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Editorial by Biosciences Head of Research (by Prof Susannah Thorpe)

We seem to have turned a corner in the pandemic in many areas of life, from how we can slow down and limit activity to how we can get started again. This is fantastic progress and I am very grateful to all of you for your prompt and pragmatic responses to the phased return questionnaire. We will need to continue to be pragmatic because this will be a long process. I am confident that if we work together we can find the best solutions for our whole community.



My own research has been greatly affected by the closure of great ape zoos, sanctuaries and field sites. This is likely to be prolonged because (non-human) great apes are highly receptive to human borne respiratory problems. This is a shame since Dr Jackie Chappell and I had just begun a fantastic project working with the orangutan sanctuary community in SE Asia (via the Orangutan Veterinary Advisory Group ...led by our very own Dr Steve Unwin!). This project builds on our Enclosure Design Tool, which focusses on translating the behavioural ecology of wild great apes into interventions that zoos and sanctuaries can use to improve the wild-type behavioural profiles of their chimpanzees, orangutans and gorillas. The underpinning concept is to create species-appropriate challenge, choice and control through 'functional' enclosures where the environments present similar mechanical and intellectual challenges to those in the wild. All great apes are predicted to be extinct in the wild within a human generation if habitat destruction continues, so sanctuary and zoo populations are critical. But, there remains strong evidence that sanctuary apes do not have, and may never acquire, the wild-type behavioural profiles they need to thrive in a natural habitat and reinforce wild populations. Hence our new project, once we can get going, will create a tool to optimise rehabilitation for all orangutan sanctuaries.



Despite challenges to our research, I think there are positives in our current situation that we should hold on to. I have found it liberating over the last few weeks to see colleagues suddenly disappear from zoom meetings as pet cats trample across keyboards; kids demanding snacks and clean pants and dogs being sick on the carpet in the background. I thought this kind of chaos was just my life! As we plan and instigate a phased return to Biosciences, we should remember to translate the good bits of our recent experiences into new ways of working. In doing so we could optimise our much-needed thinking space and better understand the inherent complexity, diversity and humour of the home-work balance that each of us is operating in.

Bioscience Heroes

A big thank you to all the Bioscience Heroes that are keeping the School running during the lockdown.

Important contacts:

Wellbeing Pages: <https://intranet.birmingham.ac.uk/student/Your-Wellbeing/Index.aspx>
<https://intranet.birmingham.ac.uk/staff/coronavirus/Coronavirus-wellbeing-support.aspx>

LES Postgraduate students. Check out the LES PGR pages on Canvas and the following link:
<https://intranet.birmingham.ac.uk/as/studentservices/graduateschool/COVID-19-Advice-for-PGR-Students.aspx>

The PERCAT pages www.birmingham.ac.uk/university/colleges/les/percat/index.aspx

Bioscience Brilliance: Placement student heroes

Carefully positioned at least two metres apart and wearing the appropriate PPE, third year Biochemistry MSci placement students Ellie Wigg (left) and Ryan Dingle (right) have been on placement throughout the lockdown as essential workers at The Binding Site. This Birmingham-based company provides specialist diagnostic products to clinicians and laboratory professionals across the world. They have been helping The Binding Site by aiding manufacturing support to ensure *in vitro* diagnostic kits are produced to meet demand throughout the coronavirus pandemic. Ellie and Ryan are also pursuing their own research projects on fluorescent protein labelling and western blot optimisation, respectively. Ellie comments: "working throughout the lockdown has been a challenge as we are adapting daily to the ever changing demands of the company. However, knowing that our efforts are helping to meet the demand of testing centres and hospitals worldwide is a very rewarding experience". Ryan agrees, "working in a lab throughout lockdown is challenging, but also highly rewarding, and I am continuing to learn scientific and personal skills from working at The Binding Site during this period". Ellie and Ryan are being tutored by Dr Mike Tomlinson while on placement.



