



NEWSLETTER

Volume 32 Issue No.1 March 2021



IMAGE Male Wild ungulates (Grant's gazelle, *Nanger granti*) sparring (credit: S. Hauver)

PARASITRAVAGANZA!

Join us for an online parasite fest



WEDNESDAY 23 - FRIDAY 25 JUNE 2021

REGISTRATION AND ABSTRACT SUBMISSION OPEN SOON

WWW.PARASITE.ORG.AU/CONFERENCES/PARASITRAVAGANZA/



#2021PARASITRAVAGANZA #PARAFEST

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From the President's Desk

Dear Members,

On the cover of this issue of our Newsletter we have a great photo of sparring wild male ungulates (Grant's gazelle, *Nanger granti*) from Vanessa Ezenwa and Caroline Shearer from Odum School of Ecology, University of Georgia, Athens, GA, USA, who were interviewed by Lisa about their IJP PAW article "Rainfall as a driver of seasonality in parasitism", this research included parasites of this species. As Vanessa and Caroline do their fieldwork in Kenya and South Africa, their field research has been disrupted by the pandemic and like many of us they focused on writing up and submitting their manuscripts.

COVID-19 has been influencing our lives for a year now. It has been a hugely challenging time for everyone, affecting our research and teaching. While most of us could return to the laboratories, some cannot access their desks and field work can be still difficult if not impossible depending where you are based and where your field site is. This issue of our newsletter includes a comprehensive assessment of the impact of COVID-19 on teaching at Sydney University from Jan Slapeta and a few other stories about impacts of COVID-19 on research in the State news section. If you have a story about your research or research funding or other achievements, please share them with us through your State representative.

The impact of COVID-19 and uncertainty of even interstate travel resulted in ASP Council deciding to run this year conference online. I'm sure it'll be a great success and would like to encourage everybody to attend - please register and please submit your abstracts.

Nevertheless, I'm really looking forward to ASP conference in 2022 which we all hope will be F2F in Cairns (third time lucky).

ASP online Seminar Series has been very successful and I would like to encourage



everyone to attend. The next seminar is scheduled for May 2021, I would like to encourage everybody to attend this and other ASP events, all advertised on social media. If you have an idea for an outreach event in your State please contact your State representative.

We have reopened the ASP Researcher Exchange, Travel and Training and JD Smyth Postgraduate Student Travel Awards with the next closing date of 30 September, offering opportunities for support for research travel. Please consider applying for domestic travel as well as international which we are still unsure where it will be possible.

I am most grateful for all the enthusiastic support from the ASP Executive and ASP Council, in particular Lisa Jones so far this year, also for putting this newsletter together.

From the President's Desk continued

I would like to wish all of you Happy Easter, hope the weather will allow us to relax outdoors with our family and friends. I'm planning to spend at least some of the time underwater, same site as shown in the photo on the previous page taken by Jon Bryan – it's a really beautiful sponge garden with lots of fish.

This may not be our ideal Easter but nevertheless we should enjoy the break as much as possible and hope next year will be even better.

Stay safe and enjoy the Easter break

Best regards,

Barbara Nowak

President of the ASP

www.parasite.org.au

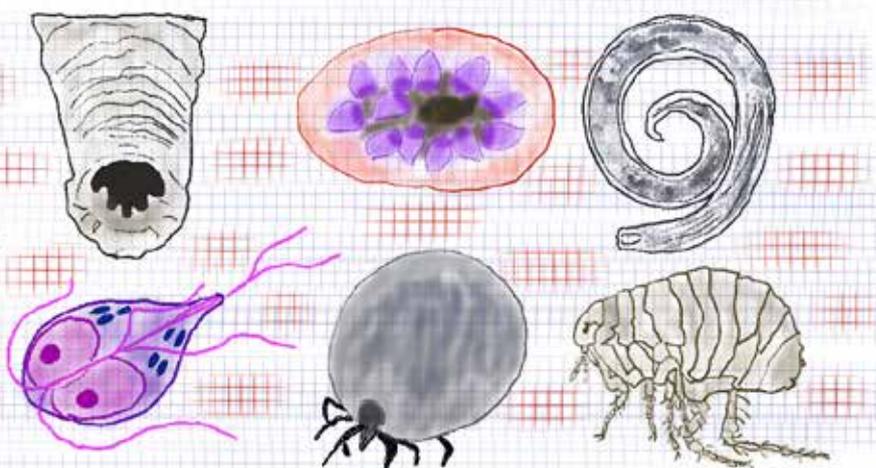
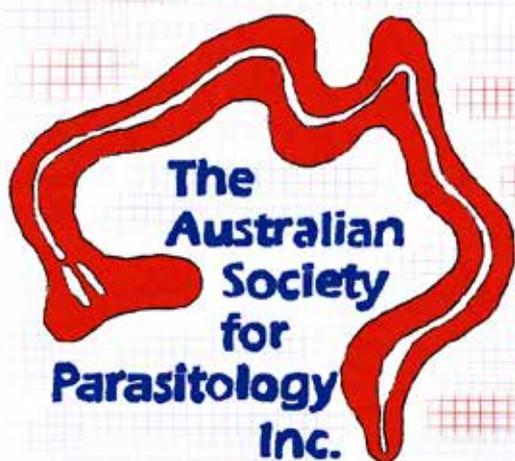
www.facebook.com/ASParasitology

www.twitter.com/AS_Para



Left: "Art meets Science" Professor Kurt Buchmann from the University of Copenhagen is a parasitologist and talented artist. His work depicts parasites and fish immunology and evolution of the immune system. "I often paint some parasite life cycle illustrations. Just to give my students an impression of the flow in the ecosystem" says Kurt. This artwork depicts bacteria. In August 2021 we will see more of Kurt's artwork and find out about his research during our "Portrait of a Parasite" series for National Science Week.

ASP Seminar Series



Seminar Series

The second event in our online ASP Seminar Series took place on Friday 26th March at 1pm AEDT by Zoom.

Co-chairs Amanda Duarte Barbosa and Stuart Ralph introduced researchers Siobhon Egan from Murdoch University, speaking about "What's in the wildlife? Surveillance of ticks and their associated microbes in Australian wildlife." and Bonnie Dern, from Flinders University, speaking on "Of parasites and pygmy bluetongues: An investigation of parasite and gut microbiota dynamics following a wildlife translocation."

Siobhon is a PhD student at Murdoch University with the Vector and Waterborne Pathogen Resource group. Her research focuses on understanding the epidemiology of ticks and associated microbes in their vertebrate hosts. Utilising a multidisciplinary approach her projects aims to (i) characterise ticks parasitizing our native wildlife; and ii) investigate bacteria and haemoprotozoa present to provide insight into the dynamics between host-microbe-tick. Siobhon will be discussing ticks and their associated microbes in Australian wildlife during her seminar. Siobhon says "Ticks (Ixodida)

represent one of the most important vector groups affecting human and animal health, and in recent years there have been increasing concerns regarding the cause of tick-borne disease affecting Australians. Recent research has identified Australian ticks harbour a unique diversity of microbes however little is known about their sylvatic lifecycle with respect to vertebrate hosts. This study aimed to characterise the diversity of tick-associated microbes present in over 550 samples from 203 wildlife hosts. The bacterial and haemoprotozoan diversity from blood, tick and tissue samples was characterised using a combination of amplicon next generation sequencing, targeted Sanger sequencing, and microscopy. A diverse range of tick associated bacteria was identified, such as Anaplasmataceae, Bartonellaceae, Borreliaceae, Coxiellaceae, Midichloriaceae. Statistical analysis using constrained ordination methods showed blood, tick and tissues had distinct community signatures and was generally different between host species. In addition, eight species of haemoprotozoa were identified, including species within the genera *Babesia*, *Hepatozoon*, *Theileria* and *Trypanosoma*. This study further confirmed the absence of northern hemisphere tick-borne pathogens and provided further

evidence of the unique microbes present in Australian wildlife and ticks."

Bonnie recently completed her PhD at Flinders University and has an interest in the role parasites play in wildlife populations, particularly during conservation management. She will talk about her PhD work which involved an experimental translocation of the endangered pygmy bluetongue lizard. She genotyped nematode, mite and gut microbiota prior to and over time following the translocation to comment on how mixing hosts from different populations affected parasite dynamics, with implications for future management of this lizard species.

Our awesome seminar series image was created by Thorey Jonsdottir from the Burnet Institute.

The next ASP Seminar Series will take place in May 2021. Please email secretary@parasite.org.au with suggestions for speakers or themes. See the ASP website and social media channels for information about the ASP Seminar Series.

2021 Australian Society for Parasitology Annual General Meeting

Please join the 2021 Australian Society for Parasitology Annual General Meeting which will be an online Zoom meeting on Thursday 29th July, 2 – 5pm AEST. Please register in advance for this meeting:

<https://us02web.zoom.us/meeting/register/tZUud-uuqT0vHNVTQwqK-4IW0Ex-3IVG3mdr>

After registering, you will receive a confirmation email containing information about joining the meeting.



Business to be conducted

The following business will be conducted at the 2021 Annual General Meeting of the Society:

- receiving the Society's financial statement, and audit report, for the last reportable financial year;
- presenting the financial statement and audit report to the meeting for adoption;
- electing members of the Council (see details below);
- appointing an auditor or an accountant for the present financial year;
- announcement of ASP Awards and Prizes;
- receipt of reports from Editors, Convenors, Archivists, Secretariat and subcommittees; and
- review and debate other actions or decisions by the Council.

If you have any trouble registering for or accessing the AGM by Zoom on the 29th July 2021, or if you want to test out Zoom before the AGM to make sure it works for you please email secretary@parasite.org.au or phone 07 42321311.

The 2021 ASP AGM will be recorded. Other participants will be able to see and hear you if your microphone is on and your video is on. When you first join this meeting your

microphone will be muted and your video will be off. We will use polls to vote for AGM matters. If you can't access the poll then you need to let me know straight away so I can give you another option to vote. There is also a chat option so that you can send a message to all. The Executive will address all questions. This chat will also be recorded and saved for viewing afterwards. Please be respectful of everyone when participating in this meeting.

Shape the future, join the ASP Council

Every year the Australian Society for Parasitology (ASP) seeks nominations for positions on the ASP Council. Nominations for the ASP Council for terms beginning 29 July 2021 have opened. To nominate someone you must be a member of the ASP. To be a member of the ASP Council you must be an eligible (under section 61A of the Act) adult and a member of the ASP. Check whether you are a financial member on the ASP membership site (<https://asp.wildapricot.org/>).

Please see www.parasite.org.au/joincouncil to read about the positions on Council that we will be voting on at the 2021 ASP AGM. We invite you to seek and encourage appropriate candidates. Nominations should be emailed to secretary@parasite.org.au and will close on 29th June 2021. The candidates will be announced by 22 July 2021 on the ASP website and by email and ASP members will vote for ASP Council positions online at the 2021 ASP AGM. We already have some candidates for Council positions, you can check these on the ASP website.

The ASP is an inclusive organisation. We encourage nominations from Indigenous Australians, people with disability, people from diverse cultural and linguistic backgrounds, parasitologists of all ages and career stages and LGBTQI people. The Society is also committed to achieving gender equality across all its Committees including, but not limited to, the ASP Council. The Society recognises and values the wealth of talent, creativity and discoveries achieved by women in parasitology. We acknowledge that women continue to be under-represented in the field, particularly at senior levels. The Society is, therefore, committed to gender equality in our discipline and in the Society and hence we encourage nominations from women for ASP Council positions. (Read about Gender Equality within the ASP Principles, By-Laws and Guidelines <https://www.parasite.org.au/the-society/constitution/>).

Please don't hesitate to get in touch if you have any questions. We look forward to electing strong and enthusiastic representatives to the ASP Council.

VR resource developers win VC Award

Vice-Chancellor's Award for Outstanding Contributions to Student Learning Award

Dr Sarah Preston and Mr Evan Dekker were awarded a VC award for "Transforming student engagement in parasitology through a peer- and student-reviewed virtual reality resource". The development of the VR resource for parasitology teaching and outreach activities was supported and peer reviewed by members of the ASP teaching committee and is available for use for teaching or outreach on the ASP website. The VR experience takes students to a farm where they can look inside a life-sized cow and locate all the different parasites that it may carry. It demonstrates to the user that some eggs of the parasites presence in the cow can be found in the cow poo and that to clear the infection we can apply a chemical known as an anthelmintic. Student feedback was fantastic, some students claiming that "This is the future of learning" and "The VR equipment was used to simulate the internal structure of a cow containing different parasites at different locations in the body. Using hand-held devices for hands, the aim was to locate each parasite to activate and information screen detailing the morphology...Good fun, learning experience."

<https://www.parasite.org.au/education/asp-education-committee-and-resources/parasites-vr/>



Above: Evan Dekker and Sarah Preston from Federation University.
Below: Sarah Preston with the VR resource



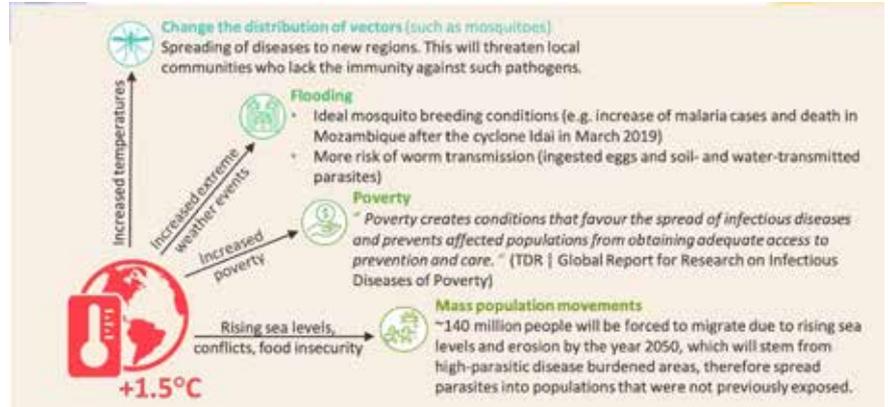
ASP Climate Focus Group for Parasitology

The ASP Climate-Focus Group organised the second seminar of a Climate-Focus series, focusing "Parasites and Climate".

