



NEW IDEAS, NEW DIRECTIONS,
CUTTING-EDGE SCIENCE
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Devi Stuart-Fox is an Associate Professor at the School of Biosciences at the University of Melbourne, Australia. Her research focuses on the evolution of animal colouration and colour change, and she has published extensively on macro-evolutionary patterns of diversity in animal colouration, mechanisms and function of colour change, and the evolution of colour polymorphism. She has worked on a wide variety of species in different parts of the world, including chameleons in South Africa, gliding lizards in Malaysia, numerous species across Australia, and most recently, colour-changing lizards in India. Stuart-Fox obtained her Ph.D. at the University of Queensland, Australia in 2003 before spending four years at the University of the Witwatersrand in South Africa pursuing postdoctoral research on colour change in chameleons. She was an Australian Research Council Postdoctoral Fellow from 2007–2009 and an Australian Research Fellow from 2010–2015. She won the L'Oréal-UNESCO “In the footsteps of Marie Curie” Special Fellowship for 2013. – Address: School of Biosciences, Royal Parade, bldg. Biosciences 4, The University of Melbourne, Victoria 3010, Australia.
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The pace of progress in science is rapid – new discoveries constantly change our ideas about how the world works and about the exciting questions that need to be answered in our disciplines. It is imperative that scientists keep abreast of new developments and new technologies in their fields, but often this is challenging because of the demands of our professional and personal lives. My five-month Fellowship at the Wissenschaftskolleg provided one thing that I valued above all others: the opportunity to learn. And what I

learnt has imbued me with enormous energy and excitement about the promise and potential of research in my field: explaining the diversity and adaptive significance of colour in nature.

I was fortunate to be invited to participate in a focus group on animal colouration at the Wissenschaftskolleg in 2015/2016. I wrote a research proposal for a five-month fellowship almost two years before I arrived in Berlin. By the time I arrived, my ideas had changed direction, and by the time I left, my ideas had matured and developed in a way that will shape my research program for several years to come.

The Wiko enabled me to learn both from other Fellows and from my own research. I learnt a great deal about animal vision and visual physiology from Daniel Osorio: what we do and do not know about how animals perceive colour (at the levels of photoreceptors in the eye and of cognition) and how this influences their decisions. From Innes Cuthill I learnt about the challenges of understanding how animals perceive patterns and entire visual scenes. From Tim Caro, I learnt about the historical foundations of our discipline and to never lose sight of ecological context. From Cassie Stoddard, I learned about new approaches to quantifying colour patterns, drawing on machine-learning algorithms. All these people I now consider personal and intellectual mentors and friends, thanks to my time at Wiko.

My time at Wiko also catalysed and consolidated my increasing interest in the adaptive significance of near-infrared reflectance in animals. The near-infrared cannot be seen by any animal that we know of, but it comprises more than half of the radiant energy in direct sunlight hitting an animal's surface. How skin, fur, feathers, and scales reflect near-infrared light influences their heat load and how they regulate body temperature. And yet we have almost no empirical data on variation in near-infrared reflectance for any animal group. Colouration research has focussed almost exclusively on visible colour (including colours invisible to humans but visible to other animals). The near-infrared part of the spectrum of sunlight has been largely ignored. This is the knowledge gap I plan to redress, both through opinion pieces highlighting the potential importance of near-infrared and through empirical data using near-infrared photography and spectrometry. This is also the area of research I focussed on while at Wiko. The time to learn at Wiko was critical, because understanding the causes and consequences of near-infrared reflectance required me to delve into entirely different disciplines, particularly biophysics.

A highlight of my time at Wiko was the Animal Colouration Workshop in May 2016. This workshop was attended by 25 of the top international researchers in the field – a

“who’s who” of animal colouration research. The attendance was remarkable because the workshop was linked to a special issue on animal colouration, to be published in *Philosophical Transactions of the Royal Society*, also an outcome of the Wiko Focus Group. Those who attended the workshop are all contributing to this special issue. We had the opportunity to “brainstorm” on the structure of the two-day workshop amongst the Wiko Animal Colouration Fellows, and we decided on a rather radical structure: to limit talks to ten minutes each, with all talks on the first day, and to devote the second day to breaking into themed sub-groups, each of which was tasked with writing a section of a major review. Remarkably, we achieved this ambitious goal, and before the second day was over, we had a working draft of a manuscript. We have strong hopes that this review will be published in a major scientific journal and reach a wide audience. This would not have been possible without the support of the Wiko and its wonderful staff.

The review and workshop structure were inspired by weekly conversations among the Animal Colouration Fellows at the “Floh”, near Grunewald station. Lubricated with good German beer, we discussed the “big questions” of our discipline. Why is animal colouration an important field of research? Why NOW in particular? How is our field being transformed by advances other disciplines? What can animal colouration research contribute in other disciplines? How is this field of inquiry relevant to society more broadly? These are the questions we are addressing through the special issue and review.

A Fellowship at Wiko is a remarkable privilege. I am keenly aware of that privilege. Such an institution, motivated by the altruistic goal of contributing to human knowledge, with no expectation of immediate financial return, is globally rare and, to my knowledge, non-existent in my home country, Australia. With privilege comes a responsibility to “give back” to the society that has generously supported us. And so I ask myself regularly how my research contributes to society. My research does not aim to solve a specific human or environmental problem. My research is driven by fundamental curiosity about the natural world, its beauty and diversity. I hope to increase people’s awareness of the science behind that beauty and diversity, and by doing so, convince them of its intrinsic value to humanity.

I only have one regret about my time at Wiko: five months were not long enough. I wish I had stayed for the full year. I am a mid-career researcher and celebrated my 40th birthday while in Berlin. I am looking forward to the next 20 years of my research career. I hope that, during that time, I have another opportunity for learning, re-energising, and rejuvenation like the one I had the privilege of experiencing at Wiko.