Read more about how The Binding Site, Birmingham Health Partners and the University's **Clinical Immunology Service** are generating a reliable coronavirus antibody test:

https://www.birmingham.ac.uk/news/latest/2020/04/experts-improve-covid-antibody-diagnosis.aspx?fbclid=IwAR1q8g7iasOR4f1DS_GiB5fOQJRgMda01bIJ1mAb3RNKnkMLyChg8or6qwl

Bioscience student runner up in Telegraph STEM Awards



First year Biological Sciences (Genetics) student Ionut-Alexandru Stanescu was a **runner up in this year's prestigious [Telegraph STEM Awards](#)**. Ionut-Alexandru reports: I spent most of the winter holiday and half the second term working on my entry for the Healthcare Challenge. I came up with a proposal for a cancer therapy consisting of a two-step cell death inducing vaccine, delivering two different plasmids. The first plasmid contains the genes for stabilising the cells by induced pluripotency and generating an immune clearance. The second plasmid generates apoptosis by replacing the damaged p53 with a healthy copy using CRISPR/Cas9. This vaccine was meant to help patients with mutations in p53 but being delivered in two steps allows its use in other circumstances. Representatives from GSK selected my idea as one of five semi-finalists to give a presentation of our concept. Even though I did not make the finals, it still was a great experience and an amazing exercise. As a first-year student it is a great feeling being told by specialists that I am on the right track and that I have potential. I want to thank the staff members and my friends, including Samantha Johnson, who helped me along this journey.

New microscope to look forward to when the School reopens

The Birmingham Advanced Light Microscopy (BALM) facility has installed a new a Zeiss LSM 900 Confocal microscope with *AiryScan 2*, equipped with a channel GaAsP URGB detector mounted on an AxioObserver7 microscope. The *AiryScan* technology is an innovative tool that transforms the confocal microscope into a superresolution microscope with up to 1.7 x higher resolution in three dimensions. Such technology is based on 32 optical detection elements arranged in an extremely light-efficient honeycomb structure, with hardly any light losses due to micro lenses. The system includes 4 laser lines (405, 488, 561 and 640nm), DIC and transmitted light illumination and a Definite Focus system that will allow a constant perfect-focus during long term live cell imaging sessions. The Zeiss LSM 900 is located on the 6th floor of Biosciences and will be open for training and booking, when the University reopens. Contact Dr. Alex Di Maio (a.dimai@bham.ac.uk) for further info on specs and applications.



Within the near future, two new microscopy systems will be **coming to the BALM facility... Stay tuned!**

The Mini-Safe Mole (by Dr Pete Lund)

Remember, you can still continue to submit COSHH forms to your local lab manager for approval, and BioCOSHH and GM forms to me (as BSO) or Ruth Perry (deputy BSO) for feedback and approval. Stay safe and well!!!!

Dr Pete Lund: p.a.lund@bham.ac.uk Ruth Perry: R.M.PERRY.PLB@bham.ac.uk.



The Mini-Mole Caption Competition

Being Editor of the Mini-Mole and a plant scientist means that Philippa Borrill takes horticulture, *very seriously*, especially when growing gravity defying carrots. Can you come up with an amusing caption? Please send captions or your own photos to either D.F.BROWNING@bham.ac.uk or P.BORRILL@bham.ac.uk. Terms and conditions apply and the Editors' decision is final (though open to bribes).

Recent News from the Research Themes

Plant Science & Food Security

From our Fern Correspondent: Dr Andrew Plackett

This photograph was taken on a sunny morning in April when I visited the Bioscience Building to carry out some essential plant tissue culture work (once I found a way past the barriers to actually set foot on site). It was very strange- a brilliantly blue sky and spring in absolute full bloom on campus, but the place almost entirely deserted. However, the maintenance staff are keeping the campus looking cared-for and, as you can see, Biosciences is still there waiting for us when it is time to go back!



Biosciences: Still standing! (left)
Dr Andrew Plackett (right).

My plants going through tissue culture are the first generation of new transgenics from fern species (*Ceratopteris richardii*) now being established as the first-ever fern genetic model. These plants carry a fluorescent marker that will allow live-imaging of their developmental processes, a tool that has revolutionised research in other plant species. As a very ancient plant lineage, the fern lifecycle is unusual compared to the seed-bearing plants we are more used to. Instead of seeds, ferns produce single-celled spores which germinate into a free-living haploid organism only millimetres in scale, an equivalent stage to the pollen of seed-bearing plants. This means that for controlled breeding I need to start their lifecycle and let them mate on sterile agar plates (left) to generate the diploid shoot- what we would **recognise as an actual 'plant'**.

Luckily, the haploid stage produces both eggs and sperm on one individual, so by putting individuals into 'self-isolation' I can create an instant homozygous transgenic plant by forcing them to self-fertilise. This cuts the number of generations needed to make a pure-breeding transgenic line compared to other plant genetic models. With a 'generation time' (spore to spore) of 6 months for this species, I need all the shortcuts I can get!