Dr Andreas Stroehlein from The University of Melbourne gave a seminar on "Parasites and Climate" on Thursday 4th March, 1:00pm – 2:00pm (AEDT).

Dr Andreas Stroehlein is a Postdoctoral Researcher in Parasite Genetics & Genomics within the Melbourne Veterinary School, Faculty of Veterinary and Agricultural Sciences at The University of Melbourne and a committee member with the ASP Climate Focus group.

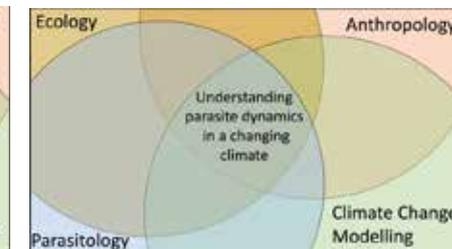
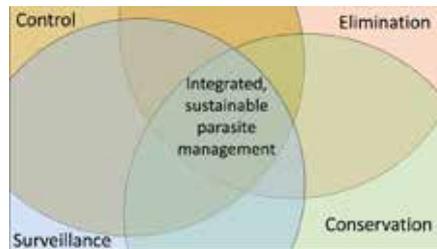
The recording of this ASP Climate Focus Series seminar "Parasites and Climate" is now available on the ASP YouTube channel <https://youtu.be/BLz2tBcdACc>. Future seminars will include sustainability in our research practices (e.g. running a net-zero emission conference). We would love to hear what you want to see next! Please contact us to let us know secretary@parasite.org.au



What happens when parasites vanish?

- **Metabolic ecology** How well can host and parasite's metabolism/physiology adapt?
- **Host body size** Larger hosts tend to host more parasites and more diverse parasites. Higher risk of co-extinction and loss of niches.
- **Host specificity and host switching** How fine-tuned are parasite and host? Host switching possible?
- **Transmission and persistence** Each life cycle stage is an ecological niche, that needs to overlap with the next one in time, space and environmental conditions.

© Stroehlein et al. 9 Soc Open Sci. 2023;10:230005



ASP Climate-Focus Seminar: "Parasites and Climate"

Education

Since the beginning of 21st century, academics have been using digital tools for learning and teaching at schools, colleges and universities. However, COVID-19 pandemic has forced us to use disrupting methods to improvise face-to-face teaching and learning activities and think outside the box to use or develop engaging and interactive platform for asynchronous (offline) and synchronous (online) learning.

The ASP Education Committee is very keen to learn what ASP members have been doing to cope with the demands of online learning and what various technological platforms and teaching methods have worked best for them? Should you like to share your experience, please send a summary of 150 words to Lisa Jones and we will be in touch with you for further details. One of the submissions will be highlighted during the 2021 ASP Virtual Conference.

The ASP Education Committee funds projects that will promote parasitology learning, teaching and outreach activities for students, academics and public. Should you have any project idea within the scope of ASP Education Committee and would like to develop it using the ASP platform, please submit an application to the ASP

secretary@parasite.org.au

For outreach activities, the ASP has prepared various modules for schools, universities and general public. Should you like to organize an outreach activity, please liaise with your state representative or Lisa Jones.

If you are passionate about parasitology learning and teaching and would like to join the ASP Education Committee, please submit your expression of interest to Lisa Jones.

Yours sincerely,

Abdul Jabbar

Chair, ASP Education Committee

See the latest from the ASP Education Committee <https://www.parasite.org.au/education/asp-education-committee-and-resources/>

Survey for academics using the e-textbook for teaching

On behalf of the ASP and Professors Beveridge and Emery, editors of the "Australasian Animal Parasites Inside and Out", we are seeking feedback from those who have used this textbook in their teaching on how to improve the first edition before producing a second edition of this textbook. A copy of the first edition is available via this link: <https://www.parasite.org.au/publications/australasian-animal-parasites-inside-and-out/>

Please complete the survey by clicking on this link <https://www.surveymonkey.com/r/ParasitesTextbook>

This survey will take approximately 10 minutes to complete. Thank you for your valuable feedback.

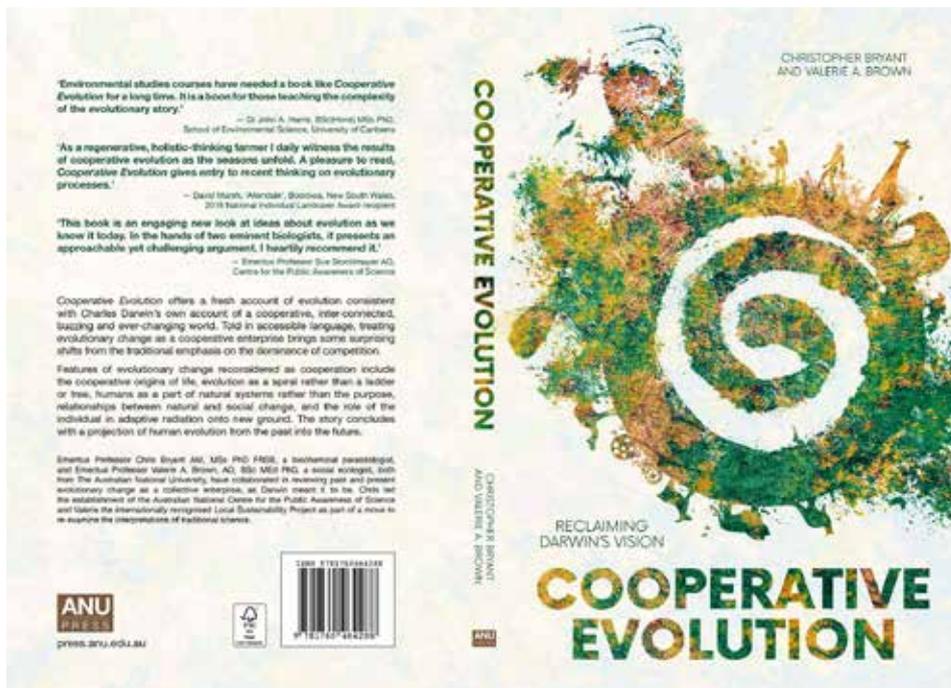
Cooperative Evolution - Reclaiming Darwin's Vision book

ASP Fellow, Emeritus Prof Chris Bryant and Val Brown have just published a book entitled *Cooperative Evolution - Reclaiming Darwin's Vision*.

The publisher, ANU Press, describes the book: "Cooperative Evolution offers a fresh account of evolution consistent with Charles Darwin's own account of a cooperative, inter-connected, buzzing and ever-changing world. Told in accessible language, treating evolutionary change as a cooperative enterprise brings some surprising shifts from the traditional emphasis on the dominance of competition."

Published by the ANU Press, this book can be downloaded free of charge using this link:

<https://press.anu.edu.au/publications/cooperative-evolution>



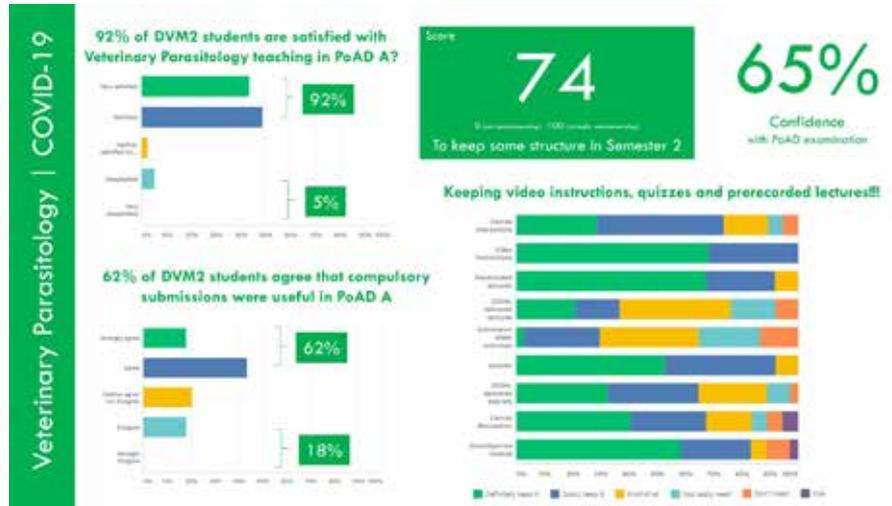
Education

How did we survive teaching at Sydney in 2020 and what have we taken into 2021? Insights into teaching during COVID-19 from Jan Šlapeta at the University of Sydney, Laboratory of Veterinary Parasitology @ McMaster Building.

What can I tell you, you must all have your own stories and anecdotes? Some good, some not so good. COVID-19 was quite a spanner in the works for us all and still is deeply in what I ... work a lot with... literally ... I'll let you fill in the dots! The sudden change was a shock for us but now I will tell you how we survived it and what we learned from it and what made us stronger in 2021. I and my colleagues (David Emery and Graeme Brown) principally teach veterinary parasitology at the Sydney School of Veterinary Science, University of Sydney; and we had amazing support from our dedicated PhD students at that time Nichola and Shona in 2020.

First and foremost, we decided right from beginning that we will retain the contact hours and devise activities that will be as interactive as possible. We told ourselves - there will be as little as possible of those do it yourselves, we trust you - sure you will find time for it and we will examine you later. Students were kept on their toes – sure some hated it but some loved it. What we could not do with student, we did in the lab and shot it with our cell phones, narrated it and deployed it as short videos that were broadcasted to students. Then each practical was associated with 30 minute debrief where we would discuss with students the relevant context and content. The practical hours would fly past.

For each practical, students were required to do either a quick quiz on the material covered or submit the scanned handbook to receive a “tick” for the presence. While University changed the policy that practicals were no more required as they were before COVID-19, we made our practicals compulsory. A bold, but useful, decision that we never regretted. Making



"While most students were quite content with the teaching, the failure was that only 65% were confident they are ready to take an exam"

them compulsory while providing students with appropriate activities with us made the essential connection of us with them. We were no more the unknown entity in the “clouds”, we were real! I would say, we came across as humans just stuck behind the ZOOM curtain and so we could connect and we did.

Teaching parasitology to veterinary students can be daunting, for all sorts of reasons that I won't delve into. But such teaching is essential, because of the responsibility and our own accountability with the profession that we represent. The classes were one off, so they need to “tick” the boxes that they are capable to link the skills and knowledge. There cannot ever be an excuse ... sorry I did not do that because it was COVID-19 and so I did not have that or the other practical. Students generally wanted to learn, but it is their nature that they resist a bit too – we all do a bit anyway. It was important, we paced the activities to the existing timeslots. Student really enjoyed the bespoke nature of the videos and the conversations we had with them. The major revelation was that to some extent all had to participate, because of the compulsory submissions and quizzes. They liked quizzes – but that is passive, someone throws bunch of questions and you just answer. Submissions were initially

received with some angst. We knew it will be the case, but we persisted and in return, we started to receive unsolicited acknowledgements that these “annoying” submissions were those factors that helped student to stay afloat and on pace. One factor to this (we speculate) was we did not make these submissions due on the day of the practicals, but by the end of the week (meaning Sunday midnight). We had around 70% student submitting by Friday another 20% by Saturday and the rest by Sunday. One could pick up those late submitters and know who they were and reach out to them to learn more about their circumstance. It was this part that we felt was critical – how otherwise would we know who is falling through the cracks?

The submissions and quizzes were extremely beneficial for our own reflection; we sometime learned how poorly we taught them. It was our opportunity to redirect students and provide them with new resources. Short (5 min) videos helped and were highly appreciated, because we showed that we were there with the students. Maybe that was not all bad after all. Instead of answering a question to a single student or a pair, we delivered answer to them all.

While most students were quite content

Education



"Bailey is a dog that tells student about all sort of things but mostly parasitology."

with the teaching, the failure was that only 65% were confident they are ready to take an exam (see the figure, where we summarise feedback we gathered). On one hand this number is low, but on the other I have no idea what the number in any other year is.

And then there was Semester 2. New challenges, but new opportunities for new interactivity. We introduced our alter-ego "Bailey" who started to teach instead of "us". From past experience of developing teaching modules inc. those for ASP using SmartSparrow. We adopted SCORM modules directly loaded into Canvas (works equally well with Moodle or whatever system your Uni is using). SCORM is just packaged HTML5 code (webpages) that can be generated using some reasonably user friendly software. We started using iSpring (a plugin for PowerPoint). The experience with SmartSparrow from the past and with ASP, propelled us right where we wanted to be. We deployed few in Semester 2 that served as interactive tools with which students worked before we had the usual 30 minutes debrief as part of the practical. BTW: Bailey is a dog that tells student about all sort of things but mostly parasitology. If you want - you can try it for yourself:

Interpreting anti-*Neospora caninum* Ig titres in a dog:

<https://vetpara.ispring.com/s/preview/85b4d70a-8f62-11eb-9fc6-121a0ab8ceeb>

Identification of tick genera on a dog in Australia:

<https://vetpara.ispring.com/s/preview/02ff99fc-8f63-11eb-9470-121a0ab8ceeb>

The drivers for these was to enable interactivity with the content and allow the context blend naturally, hence Bailey that tells personal experiences and consequences. Students responded well, close to 80% really liked it. But that is deceiving – liking does not mean understanding. What was most pleasing is that in exams student that were asked to explain the content and context covered by Bailey were writing answers that I hardly could fault, and they were interpreting it well and with rigor! Sure, it needs some extra scrutiny, but it made our life much easier, when I was marking these exams.

Selfish driver for using Bailey was that, if we were investing these ridiculous hours to get stuff online, let's make it worthwhile and get some long-term benefit from it. It is a message for me as well – time is precious and if I use it for long term benefit, all the better. Hours spent just for a one-off occasion is a really poor strategy – make it last!

