to give my sincerest thanks to Dr. Tom Nightingale for not only giving me this very precious opportunity to work with him, but also for very patiently explaining different concepts and teaching me about different methods of analysis. I will forever be grateful for this experience and knowledge that I have gained over these 6 weeks. I would also like to thank the BSCB for giving me this amazing opportunity to spend 6 weeks doing this project.

References

1. Metcalf, D.J., Nightingale, T.D., Zenner, H.L., Lui-Roberts, W.W. & Cutler, D.F. Formation and function of Weibel-Palade bodies. J Cell Sci 121, 19-27 (2008).
2. Zenner, H.L., Collinson, L.M., Michaux, G. & Cutler, D.F. High-pressure freezing provides insights into Weibel-Palade body biogenesis. J Cell Sci 120, 2117-25 (2007).
3. Nightingale, T.D., Pattni, K., Hume, A.N., Seabra, M.C. & Cutler, D.F. Rab27a and MyRIP regulate the amount and multimeric state of VWF released from endothelial cells. Blood 113, 5010-8 (2009).
4. Rojo Pulido, I. et al. Myosin Va acts in concert with Rab27a and MyRIP to regulate acute von-Willebrand factor release from endothelial cells. Traffic 12, 1371-82 (2011).

Society Business

BSCB funding to support members throughout their careers

Two joint officers support the BSCB's Company of Biologists' support funds for members' conference travel and career development. Folma Buss and Sharon Tooze came on board in summer 2019. 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. We have recently updated our process for applying for all BSCB Travel awards to use an online portal which is part of the BSCB Members area. All funding applications from July 2019 should be uploaded in PDFf format to the application portal found at bscb.org/members-login/

Honor Fell Travel Awards, sSponsored by the Company of Biologists 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. 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.

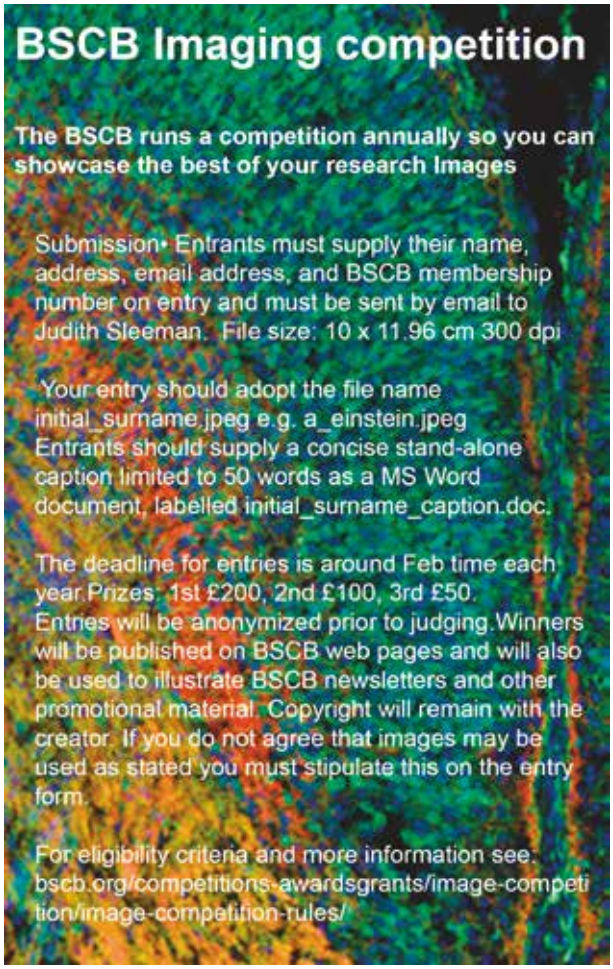
The application form and more information about the scheme are available at https://bscb.org/competitions-awardsgrants/travel-bursaries/honor-fell-company-of-biologists-travel-awards/