To keep these ferns alive in tissue culture the agar plates need to be regularly wetted with sterile water. My sincere thanks to Ruth Perry who, on top of watering all the other experimental plants in the Plant Theme growth rooms twice a week, has also been undertaking this job as well!



Ceratopteris richardii

Recent News from the Research Themes

Microbiology (μ M)

Science Success!

Research at the School of Biosciences, led by Prof Del Besra FRS (right) and Prof. Zihe Rao (with scientists at ShanghaiTech in China) has determined how ethambutol, a key front-line antibiotic, kills the bacterium *Mycobacterium tuberculosis* (TB) and was published in *Science*.

<http://science.sciencemag.org/lookup/doi/10.1126/science.aba9102>.

TB remains a global health challenge, responsible for around 1.5 million deaths each year, with particularly high incidences in India, China and Indonesia. There is an urgency to better understand how effective drugs work against the disease because of the emergence of highly drug resistant strains. TB has a complex cell wall, which surrounds the cell membrane and acts as a natural barrier to the environment. Inhibition of TB cell wall assembly is an established strategy for anti-TB chemotherapy and ethambutol targets this. However, how ethambutol kills TB has remained unresolved, until now. The structural and biochemical work, detailed in this paper, explains how ethambutol binds to Emb complexes (enzymes, which synthesise components of the cell wall), how ethambutol competes for substrate binding in the Emb complex active site and explains the clinical ethambutol resistance data from patient isolates.



Cells & Molecules

Prof Chris Bunce restarts research theme lab meetings
The crowd went wild as Prof Chris Bunce restarted our research theme meetings last Friday on Zoom. Chris told us how he and Medical School colleagues Dr Farhat Khanim and Prof. Mark Drayson are tackling blood cancer through drug re-purposing, with support from Blood Cancer UK.



Prof Alicia Hidalgo visits King's

Prof Alicia Hidalgo (left) visited King's College London last week. She was there all day and gave a seminar on the regenerative potential of glia. Alicia was the first invited speaker in the Centre for Developmental Neurobiology's new virtual seminar series.

Fruit fly heroes

Under the watchful eye of Research Manager Shrikant Jondhale, members of the groups of Dr Saverio Brogna, Dr Yun Fan, Prof Alicia Hidalgo, Dr Carolina Rezaval and Dr Matthias Soller are regularly visiting the School to keep their flies alive. Unlike microorganisms, cultured cells or even embryos, *Drosophila* fruit flies cannot be preserved frozen and must be maintained as living stocks. Pictured this week are Marta Moreira (left) and Karthik Nallasivan (right), "flipping" precious stocks of genetically modified flies into vials containing fresh food media.



Biosystems & Environmental Change

Assessing the impact of COVID on great apes: Dr Steve Unwin

Although the origin of SARS CoV2 remains speculative, it is often reported that there is a wildlife reservoir for this disease, but something which is less considered is whether SARS CoV2 may be transmitted from humans to other animals. It is currently unknown whether the morbidity and mortality associated with SARS-CoV-2 in humans are similar in our closest relatives – the other apes. However, transmission of even mild human pathogens to apes can lead to severe outcomes, so the risks seem extremely high. At the University of Birmingham, we are leading an international network of specialists working with apes in the wild and in captivity. The aim is to collate and disseminate recommended pandemic response protocols and research, to:

- Improve response efficacy and facilitate rapid access to expertise for practitioners that would not otherwise be available.
- Provide canvas and web based teaching resources for ongoing capacity building on outbreak management and wildlife focused One Health to strengthen resilience against future outbreaks.

The current pandemic is a forceful reminder of the need to treat global health as a system linking human, non-human animal and environmental health. By looking beyond the source and focusing on the drivers of infection at a systems level, we may stand a better chance of preventing or at least minimising the effects of future global health problems. Find out more here:

<https://www.birmingham.ac.uk/research/perspective/the-coronavirus-pandemic-wildlife.aspx>



The Postdoc Pages

Meet your PERCAT Reps: If you have any concerns or questions, regarding the current lockdown period, and would like to relay these to the PERCAT Committee please contact your friendly neighbourhood reps (from left to right) Dr Sarah Lee (LeeSO@adf.bham.ac.uk), Dr Santosh Kumar C M (S.K.CM@bham.ac.uk), Dr Anne Marie Labandera Nadeau (A.M.Labandera@bham.ac.uk) or Dr Doug Browning (D.F.Browning@bham.ac.uk). We may not be able to solve all your problems but we may be able to put you in touch with someone who can. Remember PERCAT is here to help you!