And then there was 2021. I tend to say it is "Teaching V3". We completed the full circle of 12 month of COVID-19 teaching. What have we changed? We have the 30 minute debriefs, a perfect length of time, as student say "it is not too short or not too long". We have the online modules with Bailey. We felt the videos needed more rigor and more "bang". When I look at my own kids ... they are constantly online... (don't get me started). I sometime look over their shoulder (they hate that), and they are often watching a YouTuber who is streaming doing something (... like playing

FIFA20). I wondered how on earth can these people do it so effortlessly, streaming and having all sorts of effects. Is it rocket science to do this or not? Well, these days you can fix cars by simply watching YouTube (done that!), or learn how to do pivot tables on Excel (done that!). So I thought, could I actually stream a "lab" and do experiments in front of the students? The answer is yes, we did it! On the next page is a photo of the parasitology lab ready to livestream.

Now for the livestream! One camera is taking the overall shot of the lab when we talk directly to students (the one on the tripod, with the monitor on top). A second camera is on the bench on the left that does close ups of what we do on the bench. We also have it hooked to the microscope on the right. The real trick is something that is called "switcher". We used ATEM mini by BlackMagic (google it!), you can see it on the bench roughly in the middle of the picture. By simple pressing buttons I can move quickly from one camera to another and even have picture in picture... plus many other tricks. All this is fed into the webcam input into my laptop and ZOOM. Students love it! All operated by me and in the meantime David is responding to students in the chat!

These sessions are amazingly interactive. We receive regularly unsolicited feedback like "Just wanted to say how helpful these prac are! The quality is amazing and thank you David for answering all our questions so quickly!" or "We've come a long way since last year's video pracs". And my favourite one, "This is the best virtual class yet :) actual lab and a teacher fantastic and live thank you".

Education



Above: This is the parasitology lab in the historic McMaster building at the University of Sydney.
Below: Here I am (Jan) talking, while David is responding to chat questions. Just before I was preparing my sample from a wombat in KOH to show Sarcoptes all in real live stream. (Don't worry I will put the safety glasses on!)



Greenlight!

For those that read the book Greenlights by Matthew McConaughey. If you have not read it - read it, worth a read.

What is next? Who knows if there is Teaching V4, but we are content with the way it's working. We have a blueprint. Most importantly, we are allowed to have 3h face to face classes later in the semester that is getting set up now. The last 12 months were challenging, but we feel we have finally moved into 21st century, it took us only 20 years! Better late than never.

Jan Šlapeta, Sydney

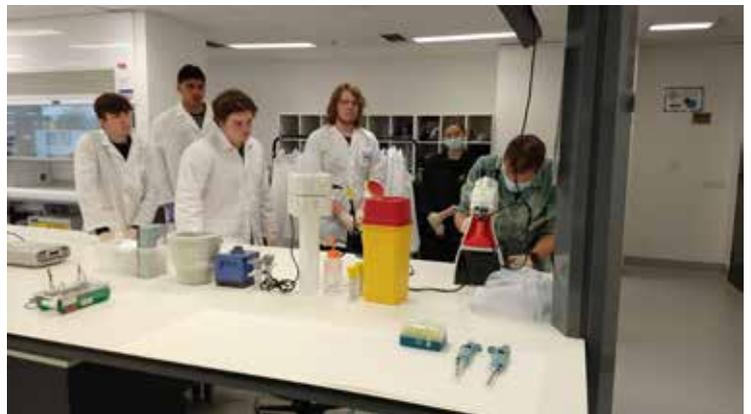
Outreach activities in ACT

Parasite Detectives



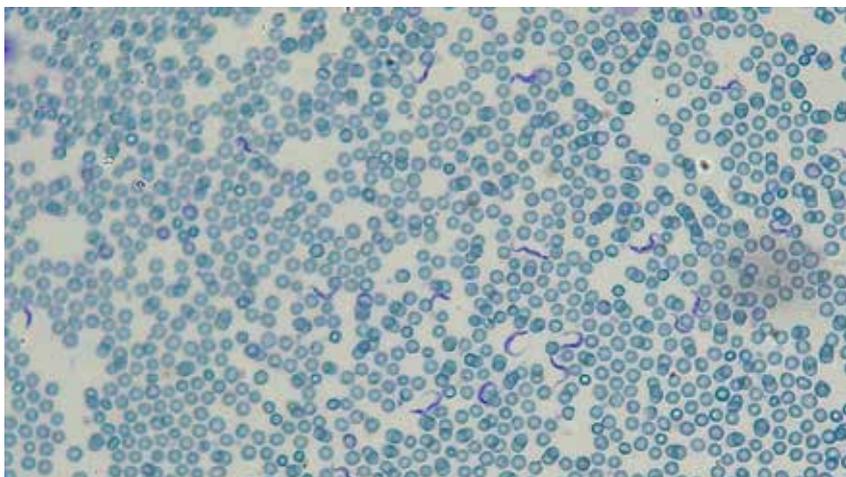
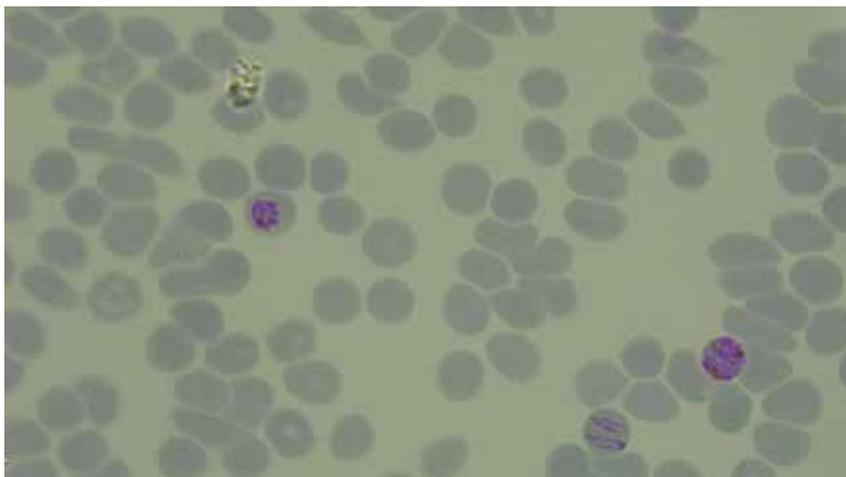
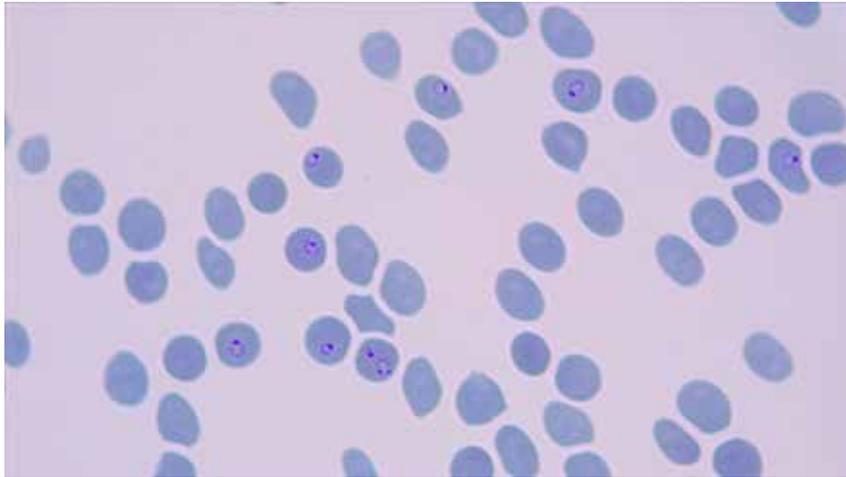
In February, ANU hosted Human Biology students from the University of Canberra Senior Secondary College Lake Ginninderra for a “Parasite Detectives” prac led by Giel van Dooren. This year, the prac was conducted in two days to ensure social distancing in the lab. On the first day students had to diagnose and treat Elizabeth Mee’s (Lehane Lab) *Plasmodium falciparum* infection, Merryn Fraser’s (Maier Lab) *Plasmodium knowlesi* infection, Cibelly Goulart’s (van Dooren Lab) *Toxoplasma* infection and Jenni Hayward’s (van Dooren Lab), Chagas disease infection before these ANU parasitologists succumbed to their illnesses. On the second day, it was time to save other parasitologists and students had to diagnose and treat Rachael Leonard’s *Toxoplasma* infection, Jenni’s *Plasmodium knowlesi* infection (poor Jenni), Soraya Zwahlen’s Chagas disease infection and Victor Makota’s *Plasmodium falciparum* infection (all from van Dooren lab). Students undertook diagnostic PCRs, microscopy analysis, and literature searches in a race against time, and managed to save their demonstrators with minutes to spare. In addition, students had the opportunity to connect their mobile phones to the microscope camera and save images of parasites found in the “patient” blood smear or tissue sample. We thank the wonderfully engaged students and their teachers (Alan Lyall and Gary Rolfe) for coming along for the pracs, Danny Wilson’s group (U. Adelaide) for providing *Plasmodium knowlesi*-infected blood smears, and the ANU Research School of Biology Teaching staff for providing facilities and reagents.

Clockwise from left: University of Canberra Senior Secondary College Lake Ginninderra students actively diagnosing parasitic diseases with the help of demonstrators: - Soraya Zwahlen (Image 1, orange lab coat), Giel van Dooren (Image 2 and 4, green lab coat), Rachael Leonard (Image 2, black lab coat) Victor Makota (Image 3, pink lab coat), Merryn Fraser and Jenny Hayward (Image 4, pink an black lab coat).



Outreach activities in ACT continued...

Parasite Detectives



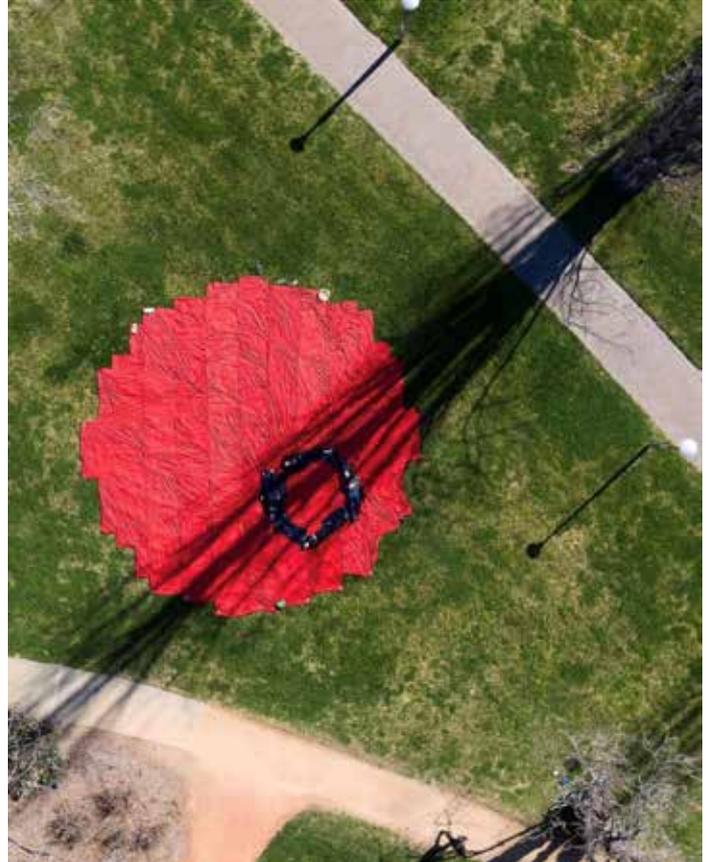
Images taken during the Parasite Detectives prac.
Top left: *Plasmodium falciparum*,
Middle left: *Plasmodium knowlesi*,
Bottom left: *Trypanosoma cruzi* and
Bottom right: *Toxoplasma gondii*



Outreach activities in ACT continued...

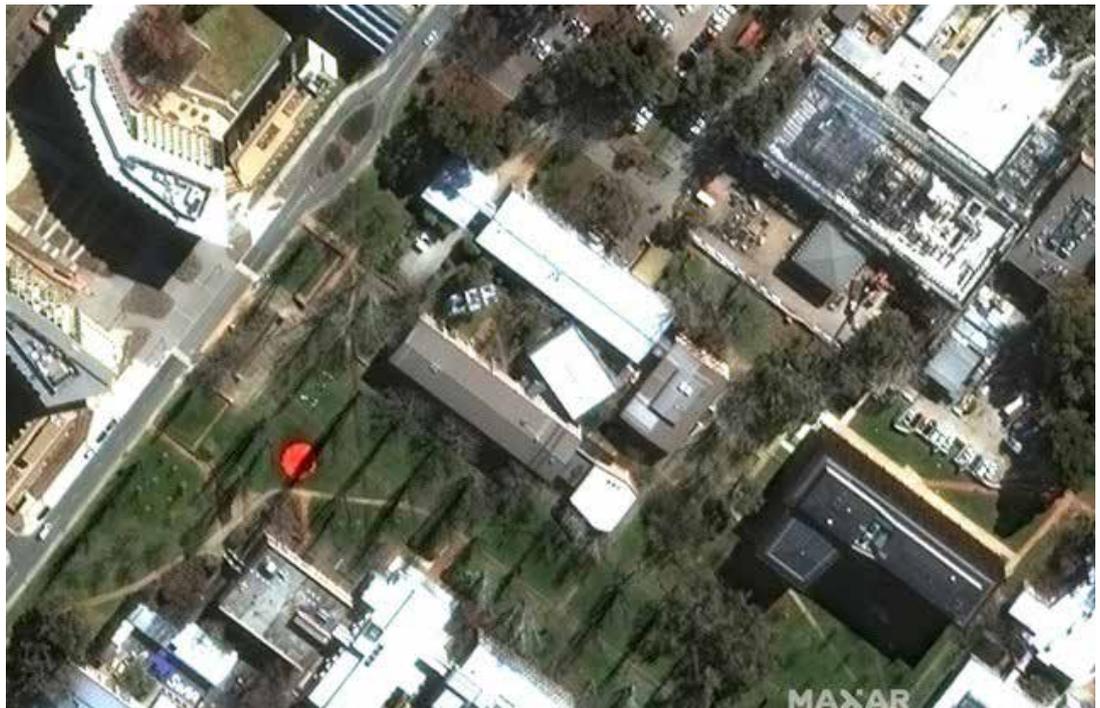
Satellite Selfies

The long-awaited “Satellite Selfie”, coordinated as part of National Science Week, was recently released. ANU Parasitologists Soraya Zwahlen, Cibelly Goulart and Fadzai (Victor) Makota (van Dooren lab), Stephen Fairweather (van Dooren and Broer labs), Merryn Fraser (Maier lab), Sashika Richards and Sarah Shafik (Martin lab), Vanessa Howieson and Christina Spry (Saliba lab), Merryn Fraser (Maier lab), Melanie Rug (Centre for Advanced Microscopy) and Alex Maier, who assembled a red blood cell (12 m in diameter), infected with a ring-stage malaria parasite composed of the parasitologists, were pleased to see their infected red blood cell made the cut. Despite some interfering trees casting a shadow, the red blood cell could be seen from space as hoped, and now features as a permanent reminder of ANU parasitologists on this satellite image of Canberra. Thanks again to the ASP for State Outreach funding to support this effort.



