CONSERVATION MICROBIAL ECOLOGY IN TRANSITION: REFLECTIONS FROM THE WISSENSCHAFTSKOLLEG

ASHLEY DUNGAN

Dr. Ashley Dungan is a conservation microbial ecologist whose research explores how host-microbiome interactions shape wildlife health, resilience, and survival. She leads an interdisciplinary program at the University of Melbourne, developing microbiome-informed strategies to support the conservation and reintroduction of threatened marsupials, having previously pioneered approaches for coral and aquatic systems. Ashley's work combines field ecology, genomics, and microbiome engineering, with a record of competitive funding and publications in leading journals such as *ISME Journal* and *Trends in Microbiology*. Her career bridges continents, from the Florida Keys to the Great Barrier Reef and now Berlin, reflecting a commitment to tackling biodiversity loss on global scales. Deeply engaged in teaching and mentoring, she has trained students across biology and bioinformatics and is active in international societies advancing microbial ecology, equity in STEM, and early-career leadership. – Address: School of BioSciences, The University of Melbourne, Grattan Street, 3010 Parkville, Australia. E-mail: ashley.dungan@unimelb.edu.au.

During my four-month fellowship in the College for Life Sciences, I set out with three ambitions: to expand my academic network, to secure my next academic position, and to step back to reflect deeply on my field. Despite personal challenges—including the discovery that I was pregnant with my first child—I was fortunate to make meaningful progress on all fronts.

Expanding academic network:
Interdisciplinary engagement can be daunting in practice, but two key events—the Berlin Reception and my Colloquium—proved invaluable. Specifically, during the Berlin

Reception, I was introduced to Prof. Mitja Remus-Emsermann, a microbiologist and Professor at Freie Universität. In email exchanges, Prof. Remus-Emsermann introduced me to other scientists, and I later went on to give a seminar to a broad ecology audience at Freie Universität on 18 December 2024 titled "Microbial rewilding—a viable option for advancing conservation outcomes?"

My Colloquium, wisely shaped by Jana's suggestion to invite external participants, was attended by researchers from the Leibniz Institute for Zoo and Wildlife Research, including former Fellow Dr. Alexandre Courtiol, Dr. Gábor Czirják (wildlife immunology), and Dr. Kristin Mühldorfer (wildlife disease microbiology). This exchange sparked a collaboration with Dr. Czirják, and together we are now co-authoring a review on One Health perspectives of marsupial immunity and microbiome interventions.

Prior to coming to the Wissenschaftskolleg, I aspired to run a workshop, bringing in an interdisciplinary network of scientists to discuss microbial rewilding. Being pregnant and needing to leave a month early threw a big wrench into those plans coming to fruition. However, the spreadsheets and contacts I had made during my time in Berlin will be an asset for running something similar in collaboration with the Melbourne Biodiversity Institute in my new role.

Finding my next academic role:

Prior to coming to the Wissenschaftskolleg, I was employed as a consultant for the Australian Institute of Marine Science. It was a great opportunity, but it did not include any wet or dry lab research, student mentoring/supervision, or opportunities to give talks/seminars or contribute to peer-reviewed manuscripts. Given that the Wissenschaftskolleg fellowship was only for a few months and I was pregnant, this was an urgent task for me. I had initially applied for a few permanent lecturer roles where the focus was on teaching biology. I used the network within the Wissenschaftskolleg, specifically Fellow Prof. Margaret McFall-Ngai, to review my application documents but was unfortunately unsuccessful. I spent much of October working on an application to The University of Melbourne Excellence in Diversity—Gender Equity in STEM Fellowship where, if awarded, I would be able to lead my own independent research under the guidance of a senior academic. For this application I leaned hard into the support of the Fellows and received feedback from Kärin Nickelsen, Sara Magalhães, Mariana Gómez-Schiavon, and Rachel Gregor. In a surprisingly quick turnaround, it was announced that I was the sole recipient of this fellowship and could begin early the following year. Here is the project abstract:

Australia reports the highest mammalian extinction rate on Earth. An estimated 10% of endemic mammal species have become extinct over the past 200 years and, given that ~21% of extant Australian mammals are now assessed as threatened, without substantial intervention, further extinctions are likely in coming decades. Management plans for threatened species traditionally include the maintenance of captive populations. It is challenging to provide a true native diet to captive animals; this is particularly apparent in carnivorous and omnivorous species, where the supply of natural and diverse diets in an artificial setting is often restricted. This diet alteration can lead to changes in the gut microbiota: the often complex and diverse community of commensal bacteria resident in the gastrointestinal tracts of their animal hosts. As well as playing a crucial role in the digestion of food, studies from humans and model laboratory animals highlight the benefits of gut microbiota on host behaviour and fitness.

The gut microbiome of native Australian marsupials is largely unstudied but is the topic of my proposed innovative project. Using a model marsupial, the fat-tailed dunnart (*Sminthopsis crassicaudata*), I aim to understand how diet and the gut microbiome can impact overall fitness in a vulnerable marsupial species.

As mentioned above, because of my new relationship with Dr. Gábor Czirják, I was able to add a new component to this project and document how diet and microbiome composition impact host immunity. This novel addition was funded by a grant from the Applied Microbiology International Sustainable Microbiology Novel Research Grant (awarded May 2025). I feel confident that my success in being awarded the two-year fellowship and this research grant is due in part to my position as a Fellow at the Wissenschaftskolleg. I began the new fellowship at The University of Melbourne in early February 2025, but was only in the position for two months before going on parental leave.

Time to think:

The most distinctive gift of the Wissenschaftskolleg was time—time to read, reflect, and write without interruption. I read far more literature than I ever could in my usual academic routine, often 10–15 papers a week. From this immersion, I drafted two reviews: one providing a broad synthesis of conservation microbial ecology and the potential of

microbiome engineering to enhance animal health and conservation outcomes, and another, in collaboration with Dr. Czirják, focused on the unique immunological development of marsupials and its implications for microbiome interventions. The latter is critical for my research, as marsupials experience early-life immune development profoundly different from that of placental mammals. These reviews will shape the conceptual foundation of my research going forward.

Final thoughts:
I arrived at the Wissenschaftskolleg in early September, having found out just a few days prior that I was pregnant with my first child. It was a challenge on so many levels. Being without my partner and friends in a new place where I didn't speak the native language. Being a woman in STEM where there is still a stigma around having children—those who do have children seem to have to work twice as hard, as if there is something to prove. Having previously had a miscarriage and being worried that it would happen again. I found myself not only experiencing the traditional symptoms of first-trimester pregnancy, but quite depressed and struggling to build relationships with Fellows that would have otherwise come easily to me. I am particularly thankful to Vera, Jana, and Mariana for being so supportive and always checking in on me. It was also quite the relief to get past the 12-week mark and feel comfortable sharing the news of my pregnancy with the larger group. My daughter, Violet, is the greatest gift and I feel very fortunate that I was able to have that time at the Wissenschaftskolleg to grow professionally but also rest when I needed to.

There are a few parts of life in the Kolleg that I think could have been altered to improve my overall experience. To start, having my office in the same place as my apartment/bedroom was challenging. Other than for meals, I wasn't really going to the main building and interacting with other Fellows as often as I should have. It also made separating work and rest tricky. I also never felt a huge camaraderie with the other College for Life Sciences Fellows. I wish there would have been more group activities early on for the five of us together or focused time when we would have met each week to discover where our research or interests overlapped.

My time at the Wissenschaftskolleg was transformative. I left Berlin with new collaborations, a prestigious fellowship, and clarity about the future directions of my research. Balancing professional ambition with the realities of motherhood will remain a challenge, but my experience at the Kolleg has given me both the confidence and the perspective to embrace this next stage of life and career.