



NOW, THIS IS A STORY ALL ABOUT HOW
MY LIFE GOT FLIPPED, TURNED
UPSIDE DOWN...
MAROŠ PLEŠKA

Maroš Pleška is a research fellow at the Rockefeller University in New York. He completed his undergraduate studies in Bratislava, Slovakia, where he studied molecular biology. His PhD work at the Institute of Science and Technology Austria focused on the biology of restriction-modification systems, which are considered a primitive form of prokaryotic innate immunity. As a postdoctoral researcher in the Laboratory of Living Matter at the Rockefeller University, he developed novel experimental and theoretical approaches to study the behavior of microorganisms at an unprecedented scale and resolution. His primary interest, which he also pursued as a College for Life Sciences Fellow at the Wissenschaftskolleg, is in understanding the role of individual-level variability in population-level processes, both in the context of microbial populations and in populations of higher organisms. – Address: Laboratory of Living Matter, Rockefeller University, 1230 York Ave, New York, NY 10065, USA. E-mail: mpleska@rockefeller.edu.

As a nineties kid, I used to watch a lot of television. In the opening credits to one of my favorite TV shows called *The Fresh Prince*, young Will Smith, playing a street-smart teenager from West Philadelphia, slams the door of a taxi to find himself in front of his new home, a beautiful mansion in Bel Air, Los Angeles – a rich neighborhood studded with large luxurious villas. I have not thought about the show for a long time, but I was strongly reminded of the scene once I managed to escape the busy streets of New York City to find myself standing with a large suitcase at the doorstep of Villa Linde, a stately old house conveniently located in what appeared (and later proved) to be one of the fancier districts of Berlin. For young Will, adjusting to the new environment was difficult and

his struggles were the central focus of the TV show. For me, the transition was less dramatic, even though it did involve a few ups and downs.

To begin with, due to a combination of logistic, professional, and personal constraints, I had the honor to be the last arriving Fellow, joining the program only in March 2023, approximately six months after everyone else had jumped aboard. Therefore, I was welcomed by an astoundingly heterogeneous group of circa forty people and their partners, all of whom seemed to know each other very well and were thus eager to get to know a newcomer. In contrast, I as that newcomer knew very little about the composition of this remarkable assembly and the dynamics within it. As a person who is easily socially overwhelmed, it would be a big understatement to say that I was socially overwhelmed. I was not discouraged though, and day by day, or should I say lunch by lunch, I had the pleasure of meeting and getting to know almost everyone (I do remember introducing myself to a few people at the goodbye party, though). The effort definitely paid off and if I had to pick one aspect that made my Wiko experience memorable, it would certainly be the diverse mixture of interesting characters and unique personalities, all working, playing, and laughing in unison.

While the timeframe of my fellowship at Wiko was constrained by a multitude of predominantly external factors, circumstances luckily arranged it such that it happened at the best possible time. Or, better said, at the time when I needed it the most. Before my departure to Berlin, I was swamped with personal, family, and personal struggles. I had projects to finish, job applications to submit, interviews to conduct, a lab-space to clean out, all of this while raising three small kids in the hectic city of New York, which is known to offer many opportunities, but little time to relax. The environment I found in Berlin was pretty much the opposite and therefore almost exactly what I needed. Ahead of me were four months of barely any obligations and distractions other than the beautiful lakes inviting me to take a swim and a large forest to explore. To make things even better, a delicious lunch (and even more delicious breakfast!) was served every day so that I could spend most of my time thinking about my current work and future plans, undistracted from such trivial things as nutritional needs. Indeed, the official slogan of the College for Life Sciences program that convinced me to apply was: "Gain Time to Think!" In retrospect I can certify that the slogan was fitting, and time to think, which seems to be an increasingly valuable commodity in academic research, was offered in abundance, together with all the spectacular meals.

So, what did I do with all that time? Most importantly, I made significant progress in my research project, which I embarked on just a few months before leaving for Berlin

and which I am currently very excited about. The aim of the project is to bridge the behavioral and physiological timescale of individual organisms to the ecological timescale of populations in order to quantify the extent to which individual-level variations affect population-level dynamics. Put simply, I aim to quantify how much variation between individuals within a group matters once we zoom out and observe whole populations instead. Microorganisms, which are the main object of my scientific interest, are a good model organism for this sort of a study, since their small size and short generation times make it possible to capture the behavior and physiology of hundreds of individuals across several generations in just a few days.

Initially, I focused on finding a meaningful set of variables to capture the astounding variation between individual organisms thriving in the synthetic ecosystems observed in my experiments. Instead of arbitrarily deciding on traits to be quantified, I attempted to extract the traits directly from the microscopic images using artificial neural networks, an approach not too dissimilar to the (in)famous ChatGPT, which was one of the more frequent topics of our lunch discussions. The analysis revealed that most of the phenotypic variation observed in my experiments can be conveniently captured by a small number of traits – two morphological and two behavioral. Using these traits to quantify the phenotype of all individuals, I found that populations are not static in their phenotypic composition, but move along seemingly deterministic trajectories, which are strongly correlated to population sizes. This effort not only informs us that, at least in the organisms under study, the phenotypic composition of the population is linked to the size of the population, but also gives us a general and flexible framework to directly quantify and compare the strength of this association across different biological and environmental contexts. I am currently in the process of finishing the quantitative analysis of the data, and I plan to write the manuscript reporting on the results of this work in the upcoming months.

Besides allowing me to significantly advance my scientific work, the time at Wiko was also important because it gave me the opportunity to think more about my future scientific career. I have submitted a number of job applications and conducted several interviews. In the end, I was fortunate to be offered a nice position at the New York Genome Center, which will allow me to do what I enjoy the most – develop novel theoretical and experimental approaches to extract biological knowledge from large volumes of complex microscopy data. This success would hardly be possible without the peace of mind that I found at Wiko.

Even though I spent most of my time thinking and working by myself, I benefited greatly from interacting with other Fellows. Like the desserts served after every meal,

that made me fail my attempt at a sugar-free diet, the conversations were always unique and never dull. I have learned different things from different people, but there was one piece of information that I have heard from almost everyone I talked to. When I told people that I was only staying for the second half of the year, almost everyone invariably told me that it was a great decision as I would avoid the depressing winter and enjoy Berlin in the spring and summer, when it was the most beautiful. This really made me wonder about how horrible the winter must have been.

While I clearly did arrive at the best possible time, not everything related to my stay at Wiko was smooth sailing, however. By far the toughest aspect of it was that I was away from my wife and children for something over three months – the longest period so far. Luckily, they were able to join me near the end of the fellowship and once they did, my happiness peaked, and not a negligible number of people have told me that it also showed. Indeed, the final month of my stay at Wiko was one of the nicest, most relaxed, and strangely enough also most productive times I have recently experienced.

In biology, it is often said that just as there is no organism without an environment, there is no environment without an organism. The external factors we experience are rarely something that preexists and that we have to simply adapt to, but instead, we all together choose, create, and modify the little niches that we thrive in. At the end of my report, I would therefore like to thank the people who helped me create my niche in Berlin: I will be forever thankful to Jana for taking care of everything related to the fellowship itself and especially for helping me when I was experiencing health issues. My gratitude also goes to Vera and Andrea for arranging everything needed to accommodate my family and me. I thank Dunia for bringing the most delicious food to the table, Nina for taking care of all the formalities (which I am notoriously bad at), Sultan for his wonderful friendship, Barbara for directing this unique program, and everyone else who made this experience so memorable. I hope I was able to do the same at least for some of you and I wish to see all of you again soon.