Top image: Red blood cell close-up. Source: Science ANU Instagram.

Bottom image: Satellite selfie. Source: <http://www.mso.anu.edu.au/SatelliteSelfie/index.html>



Outreach activities in Western Australia

Despite many community engagement events being cancelled due to COVID-19, we are fortunate that WA restrictions eased by October 2020.

There was much joy in **Rina Fu's** first face-to-face workshop since the lockdown, as an invited scientist-author-illustrator for Children's Book Week (which had been postponed since August 2020). The Year 1s and 2s children from a local school all dressed as their favorite story book character. Rina revealed a number of secrets from her Mad Scientist Mummy (her first picture storybook supported by the ASP). One of the secrets being the little girl character (you'd need to use your observations) she is named after Mabel Mackerras, renowned female Australian scientist. The real life Mabel contributed greatly through her research in veterinary medicine and medical science as an entomologist, medical scientist, and parasitologist. She served in the Army Malaria Research Unit and made a significant contribution to the Allied war effort.



Dr Rina Fu visits local high schools

Rina was also invited as a visiting lecturer to two local high schools to gross out the teens with some bloody parasites! This popular activity was conceived at the ASP's inaugural Concepts in Parasitology Course, where participants had to design an outreach activity suitable for high school age children - that was her very first experience of developing something for school-based science outreach!



Rina had the opportunity to present her science outreach work at 2 local conferences in October (The Australian Institute for Medical Scientists-The Australian Society for Microbiology Joint Meeting 2020, and The Combined Biological Sciences Meeting). At the time of presentation, Rina had clocked 99 sessions of outreach since June 2018!

Rina's 100th session was at the Ruth Faulkner Library as part of the Curious Kids program. The librarian commented that this was the first time ever for her events to have 100% registered turnouts, let alone all those children who were on the waiting list turned up too! It was a wonderful encouragement and lots of fun.

Left: Dr Rina Fu performs for Children's Book Week in August 2020

WA outreach continued...



Rina was recently interviewed by Alysha Huxley from Scientell, about spearheading a number of National Science Week workshops tailored to include people with disabilities. The interview will be used as part of a National Science Week brochure, to be published later this year.

Rina is also collecting parasite specimens big and small ones for her book launch and community outreach, she would love to hear from anyone who could provide her with some (fixed) parasites! Please email Rina (rina@rinafu.com) if you have some.



Lastly, in anticipation of Rina's 2nd book - *My Mummy's Pet Parasites*, she'll be launching the 'Cells & Parasites Jewellery Series', to support her Outreach work.

Above: Dr Rina Fu bringing science to campers in Augusta (Rina's tent in the background January 2021)

Queers in Science

QUEERS IN SCIENCE

The QueersInScience Network started in Parkville, Victoria and has expanded nationally with a branch established in most States and Territories. QueersInScience aims to champion LGBTQIA+ scientists, and to create an inclusive environment for all LGBTQIA+ people in STEMM. Queer visibility, advocacy and intersectionality are important pillars of the network.

Michelle Power is a member of the NSW Branch Committee and is encouraging LGBTQIA+ individuals who are ASP members to join their local branch <https://queersinscience.org.au>. Opportunities arise each year to take up an office role on state committees with new committees voted in annually.

Each state runs events to foster inclusion for all LGBTQIA+ individuals studying and/or working in STEMM fields. Events so far across the country have included pub gatherings, trivia nights, panels and talks in conjunction with LGBTQIA+ awareness days, picnics, and outreach tents at Midsumma Festival.

If you identify as LGBTQIA+ and would like to be part of a MyQueerScience career parasite outreach event during National Science Week or LGBTIQ+ STEMM Day contact Michelle Power (michelle.power@mq.edu.au)

Undergraduate prizes

The ASP undergraduate prizes from James Cook University were recently announced.

From James Cook University in Queensland for the 2020 academic year, the worthy recipients of the Australian Society for Parasitology Prize in Veterinary Science was **Anna Jane Willis** and **Samuel Fraser Thomas**.

\$400 Undergraduate Prizes

The Australian Society for Parasitology is pleased to announce that it will be offering undergraduate student prizes of \$400 each to Australian Universities identified as offering a suitable course in parasitology, for presentation to the best undergraduate student in parasitology (highest passing mark/grade).

The course(s) must be taught by a financial member of the ASP (of more than one year standing), and must comprise at least 30% parasitology. **Requests for 2021 prizes must be made by the eligible University to the ASP Treasurer by the 30th September 2021. Please complete the online application form:**

www.parasite.org.au/awards/asp-undergraduate-prizes/

International Women's Day 2021

Happy International Women's Day 2021. This week we celebrate #WomenInSTEM and our awesome #womeninparasitology their achievements and how they are changing the world one parasite at a time! #IWD2021 #womeninparasitology #womeninSTEM

Dr Mabel Josephine Mackerras (1896-1971) was an Australian parasitologist, zoologist and entomologist. She made contributions to the study of the blood parasites of Australian marine fish, the malaria parasite and the parasites of Australian mammals. The rat lung-worm, *Angiostrongylus mackerrasae*, whose life cycle she elucidated, was named after her. Dr Jo Mackerras was awarded a Fellow of the ASP in 1967, one of the first three ASP Fellows and the first female ASP Fellow and is the featured image for this post. To read more about Dr Jo Mackerras see our ASP Fellow's pages <https://www.parasite.org.au/the-society/fellows-of-the-society/jo-mackerras-fasp-1967/>

<https://www.internationalwomensday.com/>

For International Women's Day the IWD 2021 campaign theme is #ChooseToChallenge

A challenged world is an alert world. Individually, we're all responsible for our own thoughts and actions – all day, every day. We can all choose to challenge and call out gender bias and inequality. We can all choose to seek out and celebrate women's achievements. Collectively, we can all help create an inclusive world. From challenge comes change, so let's all choose to challenge.



Left: Dr Mabel Josephine Mackerras (1896-1971)

Below: the many faces of Women in Parasitology from the Australian Society for Parasitology



IJP

INTERNATIONAL JOURNAL FOR PARASITOLOGY

www.journals.elsevier.com/international-journal-for-parasitology

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IJP Editor Brian Cooke recommends these recent articles published in IJP:

January 2021:

Cover caption:

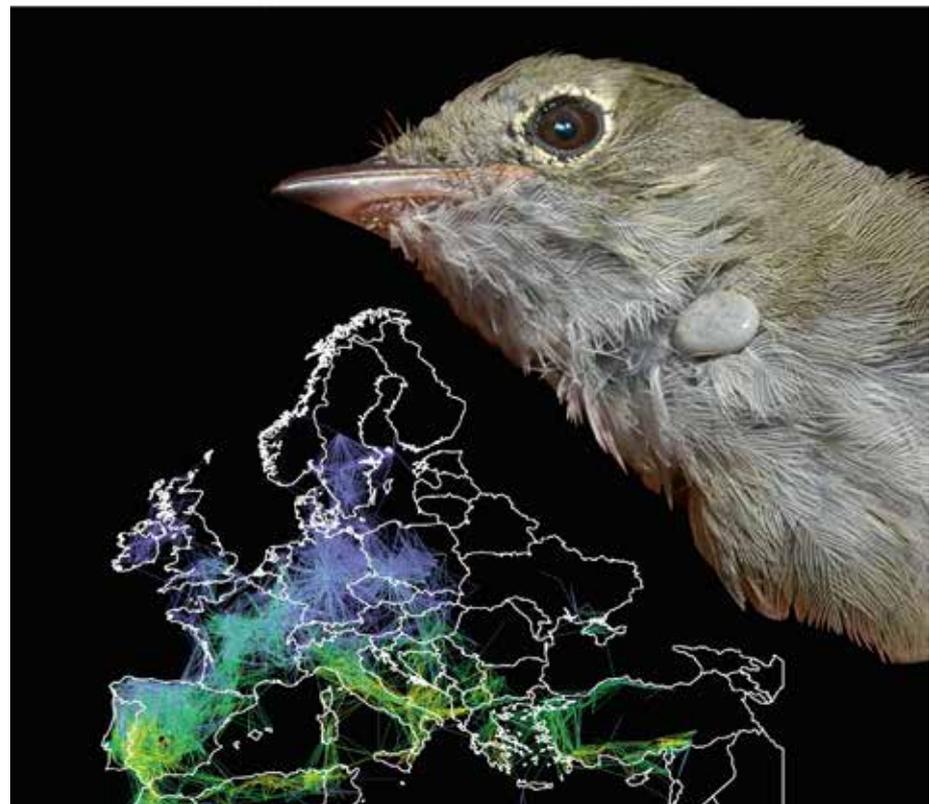
Prediction of the pathways of African-European migratory birds and the probability of spread of invasive ticks. Picture of *Acrocephalus* sp. carrying a feeding tick courtesy of José Venzal (Universidad de la República, Uruguay).

Estrada-Peña, A., D'Amico, G., Fernández-Ruiz, N., 2021. Modelling the potential spread of *Hyalomma marginatum* ticks in Europe by migratory birds. *Int J Parasitol.* 51, 1-11. <https://doi.org/10.1016/j.ijpara.2020.08.004>



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VOLUME 51 ISSUE 1 JANUARY 2021



International Journal for Parasitology continued

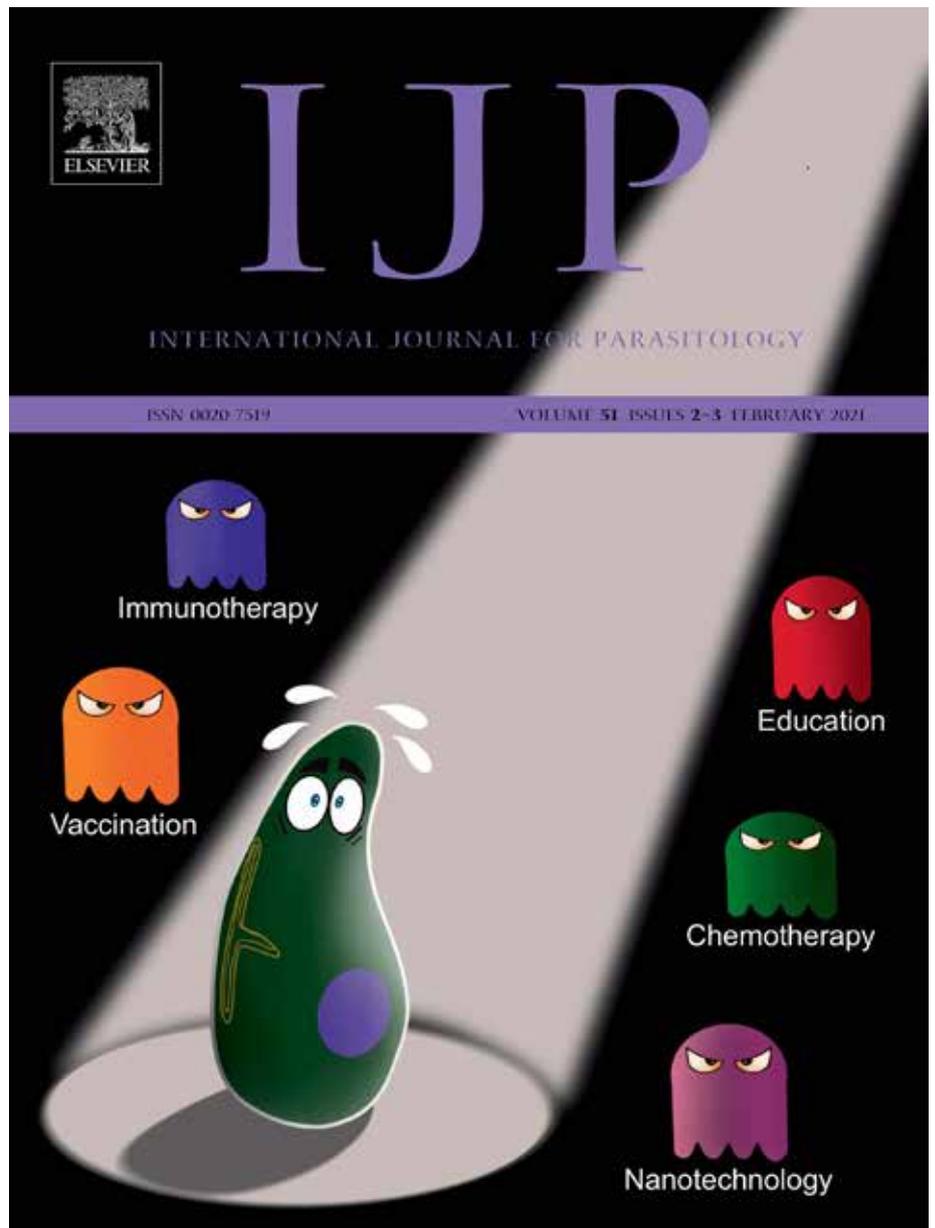
February 2021:

Cover caption:

Toxoplasma, caught in the spotlight for control through education, chemotherapy, nanotechnology, immunotherapy and vaccination. Cover image courtesy of Dr Cibelly Goulart (University of Technology Sydney and The Australian National University, Australia).