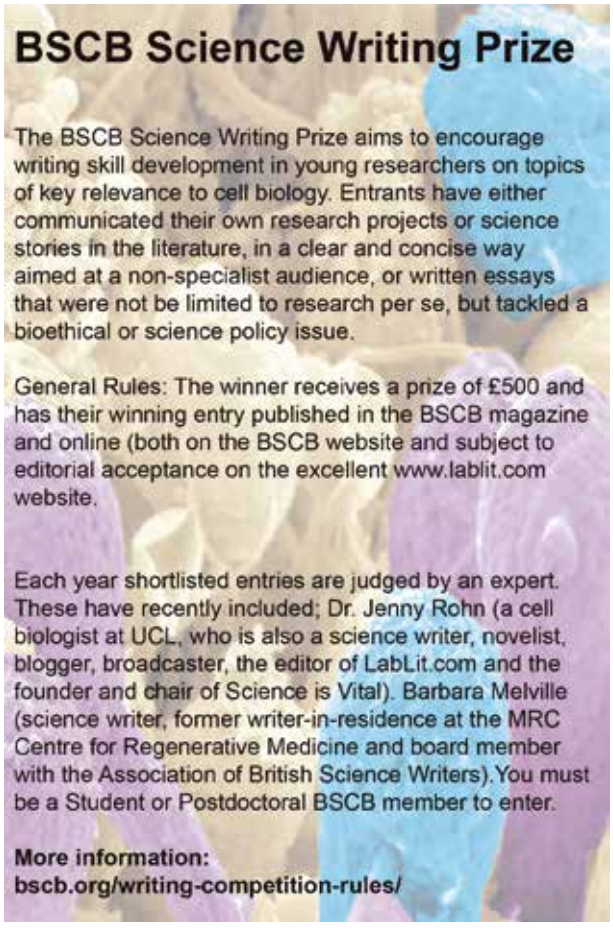
Company of Biologists Support Grants are available for independent group leaders/PIs with no current funds for travel to attend meetings, conferences, workshops, practical courses, PI laboratory management courses and courses to re-train. For more information and to apply please see https://bscb.org/competitions-awardsgrants/cob-support-grants/

Childcare Award: The BSCB now accepts applications to provide financial help with childcare or care for dependents when the applicant is presenting at a scientific meeting. All claims will require approval with appropriate receipts. You will be notified within 2–3 weeks of the outcome. 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/childcare-award/





The closing date for entries to the 2021 Competetions: 30 June 2021.

The British Society for Cell Biology

Statement of Financial Activities for the Year to 31 December 2019

	Unrestricted Funds	Restricted Funds	Total 2019	Unrestricted Funds	Restricted Funds	Total 2018
Income from:	£	£	£	£	£	£
Grants	35,000	62,500	97,500	35,000	62,500	97,500
Investments				8,932	–	8,932
	2,389	–	2,389			
Charitable activities						
Meetings	759	–	759	–	–	-
Subscriptions	32,389	–	32,389	33,425	–	33,425
Total income	**70,537**	**62,500**	**133,037**	**77,357**	**62,500**	**139,857**
Expenditure on:						
Charitable activities						
Grants payable:						
CoB	–	63,663	63,663	–	68,274	68,274
Other grants	–	–	–	3,099	-	3,099
Studentships	17,600	–	17,600	17,100	–	17,100
Costs of meetings	18,697	–	18,697	10,808	–	10,808
Website expenses	690	–	690	2,429	–	2,429
Newsletter costs	3,493	–	3,493	-	–	-
Membership fulfilment services	14,933	–	14,933	16,365	–	16,365
Executive Committee expenses	1,923	–	1,923	3,352	–	3,352
Examiner's remuneration	2,707	–	2,707	2,644	–	2,644
Miscellaneous	2,286	–	2,286	915	–	915
Subscriptions	2,896	–	2,896	2,299	–	2,299
Insurance	1,114	–	1,114	1,114	–	1,114
Total expenditure	**66,339**	**63,663**	**130,002**	**60,125**	**68,274**	**128,399**
Net (expenditure)/income	4,198	(1,163)	3,035	17,232	(5,774)	11,458
Transfer between funds	–	–	–	–	–	–
Net movement in funds	4,198	(1,163)	3,035	17,232	(5,774)	11,458
Funds brought forward at 1 January 2018	221,615	25,298	246,913	204,383	31,072	235,455
Funds carried forward at 31 December 2019	**225,813**	**24,135**	**249,948**	**221,615**	**25,298**	**246,913**

BSCB Committee 2021

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 which 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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BSCB Ambassadors 2021

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.

Anyone who wishes to volunteer to become a BSCB ambassador at any Institutes not represented in the list below please contact the BSCB.

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If you have an idea for an article please e-mail the editor a brief outline first.I t is preferable to send all articles, reports and images by e-mail (though alternatives can be arranged after contacting the editor).

Attachments for text can be in txt, rtf or doc format.
Please send images as 300dpi JPEG, TIFF or PSD files.

Submission of articles and images should be made to

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