[PERCAT Webinar: Building an Academic Track Record and Navigating an Academic Career](#)

This seminar will explore how to build your track record and develop an academic career.

Date 14/05/2020 (13:00-15:20) Location: Webinar – online

Postponed [PERCAT Postdoctoral Researcher Conference 2020](#). Unfortunately, the conference has been postponed until later in the year. Look out for further information.

Online Remote Shut Up and Write. This will enable you to work on your own writing, planning or literature discovery in a 'virtual' but supportive environment. Dates: May 12th, 15th, 22nd and 26th (9.30am-3.15pm). Sign up with mds.research.training@contacts.bham.ac.uk to be invited to the remote break/networking sessions.

Caption Competition Results (Mini-Mole N°2)

Many thanks for the avalanche of suggestions for last issue's caption competition, which included many suggestions about "Cowboy Cloning". Thanks, really, thanks!

However, the winner of the highly competitive Mini-Mole Caption Competition is again Prof Steve Busby (left) with "There was an error in the COSHH assessment for shotgun cloning experiments". Well done, Steve! Can anyone knock Steve off his lofty FRS perch? Stay tuned!



Recent Publications

Biosciences students and staff in bold.

Adamski NM*, Borrill P*, Brinton J*, Harrington S*, Marchal C*, Bentley AR, Bovill WD, Cattivelli L, Cockram J, Contreras-Moreira B, Ford B, Ghosh S, Harwood W, Hassani-Pak K, Hayta S, Hickey LT, Kanyuka K, King J, Maccaferrri M, Naamati G, Pozniak CJ, Ramirez-Gonzalez RH, Sansaloni C, Trevaskis B, Wingen LU, Wulff BBH, Uauy C. 2020. A roadmap for gene functional characterisation in crops with large genomes: Lessons from polyploid wheat. *eLIFE* 9: e55646. <https://doi.org/10.7554/eLife.55646>
*Co-first author.

Hale OJ, Sisley EK, Griffiths RL, Styles IB, Cooper HJ (2020), 'Native LESA TWIMS-MSI: Spatial, Conformational, and Mass Analysis of Proteins and Protein Complexes', *J Am Soc Mass Spectrom.* 31, 873-879.

Haque T, Eaves DJ, Lin Z, Zampronio CG, Cooper HJ, Bosch M, Smirnoff N, Franklin-Tong VE (2020), 'Self-incompatibility triggers irreversible oxidative modification of proteins in incompatible pollen', *Plant Physiol.* pii: pp.00066.2020.

Holdsworth, MJ and Gibbs, DJ (2020) Comparative Biology of Oxygen Sensing in Plants and Animals. *Current Biology*. Doi.org/10/1016/j.cub.2020.03.021

Orman-Ligeza B, Borrill P, Chia T, Chirico M, Doležel J, Drea S, Karafiátová M, Schatłowski N, Solomon CU, Steuernagel B, Wulff BBH, Uauy C, Trafford K. 2020. *LYS3* encodes a prolamin-box-binding transcription factor that controls embryo growth in barley and wheat. *Journal of Cereal Science* 93: 102965. <https://doi.org/10.1016/j.jcs.2020.102965>

Zhang L, Zhao Y, Gao Y, Wu L, Gao R, Zhang Q, Wang Y, Wu C, Wu F, Gurcha SS, Veerapen N, Batt SM, Zhao W, Qin L, Yang X, Wang M, Zhu Y, Zhang B, Bi L, Zhang X, Yang H, Guddat LW, Xu W, Wang Q, Li J, Besra GS, Rao Z (2020), 'Structures of cell wall arabinosyltransferases with the anti-tuberculosis drug ethambutol', *Science*. pii: eaba9102. doi: 10.1126/science.aba9102. [Epub ahead of print] <http://science.sciencemag.org/lookup/doi/10.1126/science.aba9102>.

Got a story for us? Contact us: D.F.BROWNING@bham.ac.uk and P.BORRILL@bham.ac.uk