Smith, N.C., Goulart, C., Hayward, J.A., Kupz, A., Miller, C.M., van Dooren, G.G., 2021. Control of human toxoplasmosis. *Int J Parasitol.* 51, 95-121. <https://doi.org/10.1016/j.ijpara.2020.11.001>

Hedtke, S.M., Zendejas-Heredia, P.A., Graves, P.M., Sheridan, S., Sheel, M., Fuimaono, S.D., Lau, C.L., Grant, W.N., 2021. Genetic epidemiology of lymphatic filariasis in American Samoa after mass drug administration. *Int. J. Parasitol.* 51, 137-147. <https://doi.org/10.1016/j.ijpara.2020.08.009>



International Journal for Parasitology continued

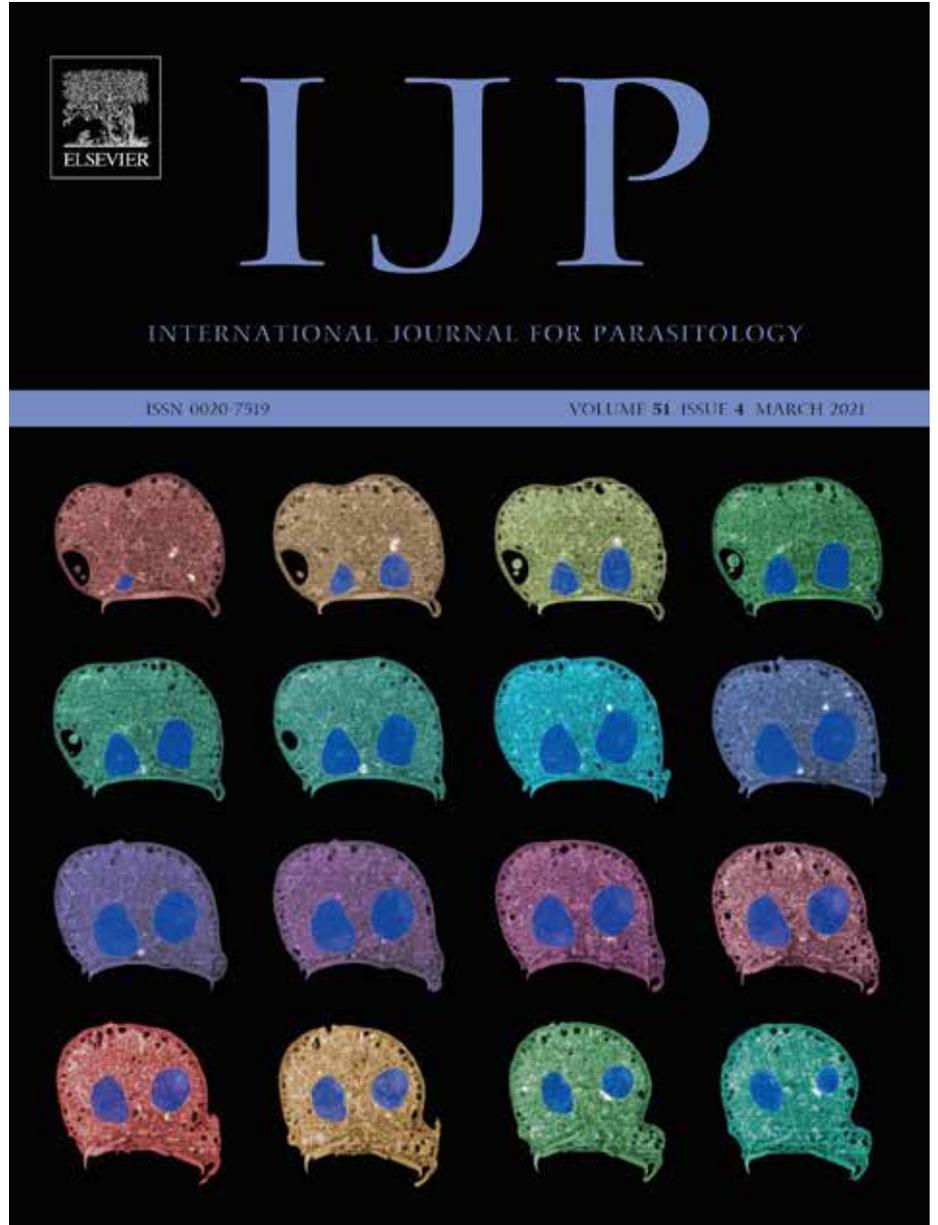
March 2021:

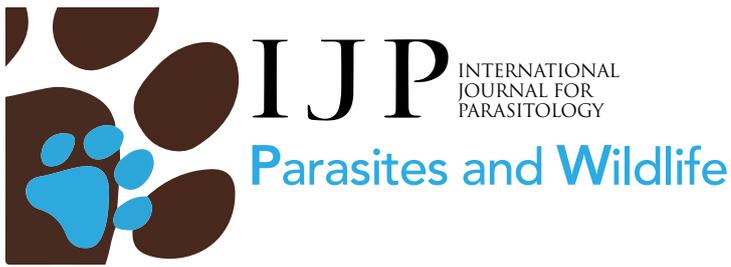
Cover caption:

Serial sections through the two nuclei of *Giardia duodenalis*. Image courtesy of Crystal Cooper, Queensland University of Technology, Australia.

Emery-Corbin, S.J., Hamey, J.J., Balan, B., Rojas-López, L., Svärd, S.G., Jex, A.R., 2021. Eukaryote-conserved histone post-translational modification landscape in *Giardia duodenalis* revealed by mass spectrometry. *Int J Parasitol.* 51, 225-239. <https://doi.org/10.1016/j.ijpara.2020.09.006>

Teo., E.J.M., Vial, M.N., Hailu, S., Kelava, S., Zalucki, M.P., Furlong, M.J., Brker, D., Barker, S.C., 2021. Climatic requirements of the eastern paralysis tick, *Ixodes holocyclus*, with a consideration of its possible geographic range up to 2090. *Int. J. Parasitol.* 51, 241-249. <https://doi.org/10.1016/j.ijpara.2020.08.011>





www.journals.elsevier.com/international-journal-for-parasitology-parasites-and-wildlife/

Editor: R.C. Andrew Thompson

Facebook: www.facebook.com/IJPPAW/

Andrew Thompson, Editor of IJP:PAW, gives a selection of recommended reading including recent articles from the IJP:PAW special issue [Parasites in Extreme Environments](#).

[Review on parasites of wild and captive giant pandas \(*Ailuropoda melanoleuca*\): Diversity, disease and conservation impact.](#) Junqiang Li, Md Robiul Karim, Jun Li, Liping Zhang, Longxian Zhang International Journal for Parasitology: Parasites and Wildlife, Volume 13, Pages 38-45.

[First identification and molecular phylogeny of *Sparganum proliferum* from endangered felid \(*Panthera onca*\) and other wild definitive hosts in one of the regions](#)

[with highest worldwide biodiversity.](#) Juan Pablo Arrabal, Matías Gastón Pérez, Lucas Federico Arce, Laura Kamenetzky, International Journal for Parasitology: Parasites and Wildlife, Volume. 13, Pages 142-149.

[Parasites of an Arctic scavenger; the wolverine \(*Gulo gulo*\).](#) Sophie E. Watson, Frank Hailer, Nicolas Lecomte, Pratap Kafle, Rajnish Sharma, Emily J. Jenkins, Malik Awan, Vincent L'Hérault, Sarah E. Perkins. International Journal for Parasitology: Parasites and Wildlife, Volume 13, Pages 178-185. This research paper was featured in the [December 2020](#) issue of the ASP Newsletter [Vol 31.5](#).

[Diversity of trypanosomes in wildlife of the](#)

[Kafue ecosystem, Zambia.](#) David Squarre, Kyoko Hayashida, Alex Gaithuma, Herman Chambaro, Naoko Kawai, Ladslav Moonga, Boniface Namangala, Chihiro Sugimoto, Junya Yamagishi, International Journal for Parasitology: Parasites and Wildlife, Volume 12, Pages 34-41

Invitations for contributions to the next special issue on 'Parasites of Wildlife in China' are on the PAW website, social media including Weibo in China. Lihua Xiao will be Co-Editor, and will write an introductory review with remaining articles solicited. Please let me know if you have any suggestions of potential contributors who we should target.

Special Issue

IJP: Parasites and Wildlife Parasites in Extreme Environments

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IJP:PAW Interview with Dr Vanessa Ezenwa and Caroline Shearer

Lisa Jones interviewed researchers Dr Vanessa Ezenwa and Caroline Shearer, Odum School of Ecology, University of Georgia, Athens, GA, USA about their IJP PAW article “Rainfall as a driver of seasonality in parasitism”.

Lisa: Vanessa and Caroline, please tell us a bit about yourselves and your research. What do you enjoy the most about your research?

Caroline: I am now an Associate in Research at Duke University (Durham, NC, USA) and am applying to PhD programs in Ecology and Evolutionary Biology. This research was my undergraduate senior thesis and the culmination of three-and-a-half years studying relationships between gazelle and their helminth (worm) parasites with Dr. Ezenwa. Working with Dr. Ezenwa introduced me to the world of host-parasite dynamics, and I have been hooked ever since. Some of the most rewarding and

enjoyable parts of my research have been using statistics to tease apart and discover the nuanced connections between hosts, infection, and their environment.

Vanessa: I am a professor in the Odum School of Ecology and College of Veterinary Medicine at the University of Georgia. I have been studying wild ungulates and their helminth parasites since I was a PhD student. I am fascinated by the complex interactions that occur between hosts and parasites and how parasitism shapes almost all aspects of the lives of animals. The most exciting thing about my research is that it allows me explore these many, often cryptic, interactions. I also enjoy getting to share the fascinating world of host-parasite interactions with students like Caroline.

Lisa: How did you become interested in seasonal variation of parasite burden and why do you think it is important to study this area?

Vanessa: My lab has been studying host-parasite interactions in Grant’s gazelles for

the past 12 years. In particular, we have explored how host behaviour, physiology, and ecology drive variation in helminth burdens among individuals. For example, we have focused on questions such as how social connectivity influences infection risk; the effects of testosterone on immunity and infection in males; and more recently, links between environment, behaviour, infection and the microbiota. Caroline’s work zeroed in on understanding the effects of environmental variation on infection patterns. Environmental conditions play a central role in the ecology of our study system, a semi-arid savannah ecosystem, influencing nearly all aspects of a gazelle’s life.

Caroline: I became interested in how parasite burdens vary seasonally because we cannot fully understand how host traits (e.g. behaviour, physiology) and parasite traits (e.g. transmission mode) interact to drive variation in parasite burdens among individuals without considering the role of the environment. In our study system, rainfall is a key element of seasonal change



Left: Females running (credit: S. Ekernas)

Right page 19: Male with ear tags and a radio collar (credit: M. Snider)

IJP:PAW interview with Dr Vanessa Ezenwa and Caroline Shearer continued

that might reasonably affect levels of parasitism by influencing the susceptibility of hosts that rely on rainfall-dependent food resources as well as the exposure of hosts to parasites with free-living life stages that require moisture in the environment for mobility and survival. The multiple potential pathways by which seasonal variation in rainfall can affect parasitism make unravelling the links between rainfall and helminth infection a fascinating problem.

Lisa: The results of your study suggest that the delayed effects of low rainfall impact host susceptibility, what is the mechanism for this impact on helminth parasite burden in its host?

Vanessa & Caroline: A likely mechanism of these delayed effects is that low rainfall reduces the quality or quantity of food (plant material) available to gazelles. Over time, this poor food quality may reduce gazelle body condition and/or weaken immune function making it more difficult for these animals to resist their worm infections and resulting in higher worm burdens. In our study system, future work examining how host immune function varies in relation to rainfall and forage quality is needed to support or challenge this proposed mechanism.

Interestingly, we found that host-life history may be an important modifier of how the environment affects parasitism. Rainfall was less strongly associated with helminth loads

in territorial males compared to bachelor males. For territorial males, the energy expenditure and stress related to territory defence, as well as the immunosuppressive effects of testosterone, may mean that higher food quality due to increased rainfall has less of an effect of parasite susceptibility. In short, better food during periods of high rainfall may not sufficiently compensate for the negative physiological effects of reproductive dominance, thereby weakening the link between parasite load and rainfall in territorial males. Comparatively, bachelor males may be able to take greater advantage of improved food resources during rainy periods to boost their resistance to worms.

Lisa: Can you comment about the possible

IJP:PAW interview with Dr Vanessa Ezenwa and Caroline Shearer continued

outcomes a changing environment could have on helminth parasite burden and whether you see climate change having an influence in the longer term?

Vanessa & Caroline: The impact of changing environmental conditions on helminth infections will depend, in part, on host, parasite and geographical region. However, for our study system and region, increased frequency of drought conditions, for example, may result in extended periods of high host susceptibility to worms, paralleling periods of reduced forage quality and quantity. Moreover, increasing helminth burdens in ungulate hosts, like Grant's gazelles, have the potential to have knock on effects on processes such as plant-herbivore interactions (e.g. if highly parasitized animals eat less) and predator-prey interactions (e.g. if parasitized prey are easier to catch), with cascading consequences for entire ecosystems. The potential links between helminth parasitism and ecosystem processes require significantly more study, particularly given ongoing climate change.

