



108 DAYS IN BERLIN
ROWAN D. H. BARRETT

I am the Canada Research Chair of Biodiversity Science at McGill University. My work is motivated by a desire to understand the genetic basis of adaptation to changing environments. My research bridges theoretical and empirical approaches in population genetics, evolutionary ecology, and molecular biology to ask questions about the reciprocal interactions between ecological and evolutionary processes, and the mechanisms by which these forces impact genomic variation in natural populations. I have pursued this research program with a variety of key study systems, including stickleback fish, deer mice, and microbes. – Address: Redpath Museum, McGill University, 859 Sherbooke Street West, Montreal, H3A 2K6, Canada. E-mail: rowan.barrett@mcgill.ca; website: barrettlab.ca

I don't keep a written diary, and having failed to follow the advice of experienced Wiko staff to write my yearbook report immediately after concluding my 108-day stay last fall, I found myself struggling to recall precise memories eight months, two international moves, and a new job after leaving Berlin. Fortunately, I do keep an excellent visual diary in the form of my Flickr website (www.flickr.com/photos/rowan_barrett/collections/72157632137524018/)! As I clicked through this digital tapestry I became deeply nostalgic about my time at Wiko and the wonderful city of Berlin. It all came flooding back so quickly! From the nervous excitement of the first forays across the city to Friedrichshain to the bittersweet goodbyes at the *Weißwurstfrühstück* and Villa Walther cocktail crawl, the time could not have been more full or more diverse.

If I could only pick one point of advice to give future Fellows, it is to bring, buy, or borrow a bike for your stay. My wife, Naomi, and I brought our bikes along with us and

these became our passports to explore the city with absolute freedom from train and bus routes or schedules. Berlin is a fantastically bike-friendly city, and this is by far the best way to experience your new home. Just a few scattered highlights from our ever-expanding adventures around the city: spooky relicts of the Cold War adorned with graffiti on Teufelsberg, a cacophony of sounds in the most unlikely of places during the musical festival at Tempelhof Airport, riots of color and smell at the Turkish market, athletic prowess on the pitch and spilled beer in the stands during soccer matches at the Olympic Stadium, smoky air and thudding beats at subterranean night clubs in Kreuzberg, retro treasures amongst the junk and performers at Mauerpark, fantastical art pieces nestled among the office towers in Charlottenburg, snow-blanketed trails crunching under bike tires while cycling in Grunewald Park, opulent architecture in Potsdam, sifting through vintage clothes for sale inside an old shipping container in Prenzlauer Berg, the profound competing for space with the mundane at Art Berlin Contemporary, botanical fireworks at the *Flohmarkt*, austere Soviet monuments in Treptower Park, fiery carpets of yellow and orange leaves along the Hasensprung, and dazzlingly creative street art peering down from walls along the Spree. Every week brings a new surprise in Berlin, and as wonderful as the Wissenschaftskolleg is, excursions out of the Western side of the city are always rewarding!

Ah, and the work? Yes, there was plenty of that too. Being away from my lab bench at Harvard, and also being unable to do my usual field trips to study mice in Nebraska, meant that I could focus on a few key objectives. A large goal for the semester was to write a series of grant proposals that would be instrumental in helping me set up my new lab at McGill University, where I would be starting my first faculty position in a year's time. During September and October I managed to write applications for a Canada Research Chair, a Canada Foundation for Innovation grant, a National Science and Engineering Research Council Discovery grant, and a National Science and Engineering Research Council Research Tools and Infrastructure grant. I am happy to report that these applications were successful, and as I sit here in Montreal a year later I am busy putting the funds to good use and getting my first students set up with their research projects. In November and December I turned to analysis of a large-scale genomics dataset that I had generated from the previous year's field and molecular efforts, and also worked on two manuscripts. The first investigated the genetic basis of adaptive pigmentation in deer mice and has since been published in *Science*. This paper focuses on a classic story of adaptation – rapid evolution of pigmentation of mice inhabiting the Nebraska Sand Hills –

first described by natural historians in the 1940s. In previous work, my colleagues showed that changes in gene expression at a major effect locus (*Agouti signaling protein*) could lead to an overall lighter coat color in mice. In this new paper we dissect the major-effect *Agouti* locus to show, quite surprisingly, that this gene fractionates into multiple smaller-effect mutations, each with a specific effect on pigmentation (e.g., dorsal versus ventral hair color) and showing strong evidence of having been favored by natural selection in the past. The work highlights the extraordinary fine-tuning of genetic and phenotypic variation possible during adaptation and demonstrates the importance of going beyond gene-level resolution to understand the specific mutations implicated in adaptive evolutionary changes. In particular, lighter-colored mice do not evolve through a single change in a gene that simultaneously changes multiple pigmentation traits. Instead, distinct mutations have very precise effects on different aspects of coat color, and together these different changes are assembled through evolution to lead to lighter-colored mouse populations. The second paper investigated the role of molecular plasticity in the temperature tolerance of fish and is currently in review at *Evolution*. We show how temperature-dependent gene expression has been important for allowing marine sticklebacks to colonize freshwater environments, and thereby demonstrate the importance of molecular plasticity in facilitating adaptation to novel environments. In November I also gave talks at the Leibniz Institute of Freshwater Ecology and Inland Fisheries (and enjoyed my bike ride across Berlin to the banks of the Müggelsee, where the institute is located) and at the Institute of Biology at the University of Basel in Switzerland (combined with a quick side trip to the Alps to play in the mountains!).

Throughout all of these months I also participated in the Evolution Discussion Group with a number of other Fellows. This weekly meeting served as an excellent opportunity for us to read a diverse range of papers and learn from each other's different expertise on the topics. I found it very helpful to have a number of non-evolutionary biologists as participants, who expertly forced the rest of us to question (or at least better explain!) many of our deeply held assumptions about various evolutionary principles. This interdisciplinary boiling pot is of course a *raison d'être* of the institute and reflects the simple brilliance of the Wiko endeavor. Bring a group of intellectually curious and extremely diverse people together, place very few restrictions on their time, and let things evolve! Naturally, there can be difficulties in communication when individuals used to being immersed in their own disciplines are forced to try to explain their work to people in wildly different fields, but this is part of the fun, and always an interesting challenge!

I especially enjoyed this opportunity for intellectual exchange with Fellows from the humanities, whose thoroughly alien ways of doing all things academic continually surprised, frustrated, and excited me. I certainly don't think I'll ever hear another talk focused on the elbow of a single sculpture from the Italian Renaissance! Of course, the broader implications of the talk were more profound, and involved the concept of self-referentialism in art. It took some reflection to appreciate that, to the uninitiated, one of my talks could equally be viewed as being solely focused on just a few populations of a single species of little fish! I will always treasure the relationships I developed with Wiko Fellows of all academic stripes, and I remain thankful to the flawless group of professionals working at Wiko to make our lives so easy during those transplanted months. If any of you have the opportunity to pass through Montreal, please contact Naomi and me so that we can try to recreate the collegiality of the Wiko dining room!