Lisa: How are you continuing your research at the present time, when the world is self-isolating due to the COVID-19 outbreak and what advice do you have for fellow field researchers?

Vanessa & Caroline: Like many researchers, we have been primarily working remotely due to COVID-19. Typically, our research involves summers spent at our field sites in Kenya and South Africa. However, this past summer we focused on data analyses and writing. For Caroline, who is an early career researcher, the circumstances of 2020 provided an opportunity to connect with colleagues virtually (e.g. by taking advantage of many virtual conferences) and to develop collaborative proposals for future work. For Vanessa, 2020 provided an opportunity to catch up on languishing projects and to reflect on future research directions and themes.

Lisa: And, finally Vanessa and Caroline, are wild ungulates (Grant's gazelle, *Nanger granti*) amazing to work with and do you have some lovely photos to share?

Vanessa & Caroline: Yes! Wild ungulates are amazing. At our field site (Mpala Research Centre, Kenya) where the work for this paper was done there are over 15 species of ungulates ranging from dik-dik to eland. We have had the opportunity to work with Grant's gazelles up close, capturing them for identification purposes and tracking individuals over time to understand the causes and consequences of variation in helminth parasitism. The attached photos show some of our study individuals.

Lisa: Thank you Vanessa and Caroline we look forward to hearing more about your research in the future!

Download the research paper:

Caroline L. Shearer, Vanessa O. Ezenwa, Rainfall as a driver of seasonality in parasitism, *International Journal for Parasitology: Parasites and Wildlife*, Volume 12, 2020, Pages 8-12, ISSN 2213-2244, <https://doi.org/10.1016/j.ijppaw.2020.04.004>

<http://www.sciencedirect.com/science/article/pii/S2213224420300341>

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Photo list:

Male with ear tags and a radio collar (credit: M. Snider) (page 19)

Males sparring (credit: S. Hauver) (front cover of this newsletter)

Females running (credit: S. Ekernas) (page 18)

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IJP: Parasites and Wildlife

Curated by Prof. Andrew Thompson, Editor-in-Chief



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Drugs and Drug Resistance

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Editors In Chief: Andrew Kotze & Kevin Saliba

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Please enjoy a recent selection of IJP DDR articles Drugs and Drug Resistance, from Issues 14 and 15 and Special issue articles on 'Drug Resistance - Mechanisms, Surveillance and Parasite Populations' and Special issue articles on 'Anaerobic Protozoan Pathogens: Drugs, Resistance and New Developments'

Christian W. Saueremann, Dave M. Leathwick, Mark Loeffering, Martin K. Nielsen, "Climate change is likely to increase the development rate of anthelmintic resistance in equine cyathostomins in New Zealand", International Journal for Parasitology: Drugs and Drug Resistance, Volume 14, 2020, Pages 73-79, ISSN 2211-3207,

<https://doi.org/10.1016/j.ijpddr.2020.09.001>.

<https://www.sciencedirect.com/science/article/pii/S2211320720300270>

Abstract: Climate change is likely to influence livestock production by increasing the prevalence of diseases, including parasites. The traditional practice of controlling nematodes in livestock by the application of anthelmintics is, however, increasingly compromised by the development of resistance to these drugs in parasite populations. This study used a previously developed simulation model of the entire equine cyathostomin lifecycle to investigate the effect a changing climate would have on the development of anthelmintic resistance. Climate data from six General Circulation Models based on four different Representative Concentration Pathways was available

for three New Zealand locations. These projections were used to estimate the time resistance will take to develop in the middle (2040–49) and by the end (2090–99) of the century in relation to current (2006–15) conditions under two treatment scenarios of either two or six yearly whole-herd anthelmintic treatments. To facilitate comparison, a scenario without any treatments was included as a baseline. In addition, the size of the infective and parasitic stage nematode population during the third simulation year were estimated. The development of resistance varied between locations, time periods and anthelmintic treatment strategies. In general, the simulations indicated a more rapid development of resistance under future climates coinciding with an increase in the numbers of infective larvae on pasture and encysted parasitic stages. This was especially obvious when climate changes resulted in a longer period suitable for development of free-living parasite stages. A longer period suitable for larval development resulted in an increase in the average size of the parasite population with a larger contribution from eggs passed by resistant worms surviving the anthelmintic treatments. It is projected that climate change will decrease the ability to control livestock parasites by means of anthelmintic treatments and non-drug related strategies will become increasingly important for sustainable parasite control.

Melissa M. George, Adriano F. Vatta, Sue B. Howell, Bob E. Storey, Ciaran J. McCoy, Adrian J. Wolstenholme, Elizabeth M. Redman, John S. Gilleard, Ray M. Kaplan, "Evaluation of changes in drug susceptibility and population genetic structure in *Haemonchus contortus* following worm replacement as a means to reverse the impact of multiple-anthelmintic resistance on a sheep farm", International

Journal for Parasitology: Drugs and Drug Resistance, Volume 15, 2021, Pages 134-143, ISSN 2211-3207,

<https://doi.org/10.1016/j.ijpddr.2021.02.004>.

<https://www.sciencedirect.com/science/article/pii/S2211320721000075>

Abstract: A population of *Haemonchus contortus* that was highly resistant to benzimidazoles and avermectin/milbemycins with a subpopulation that was resistant to levamisole, was replaced with a susceptible laboratory isolate of *H. contortus* in a flock of sheep. The anthelmintic susceptibility and population genetics of the newly established population were evaluated for 3.5 years using in vivo, in vitro, and molecular methods. Successful replacement of the resistant population with a susceptible population was confirmed using phenotypic and genotypic measurements; larval development assay indicated full anthelmintic susceptibility; albendazole treatment yielded 98.7% fecal egg count reduction; pyrosequence genotyping of single nucleotide polymorphisms in positions 167 and 200 of the isotype-1 beta tubulin gene were present at 0.0 and 1.7%, respectively; microsatellite genotyping indicated the background haplotype was similar to the susceptible isolate; and haplotypes of the isotype-1 beta tubulin gene were similar to the susceptible isolate. To sustain the susceptibility of the new population, targeted selective treatment was implemented using albendazole. Surprisingly, within 1.5 years post-replacement, the population reverted to a resistant phenotype. Resistance to albendazole, ivermectin, and moxidectin was confirmed via fecal egg count reduction test, larval development assay,

IJP:DDR continued

and pyrosequencing-based genotyping. Targeted selective treatment was then carried out using levamisole. However, within one year, resistance was detected to levamisole. Population genetics demonstrated a gradual change in the genetic structure of the population until the final population was similar to the initial resistant population. Genetic analyses showed a lack of diversity in the susceptible isolate, suggesting the susceptible isolate had reduced environmental fitness compared to the resistant population, providing a possible explanation for the rapid reversion to resistance. This work demonstrates the power of combining molecular, in vitro, and in vivo assays to study phenotypic and genotypic changes in a field population of nematodes, enabling improved insights into the epidemiology of anthelmintic resistance.

Marcelo U. Ferreira, Tais Nobrega de Sousa, Gabriel W. Rangel, Igor C. Johansen, Rodrigo M. Corder, Simone Ladeia-Andrade, José Pedro Gil, "Monitoring *Plasmodium vivax* resistance to antimalarials: Persisting challenges and future directions", *International Journal for Parasitology: Drugs and Drug Resistance*, Volume 15, 2021, Pages 9-24, ISSN 2211-3207,

<https://doi.org/10.1016/j.ijpddr.2020.12.001>.

(<https://www.sciencedirect.com/science/article/pii/S221132072030049X>)

Abstract: Emerging antimalarial drug resistance may undermine current efforts to control and eliminate *Plasmodium vivax*, the most geographically widespread yet neglected human malaria parasite. Endemic countries are expected to assess regularly the therapeutic efficacy of antimalarial drugs in use in order to adjust their malaria treatment policies, but proper funding and trained human resources are often lacking to execute relatively complex and expensive clinical studies, ideally complemented by ex vivo assays of drug resistance. Here we review

the challenges for assessing in vivo *P. vivax* responses to commonly used antimalarials, especially chloroquine and primaquine, in the presence of confounding factors such as variable drug absorption, metabolism and interaction, and the risk of new infections following successful radical cure. We introduce a simple modeling approach to quantify the relative contribution of relapses and new infections to recurring parasitemias in clinical studies of hypnozoitocides. Finally, we examine recent methodological advances that may render ex vivo assays more practical and widely used to confirm *P. vivax* drug resistance phenotypes in endemic settings and review current approaches to the development of robust genetic markers for monitoring chloroquine resistance in *P. vivax* populations.

Jean Popovici, Kieran Tebben, Benoit Witkowski, David Serre, "Primaquine for *Plasmodium vivax* radical cure: What we do not know and why it matters", *International Journal for Parasitology: Drugs and Drug Resistance*, Volume 15, 2021, Pages 36-42, ISSN 2211-3207,

<https://doi.org/10.1016/j.ijpddr.2020.12.004>.

(<https://www.sciencedirect.com/science/article/pii/S221132072030052X>)

Abstract: *Plasmodium vivax* radical cure requires the administration of a blood schizonticide for killing blood-stage parasites and the addition of a drug able to kill hypnozoites, the dormant parasite stages residing in the liver of infected patients. All drugs used clinically for killing hypnozoites are 8-aminoquinolines and among them, primaquine has been at the forefront of *P. vivax* case management for decades. We discuss here the possible factors that could lead to the emergence and selection of *P. vivax* primaquine resistant parasites and emphasize on how a better understanding of the mechanisms underlying primaquine treatment and hypnozoite biology is needed to prevent this catastrophic scenario from happening.

Alexander Y.F. Lam, Daniel Vuong, Aaron R. Jex, Andrew M. Piggott, Ernest Lacey, Samantha J. Emery-Corbin, "TriTOX: A novel *Trichomonas vaginalis* assay platform for high-throughput screening of compound libraries", *International Journal for Parasitology: Drugs and Drug Resistance*, Volume 15, 2021, Pages 68-80, ISSN 2211-3207,

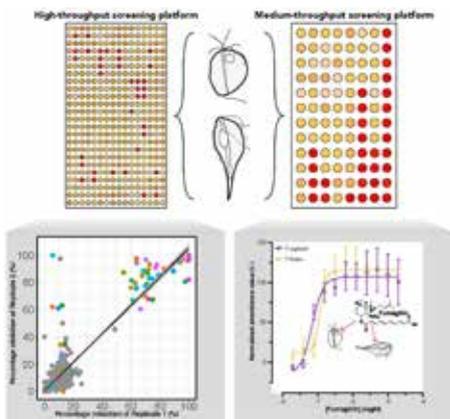
<https://doi.org/10.1016/j.ijpddr.2021.01.001>.

(<https://www.sciencedirect.com/science/article/pii/S2211320721000014>)

Abstract: *Trichomonas vaginalis* is a neglected urogenital parasitic protist that causes 170 million cases of trichomoniasis annually, making it the most prevalent non-viral, sexually transmitted disease. Trichomoniasis treatment relies on nitroheterocyclics, such as metronidazole. However, with increasing drug-resistance, there is an urgent need for novel anti-trichomonals. Little progress has been made to translate anti-trichomonal research into commercialised therapeutics, and the absence of a standardised compound-screening platform is the immediate stumbling block for drug-discovery. Herein, we describe a simple, cost-effective growth assay for *T. vaginalis* and the related *Tritrichomonas foetus*. Tracking changes in pH were a valid indicator of trichomonad growth (*T. vaginalis* and *T. foetus*), allowing development of a miniaturised, chromogenic growth assay based on the phenol red indicator in 96- and 384-well microtiter plate formats. The outputs of this assay can be quantitatively and qualitatively assessed, with consistent dynamic ranges based on Z' values of 0.741 and 0.870 across medium- and high-throughput formats, respectively. We applied this high-throughput format within the largest pure-compound microbial metabolite screen (812 compounds) for *T. vaginalis* and identified 43 hit compounds. We compared these identified compounds to mammalian cell lines, and highlighted extensive overlaps between anti-trichomonal and anti-tumour activity. Lastly, observing

IJP:DDR continued

nanomolar inhibition of *T. vaginalis* by fumagillin, and noting this compound has reported activity in other protists, we performed in silico analyses of the interaction of fumagillin with its molecular target methionine aminopeptidase 2 for *T. vaginalis*, *Giardia lamblia* and *Entamoeba histolytica*, highlighting potential for fumagillin as a broad-spectrum anti-protistal against microaerophilic protists. Together, this new platform will accelerate drug-discovery efforts, underpin drug-resistance screening in trichomonads, and contributing to a growing body of evidence highlighting the potential of microbial natural products as novel anti-protistals.



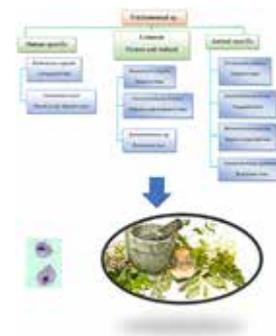
Nooshin Hashemi, Davood Ommi, Parya Kheyri, Faham Khamesipour, William N. Setzer, Marlene Benchimol, "A review study on the anti-trichomonas activities of medicinal plants", International Journal for Parasitology: Drugs and Drug Resistance, Volume 15, 2021, Pages 92-104, ISSN 2211-3207,

<https://doi.org/10.1016/j.ijpddr.2021.01.002>.

(<https://www.sciencedirect.com/science/article/pii/S2211320721000038>)

Abstract: The parasitic diseases represent the most important health risk, especially in underdeveloped countries where they have a deep impact on public health. Trichomoniasis is a prevalent non-viral sexually transmitted disease, and a significant amount of new cases are identified each year globally. Furthermore, the infection is linked with serious concerns such as pregnancy outcomes, infertility, predisposition to cervical and prostate cancer, and increased transmission and acquisition of HIV. The therapy is restricted, adverse effects are often observed, and resistance to the drugs is emerging. Based on this, a new treatment for trichomoniasis is necessary. Natural products represent a rich source of bioactive compounds, and even today, they are used in the search for new drugs. Additionally, natural products provide a wide variety of leadership structures that can be used by the pharmaceutical industry as a template in the development of new drugs that are more effective and have fewer or no undesirable side effects compared to current treatments. This review focuses on the medicinal plants that possess anti-trichomonal activity in vitro or in vivo. An electronic database search was carried out covering the last three decades, i.e., 1990–2020. The literature search revealed that almost a dozen isolated phytoconstituents are being explored globally for their anti-trichomonal activity. Simultaneously, many countries have their own traditional or folk medicine for trichomoniasis that utilizes their native plants, as a whole, or even

extracts. This review focuses mainly on the human parasite *Trichomonas vaginalis*. However, at some points mention is also made to *Tritrichomonas foetus* that causes trichomoniasis in animals of high veterinary and economical interest. We will focus on the plants and plant-based compounds and their anti-trichomonal activity. The literature search highlighted that there are abundant compounds that possess anti-trichomonal activity; however, in-depth in-vivo evaluation of compounds and their clinical evaluation has not been undertaken. There is a critical need for new anti-trichomonal compounds, and focused research on phytoconstituents can provide the way forward.



Travel Awards

We are very pleased to announce that we have re-opened the Researcher Exchange, Travel and Training Award including a JD Smyth Postgraduate Travel Award scheme. The next deadline for applications is 30th September 2021.

In light of the COVID-19 outbreak worldwide we have updated the Travel Award guidelines and the application form, so please ensure that you read the updated guidelines before applying for an ASP Travel Award. <https://www.parasite.org.au/awards/jd-smyth-postgraduate-travel-awards/>

ASP Events

Due to the outbreak of COVID-19, the 10th International Symposium for Fish Parasitology and Australian Society for Parasitology Annual Conference, Shangri-la Hotel in Cairns, Australia has been postponed to after 2022 <http://www.isfpx.org/> we will continue to monitor the COVID-19 outbreak and follow government advice with respect to running face-to-face events. We really hope that we will be able to enjoy face-to-face scientific exchanges in a beautiful part of the world in July 2022; we will keep ASP members up-to-date by email and on our website with any changes to our scheduled events.



Parasitravaganza 2021 – Please join us for an online Parasite Fest! Wednesday 23rd – Friday 25th June 2021. Our 2021 Annual Conference for the Australian Society for Parasitology will take place live and online and there will be prizes awarded for the best presentations by ASP member students and ASP member ECRs.

Registration and abstract submission will open shortly. Student and Early Career Researchers are invited to career development events so please add this event onto your registration. <https://www.parasite.org.au/conferences/parasitravaganza/>

We hope you have had a chance to be part of our online events and details of any future Facebook live events and Zoom seminars will be emailed to all members and posted on our website and social media pages. The next event in the ASP Climate-Focus seminar series is May 2021 and our ASP Outreach team will run some Art-Science events online in 2021, if you are interested in participating please email Lisa secretary@parasite.org.au

Researcher Grant News

Congratulations to ASP members and parasitologists who recently won grants:

Congratulations to Amanda Ash who recently won a grant of \$1.6M from ACIAR to support a multidisciplinary team from the Veterinary, Medical and Social science disciplines from both Australia and Laos.

Well done to all recent parasitology grant winners, please let me know if you have won a grant and we will include it in the next newsletter.

With best wishes,

Nick and Lisa

<https://www.youtube.com/user/ASPParasiteNetwork>
www.parasite.org.au
www.facebook.com/ASParasitology
www.twitter.com/AS_Para

Closing dates for ASP awards

ASP Fellowships
9 January 2021

ASP Researcher Exchange, Travel and Training Awards & JD Smyth
30 September 2021

John Frederick Adrian Sprent Prize
30 September 2022

Bancroft-Mackerras Medal for Excellence
30 September 2021

More information
www.parasite.org.au

State News

Queensland

Queensland Alliance for Agriculture and Food Innovation

Veterinary Parasitology Researchers Rocked at the 6th Animal Science Olympics Poster Event 2021!

Animal BioTICKnology and Ectoparasite team (lead by **Prof Ala Tabor** and Dr Peter James) at the Centre for Animal Science, Queensland Alliance for Agriculture and Food Innovation won multiple best poster awards at the 6th Animal Science Olympics Poster event organised by QAAFI at the University of Queensland. Professor Ala Tabor has been organizing this event since 2012.

Dr Ali Raza (Postdoctoral Research Fellow) won the Virbac 'Future Farming- New science that will benefit Animal Health award for his work on discovery of biomarkers for host resistance to cattle tick. **Emily Mantilla** (PhD Student) won the Beef central Best livestock genetics poster for her work on exploring gene expression in cattle exhibiting different levels of resistance to cattle tick. **Muhammad Kamran** (PhD Student) won the Meat & Livestock Australia Innovation for the red meat industry HDR award for his work looking into developing practical methods of phenotyping cattle for buffalo fly susceptibility.



Above: Dr Ali Raza (Postdoctoral Research Fellow) won the Virbac 'Future Farming- New science that will benefit Animal Health award

Below: Emily Mantilla (PhD Student) won the Beef central Best livestock genetics poster



Above: Muhammad Kamran (PhD Student) won the Meat & Livestock Australia Innovation for the red meat industry HDR award

South Australia

University of Adelaide

Dr Amy Burns was awarded her PhD in January 2020 and has moved to the Laboratory of Dr **Scott Lindner** (Pennsylvania State University).

Dr Ben Liffner was awarded his PhD in October 2020 and has moved to the Laboratory of Dr **Sabrina Absalon** (Indiana University).



State News continued

New South Wales Macquarie University

The parasite lab at Macquarie has undergone rapid growth in 2021.

Fiona McDougall completed her PhD investigating bacterial zoonoses in flying foxes late 2020 and has returned as post doc to examine antibiotic treatment of fire affected koalas and relationship to AMR in their microbiome (supported by the Morris Animal Foundation). Our ARC Discovery investigating possum personality and zoonoses has kicked off with **Anushika Herath** (Sydney University) spending time in the lab testing possum samples for protozoan parasites. **Joe Shin** has also joined us for a Master of Research project and has over 1000 citizen science possum samples to test for *Cryptosporidium*.

Speaking of Citizen Science the Scoop a Poop project has come to an end but the tools and concepts are being used in other areas of the groups research. **Nadine Samy** is also doing a Master of Research looking at antimicrobial stewardship in wildlife and the occurrence and diversity of AMR in in monotreme microbiomes.

Jeevi Mahalingam has also joined us to do a Master of Conservation project continuing the work on malarial parasites in flying foxes with Juliane Schaer from Humboldt University. **Mariel Fulham** (Sydney University postgrad in Rachael Gray's group Sydney University) is also based in the Power lab and is in the field for much of this year sampling Australian Sealions for her project) investigating how anthelmintic treatment for hookworm in pups impacts the microbiome and carriage of human-associated pathogens. We also have two undergraduate interns, **Isabella Alcorn and James Sammes**, who are learning molecular methods for detection of *Cryptosporidium* and Trypanosomes and generating DNA samples for pracs in the new medical science subject that **Michelle Power** is whipping up. Michelle has also been getting in the lab a bit to help train the growing group.

University of Sydney Laboratory of Veterinary Parasitology @ McMaster Building

As any other University and School, we are trying to reinvent ourselves and get back to what we can consider normal, more on the teaching side later! In the past few months, we have farewelled **Dr Nichola Calvani** who is now a postdoctoral fellow at the National University of Ireland, Galway with **Prof John Dalton's group**. Yes, you guessed it correctly, she keeps pursuing the fluke. But before we let Nichola go, we wrote a Trends in Parasitology article on hybridisation of fluke species and the suspected introgression:

Calvani NED, Šlapeta J. (2021) Fasciola species introgression: Just a fluke or something more? Trends Parasitol. 37(1):25-34 <https://doi.org/10.1016/j.pt.2020.09.008>

Shona Chandra submitted her PhD thesis at the very end of 2020. Her work has become of extreme value lately, because her study subjects brown dog tick have become the centre of the recent emergence of *Ehrlichia canis* that is vectored by brown dog ticks. The emergence of *E. canis* meant that everyone wanted to know the distribution of the tick and what is it genetically. Shona has answered both questions rigorously. Here is her map for those that ponder on that question too:

Right: Distribution in Australian as well as typical distribution on the dog of the brown dog tick.

Brown dog tick in Australia



* Brown dog tick (BDT) can be found anywhere as a stow-away on rehomed dogs or on dogs that returned from areas with BDT.

Chandra S, Ma GC, Burleigh A, Brown G, Norris JM, Ward MP, Emery D, Šlapeta J. (2020). The brown dog tick *Rhipicephalus sanguineus* sensu Roberts, 1965 across Australia: Morphological and molecular identification of *R. sanguineus* s.l. tropical lineage. Ticks Tick Borne Dis 11(1):101305. <https://dx.doi.org/10.1016/j.ttbdis.2019.101305>.

Our current PhD students **Emily Francis** and **Rose Power** are busy with their research projects.

On more of a diagnostic note that benefits our companions - dogs. **Jan Šlapeta** managed to swing an Angiostrongylus conference early in 2020 (probably one of the very last for some time) and travelled to Hawaii. There he teamed-up with **Will Sears** from NIH to bring a new diagnostic assay that Jan previously (famously) claimed cannot be true! However, within weeks he got it up and running in Sydney (regardless of COVID-19) checking the cross-reactivity with both of the Angiostrongylus species we have here in Australia. The assay exceeded Jan's expectations and now was used to diagnose all the dogs' CSF samples and support the clinical veterinary profession across the 2020 season and is already starting in the 2021 season.

Sears WJ, Qvarnstrom Y, Dahlstrom E, Snook K, Kaluna L, Baláž V, Feckova B, Šlapeta J, Modry D, Jarvi S, Nutman TB (2021). AcanR3990 qPCR: a novel, highly sensitive, bioinformatically-informed assay to detect Angiostrongylus cantonensis infections. Clin Infect Dis. <https://doi.org/10.1093/cid/ciaa1791>.

State News continued

Last but not least, the brown dog tick in Australia is now called *Rhipicephalus linnaei*. Review of the material and genetic identity led to resurrection of this name that was first used by the Napoleon's army scientist for a tick from Egypt. It is this tropical brown dog tick that we have here in Australia. You can read about it in the upcoming IJP issue:

Šlapeta J, Chandra S, Halliday B (2021). The "tropical lineage" of the brown dog tick *Rhipicephalus sanguineus* sensu lato identified as *Rhipicephalus linnaei* (Audouin, 1826). *Int J Parasitol.* <https://doi.org/10.1016/j.ijpara.2021.02.001>



Above: The Australian brown dog tick – *Rhipicephalus linnaei* (female)

Below: Dr Siobhon Egan, Australian National Phenome Centre, Murdoch Uni, WA



WA

Murdoch University
Ash Lab

Amanda Ash has recently obtained a research grant from ACIAR to continue her research in Laos on the zoonotic tapeworm *Taenia solium*. The grant of \$1.6M will support a multidisciplinary team from the Veterinary, Medical and Social science disciplines from both Australia and Laos. COVID related travel restrictions are creating significant challenges in getting an international project started but ZOOM is helping somewhat and with any luck we'll be back in the field soon!

Andrew Larkins (PhD candidate) has joined the *T. sol* team and will be researching best methods to conduct an "Economic Evaluation on a One Health program". Andrew is a vet with postgrad qualifications in One Health and veterinary epidemiology, so is well suited for the challenge.

Also linked to the Lao project, **Ash Peck** (Honours student) is finishing up her research investigating transmission pathways of *Ascaris* sp. between pigs, people and dogs within small holder farming communities in Laos.

In keeping with our wildlife parasitology interests **Claire Bowery** (Masters student) is close to finishing her investigation of *Demodex* sp. on the Dibbler, an endangered marsupial only found in two tiny pockets of WA, while **Atsu Ueda and Jennifer Kelly** are just both starting their honours projects looking at seabird parasite communities and Rufous hair-wallaby ectoparasites respectively.

Centre for Sustainable
Aquatic Ecosystems

Dr Storm Martin has been successful in obtaining an ABRS postdoc and will be joining the Sustainable Aquatic Ecosystems centre this year. Storm received his PhD

from the University of Queensland, working with **Tom Cribb**, and will continue his study of trematodes in tropical marine fishes, sampling principally from Ningaloo Reef.

We have a new PhD student, **Jack Ingelbecht**, who will be examining ectoparasite communities on sawfishes, wedgefishes and giant guitarfish in the north of Western Australia, as part of an ongoing project studying anthropogenic impacts on these endangered animals.

Our work on freshwater mussels continues apace, with an ongoing project funded by the Australia and Pacific Science Foundation on how mussels can improve water quality in farm dams, and a new project funded by the Water Corporation to survey mussel populations in Corporation assets such as drains and treatment plants. **Garry Ogston** will soon be starting a PhD as part of this project, and will be aiming to measure the filtration capacity of mussels and their role in reducing organic load in these waterbodies.

Australian National
Phenome Centre

Congratulations to **Siobhan Egan** who has been appointed as a Postdoctoral research fellow in the Centre for Computational and Systems Medicine, Australian National Phenome Centre at Murdoch University. This postdoctoral research fellow is part of Prof. Elaine Holmes ARC Laureate Fellowship – Understanding host-microbiome signalling axes in ageing. The aim of this project is to use metabolic phenotyping to define the ageing phenotype, and in particular, to perform deep phenotypic characterization of the impact of microbial metabolic signalling on physiological processes associated with ageing and to characterize and understand the role of gut microbiota in the physiology of ageing.

State News continued

Victoria

Walter & Eliza Hall Institute Jex Laboratory

Congratulations to PhD student, **Swapnil Tichkule**, from the Jex Laboratory at the Walter & Eliza Hall Institute who won 3rd place – “Finalist award” as an oral presentation in Infection, at Medicine Dentistry & Health Sciences (MDHS) graduate research conference in Melbourne in December 2020 held at The University of Melbourne. Swapnil also has a recent publication; "Comparative genomics revealed adaptive admixture in *Cryptosporidium hominis* in Africa."

Swapnil Tichkule, Aaron R. Jex et al. January 2021, *Microbial Genomics* <https://doi.org/10.1099/mgen.0.000493>

Congratulations to **Alex Lam** who completed his honours in the Jex lab at WEHI 2020 with a thesis entitled “Exploring a Novel Microbial Natural Product Library to Reveal Novel Anti-protistal Compounds”. Even more exciting, Alex was able to publish some of his honours work in his first publication in IJP:DDR in January (<https://doi.org/10.1016/j.ijpddr.2021.01.001>). Congratulations Alex, we are looking forward to seeing your research grow when you start your PhD in the Jex lab later in 2021!

Congratulations to **Balu Balan**, who has also had his first publication accepted in IJP in December!

The national “**ColoSSoS Project**” – **Collaboration on Sewage Surveillance of SARS-COV-2** – is approaching its first anniversary since starting in April 2020. Throughout this time the **Jex Lab (Dr Nijoy John, Dr Louise Baker, led by A/Prof Aaron Jex)** have been contributing to the ColoSSoS CoVID wastewater monitoring program, which was recently awarded



Above: From left, Aaron Jex, Louise Baker, Brett Sutton (Victorian Chief Health Officer), Nijoy John.

the Victorian Research and Development Excellence Award for 2020 from the Australian Waterworks Association, and is a finalist for the National Research and Development Excellence Award to be announced in April, 2021. On the 22nd of March on World Water Day they attended an event held by the Department of Health to acknowledge and celebrate the work and awards achieved by the ColoSSus group. During this event Aaron gave a presentation and they met the Victorian CHO Brett Sutton (pictured) and Minister for Health Martin Foley (MP).

University of Melbourne

Mr. Abdul Ghafar has completed his PhD in Veterinary Parasitology (Jan 2020) from the Melbourne Veterinary School, University of Melbourne, Werribee, under the supervision of **A/Prof. Abdul Jabbar** and **Prof. Robin B. Gasser**. During his PhD, AG has employed various high-throughput

techniques (including Next-Generation Sequencing and Microfluidics) as well as tools of participatory epidemiology to investigate the genetic diversity and spatial epidemiology of ticks and tick-borne pathogens of ruminants in different agro-ecological zones of Pakistan. Here are some of publications from his thesis:

1. Ghafar A, Cabezas-Cruz A, Galon C, Obregon D, Gasser RB, Moutailler S, Jabbar A. Bovine ticks harbour a diverse array of microorganisms in Pakistan. *Parasites & Vectors*, 2020, 13(1), 1.
2. Ghafar A, Gasser RB, Rashid MI, Ghafoor A, Jabbar A. Exploring the prevalence and diversity of bovine ticks in five agro-ecological zones of Pakistan using phenetic and genetic tools. *Ticks and Tick-borne Diseases*, 11 (5), 101472.
3. Ghafar A, McGill D, Stevenson MA, Badar M, Kumbher A, Warriach HM, Gasser RB, Jabbar A. A participatory investigation of bovine health and production issues in Pakistan. *Frontiers in Veterinary Science*, 2020, 7, 248.
4. Ghafar A, Abbas T, Rehman A, Sandhu ZU, Cabezas-Cruz A, Jabbar A. Systematic review of ticks and tick-borne

State News continued

pathogens of small ruminants in Pakistan. *Pathogens*. 2020, 9, 937.

5. Ghafar A, Khan A, Cabezas-Cruz A, Gauci CG, Niaz S, Ayaz S, Mateos-Hernández L, Galon C, Nasreen N, Moutailler S, Gasser RB, Jabbar A. An assessment of the molecular diversity of ticks and tick-borne microorganisms of small ruminants in Pakistan. *Microorganisms*, 2020, 8, 1428.

6. Ghafar A, Koehler AV, Hall RS, Gauci CG, Gasser RB, Jabbar A. Targeted Next-Generation sequencing, and informatics as an effective tool to establish the composition of bovine piroplasm populations in endemic regions. *Microorganisms*. 2021, 9, 21.

Burnet Institute Gilson/Crabb lab

Brendan Crabb received an NHMRC Investigator Grant for Therapeutically targeting the malaria pathogenesis, specifically for the discovery of drugs that block parasites from proliferating in and modifying their human red blood cell hosts.

Paul Gilson received Ideas Grant in collaboration with WEHI to develop new anti-malarial drugs that block parasite invasion. His laboratory has identified new candidate drugs that block parasite invasion and is now screening for mechanisms of action to further develop these drugs as anti-malarials. CIB is William Nguyen and Associate Investigators include: **Brad Sleebs, Tania de Koning-Ward, Wai-Hong Tham, Darren Creek, Alyssa Barry and Danny Wilson.**

Hayley Bullen received Ideas Grant in collaboration with WEHI to discover how a novel anti-malarial drug series (termed WEBs) rapidly kills parasites and to determine their mechanism of actions. CIB is Trent Ashton and associate Investigators include: **Paul Gilson, Brad Sleebs and Wai-Hong Tham.**

Coralie Boulet has started a new job at the Burnet in the Gilson/Crabb lab. She will

be continuing on work done by Madeline Dans, who screened the Pathogen Box of Medicines for Malaria Venture (MMV) for egress and invasion inhibitors of *P. falciparum* with the aim to understand the mode of actions of some lead compounds. Coralie has also recently published a paper: <https://www.frontiersin.org/articles/10.3389/fcimb.2021.630812> "Eryptosis and Malaria: New Experimental Guidelines and Re-Evaluation of the Antimalarial Potential of Eryptosis Inducers", Coralie Boulet, Taylah Gaynor and Teresa Carvalho.

ACT

Australian National University

PhD awarded

Congratulations to **Sarah Shafik** (Martin lab, Research School of Biology) who was awarded her PhD in January for a thesis entitled: "Exploring the substrate specificity of the malaria parasite's chloroquine resistance transporter". During the course of her thesis, Sarah has published as many as 11 journal articles, including a first author Nature Communications paper.



Well done on some impressive work Sarah and best of luck with your next steps!

Welcome

Di Barton has moved to Canberra from CSU, Wagga (where she is maintaining her contacts via **Shokoofeh Shamsi** and **David Jenkins** and a stable of Honours and PhD students) and has obtained a Visiting Fellow position at ANU in the **Maier Lab** – although she will be spending the majority of her time in the dungeons, with her bits of various smelly animals in her eternal search for all things wormy.

Let's talk about a green lab.

In December 2020, **Soraya Zwahlen**, an honours student in the van Dooren Lab, started a conversation about greening the labs at the Research School of Biology (RSB-ANU). She was inspired by the "Sustainability in the Lab" seminar organised by the ASP Climate-Focus group. During the workshop, the biologists brainstormed how to reduce energy consumption and waste production at RSB, and came up with some simple but effective ideas, such as a 'traffic light' sticker system to encourage researchers to turn off unused equipment.



Above: Green lab presentation Left: Sarah Shafik, Research School of Biology, ANU

State News continued

Publications:

The **Maier lab** recently had a paper published in PLoS Pathogens. It looks at how the presence and metabolism of *P. falciparum* parasites inside red blood cells can collapse membrane asymmetry, exposing the lipid phosphatidylserine, and ultimately leading to phagocytosis by monocytes.

Fraser M, Jing W, Bröer S, Kurth F, Sander L-E, Matuschewski K, et al. (2021). Breakdown in membrane asymmetry regulation leads to monocyte recognition of *P. falciparum* infected red blood cells. PLoS Pathog 17(2):e1009259. <https://doi.org/10.1371/journal.ppat.1009259>

A PLoS Pathogens paper was also recently published by the **van Dooren Lab**. The paper used a proteomics approach to identify protein subunits of the *Toxoplasma gondii* mitochondrial electron transport chain Complex III, a common target of anti-parasitic drugs such as atovaquone, and found that an apicomplexan-specific subunit was critical for Complex III function.

Hayward JA, Rajendran E, Zwahlen SM, Faou P, van Dooren GG. Divergent features of the coenzyme Q:cytochrome c oxidoreductase complex in *Toxoplasma gondii* parasites. PLoS Pathog. 2021 Feb 1;17(2):e1009211. <https://doi.org/10.1371/journal.ppat.1009211>

Christina Spry, Erick Tjhin, Vanessa Howieson and Kevin Saliba (all current/former **Saliba lab** members, Research School of Biology), together with Lora Starrs and **Gaetan Burgio (Burgio lab, John Curtin School of Medical Research)** and collaborators at McGill University in Canada, have published an article in the Journal of Medicinal Chemistry. The paper describes their recent efforts toward developing analogues of vitamin B5 that kill malaria parasites by interfering with utilisation of the vitamin, that are also stable in human serum.

Guan J, Spry C, Tjhin ET, Yang P, Kittikool T, Howieson VM, Ling H, Starrs L, Duncan D,

Burgio G, Saliba KJ and Auclair K. Exploring heteroaromatic rings as a replacement for the labile amide of antiplasmodial pantothenamides. Journal of Medicinal Chemistry.

University of Tasmania

Researchers in Tasmania have recently published captive trials for assessing fluralaner as a new drug to treat wombats for sarcoptic mange (see link below). Results show a single dose can cure wombats of mange and offer long-lasting protection from infection, relative to other parasiticides that are used. Field trials are now commencing to investigate capacity to control sarcoptic mange in wombat populations from Tasmania and NSW. The picture shows a wombat being monitored under anaesthesia while students collect a range of information on its health and disease status.

<https://parasitesandvectors.biomedcentral.com/articles/10.1186/s13071-020-04500-9>



Like other researchers PhD students have been affected by the pandemic. **Petra Quezada Rodriguez** spent time working from home instead of travelling to Ireland to work on experiments with salmon. Fortunately, the collaborators could run the experiments planned for Petra in Ireland and have now sent all the samples so Petra can now analyse them as she has been back in the lab for some time. COVID changed directions of Em (Khattapan Jantawongsri) PhD project, instead of doing field work in Greenland in 2020 he has been analysing archival fish samples. All PhD students showed a lot of initiative and enthusiasm to make sure their projects could continue successfully despite all the restrictions.

Above: PhD student Petra Quezada Rodriguez

Left: A wombat being monitored under anaesthesia while University of Tasmania students collect a range of information on its health and disease status



Events and Jobs in Parasitology

On the Origin of Faeces

Pictured: Alanta hunts for the origin of faeces. Yes, Alanta got in a real drain for this shoot. Photograph: Sarah Walker

On the Origin of Faeces is a scientific and comedic investigation into the excellent world of excrement and gut bacteria.

How do astronauts poo in space? Did Ancient cultures worship poo? What lurks in a gut microbiome? The answers lie within.

Alanta spent her 20s working in sanitation, inspecting Ugandan drop toilets. If one stares into a latrine for long enough, the latrine starts to stare back into you. Alanta was left with more questions than answers. What makes a healthy poo? Do our gut feelings account for more of what we do than we give them credit for? Forget Elon Musk and his lust for space; is the microbiome the final frontier of human discovery?

This is a real s*&t show. Join science comedian Alanta Colley for a festival of effluvia; exploring how gut bacteria makes us who we are, and how we feel about poo. So grab a stool and join us for a diarreally good time.

Show Details: [On the Origin of Faeces](#)

Dates: March 29 to April 4.

Time: 7pm

Cost: \$28 - \$35

Venue: The Butterfly Club, 5 Carson Place, Melbourne

Tickets: <https://www.comedyfestival.com.au/2021/shows/on-the-origin-of->



Helminth Bioinformatics Virtual Course - Asia edition

Applications are still open for our next Helminth Bioinformatics Virtual Course - Asia edition - to take place from the 28th June to the 2nd of July. This course is aimed at early career researchers from the Asia region but other application may be considered.

<https://coursesandconferences.wellcomegenomecampus.org/our-events/helminth-bioinformatics-2021/>

Due to the current ongoing Covid-19 pandemic, this course will be in virtual format this year.

The course content covers hands-on training in:

- The WormBase ParaSite database
- IGV/JBrowse genome browsers
- Variant calling
- Differential gene expression
- Unix/Linux command-line
- Introduction to R

Jobs in Parasitology

Check out the latest jobs in parasitology <https://www.parasite.org.au/jobs/>

Parasitology Diagnostic Laboratory in the Department of Veterinary Pathobiology, College of Veterinary Medicine & Biomedical Sciences at Texas A&M University are looking for a research associate/lab technician. The work will focus on classical and molecular parasitology, and mainly focus on helminths. Initially, this is a two-year position, with possible extension. https://tamus.wd1.myworkdayjobs.com/TAMU_External/job/College-Station-TAMU/Research-Associate_R-036293

Post-doctoral Fellow – Smith Lab "Endothelial Dysfunction and Malaria". The Center for Global Infectious Disease Research at Seattle Children's Research Institute is recruiting a Postdoctoral Scientist to conduct research investigating vascular dysfunction in cerebral malaria (<https://www.seattlechildrens.org/research/centers-programs/global-infectious-disease-research/research-areas-and-labs/smith-lab/>). See <https://www.parasite.org.au/jobs/> for more details.

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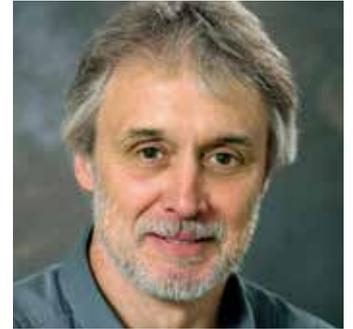
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