



SIX MONTHS WIKO-ING
YOSSI YOVEL

Yossi Yovel is a full Professor and the head of the NeuroEcology lab in the School of Zoology and the head of the Sagol School of Neuroscience at Tel Aviv University. He received a B.Sc. degree in Biology and another one in Physics, both from Tel Aviv University, an M.Sc. in Neuroscience from Tel Aviv University, and a Ph.D. in Biology and Machine Learning from the University of Tübingen, Germany. He then completed two post-docs, one at the Weizmann Institute and one at the University of Chicago, before joining the Tel Aviv University faculty in 2011. Professor Yovel's research combines biology with technology. His work on bat bio-sonar has driven the development of a bat-like autonomous robot that navigates autonomously using sound only, as well as several other bio-mimetic applications in precision agriculture. His work on bats drove the development of miniature GPS sensors that make it possible to track the smallest animals ever tracked before. His work on bats' use of bio-sonar for navigation in the field in parallel to using MRI to study the bats' brain in the lab led him to establish a new field that he terms Neuro-Ecology, which brings together ideas from Neuroscience and Ecology. Yovel is also active in various public activities, including chairing the Biology Committee of the Ministry of Education. – Address: Department of Zoology, Tel Aviv University, P.O. Box 39040, Tel Aviv 69978, Israel. E-mail: yossiyovel@gmail.com; yybatlab@gmail.com.

Wiko was a life changer for me. I arrived at Wiko after ten years of a high-speed academic race with hardly any time to think beyond my next task. I came to Wiko with hopes that, during my time in Berlin, I would be able to breathe in between the everyday scientific tasks, to read beyond my own abstracts, and to meet people other than the ones I meet in university

committees. This is exactly what happened at Wiko. With the amazing help from all staff members, I managed to breathe a bit. Wiko is truly an amazing institute. Everyone who has been to it always praised it, but I know now that one must feel it with one's own senses in order to really perceive it. The Wiko staff provides everything you need and more, from help with the bureaucracy when entering Germany, through help with childcare, to fulfilling one's needs for food, culture, or IT. Everyone is simply doing their best to make it easier for you and indeed it was easy, even through one of the worst years that humanity has ever known. I am sure that life before and after Wiko will not be the same for me. I hope to preserve many of the habits that I adopted at Wiko in order to ensure a better balance between science and life.

Instead of explaining what is so wonderful about Wiko, it might be easier to describe what I will miss about being part of it. Here is a partial list. I will miss:

Grunewald, midday wandering through Grunewald, the alleys of the neighborhood, the crazy mansions, the sports cars, cyclers on Sunday morning, long sunsets, my Wiko office.

The lakes, taking a walk along the lakes, the dog lake, a glass of wine near the lake, watching hockey on the frozen lakes, Villa Walther's lakes.

Running, running in the forest, running with Wiko colleagues, running alone, slowing down.

Villa Walther, children playing in the backyard, meeting Fellows when taking out the trash, the secret corridors of the villa, playing soccer in the garden, snow fights in the backyard of the Villa.

German, German with Eva, German reading, *Umlaute*, Stefan Zweig, *Dativ* (not really), Bertolt Brecht.

Bio, bio-food, recyclable cups, separating trash, paper bags, Bionade.

Berlin, riding the M19 bus to town, sledding in Viktoriapark, Berlin *Spielplätze*, Berlin food markets, fresh fish at the Winterfeldtmarkt, coffee in Kreuzberg, *Schnelltest* queues, graffiti, Berlin strands, Potsdam strands, FKK.

Reading, reading more than in the past five years, reading science, reading fiction, listening to podcasts while walking to the institute.

Wildlife, the return of the robins, the nesting coots, their chicks, the noisy swans, the changing of the seasons in Hasensprung, the singing of the nuthatches, the wild bees, dandelion seeds in the air, the smell of rain in summer, *Biergärten*.

Discussion, discussing with Fellows, life science meetings, discussion with evolutionary biologists, discussion with philosophers, discussion with sociologists, One Culture Forum, Two Cultures Forum, Three Cultures Forum, in Zoom.

In terms of science, I spent much of my time in Wiko working on understanding how animals, specifically bats, adjust their behavior to urban environments.

Urbanization is one of the most influential processes on our globe, putting a great number of animal species under threat. However, some species learn to cope with urbanization, and a few even benefit from it. How they do so is what I am trying to understand. One of the bat species we study, the Egyptian fruit bat (*Rousettus aegyptiacus*), is very common in both urban and rural environments, and in the past few years, we tracked its behavior both in the lab and in the field. This work led to writing two papers (one of which has been published and another that is under review at the moment).

In the first study, we report the results of GPS tracking Egyptian fruit bats from urban and rural populations. Because fruit trees are distributed differently in these two environments, with a higher diversity in urban environments, we hypothesized that foraging strategies would differ too. We thus compared the movement and foraging of the bats in these two environments. We found that when foraging in urban environments, bats were more exploratory than when foraging in rural environments. This means that they visit more sites (or trees) per hour and switch foraging sites more often on consecutive nights. We show that by doing so, bats foraging in urban environments diversified their diet more than rural bats did. This is exhibited, for example, by the bats' choice to switch fruit species when foraging in urban environments. Another interesting finding is that the location of the bats' roost does not dictate their foraging grounds. In other words, we found that many bats choose to roost in the countryside, but nightly commute to and forage in urban environments.

This study was published in *BMC Biology* with the title "Fruit bats adjust their foraging strategies to urban environments to diversify their diet" (<https://bmcbiol.biomedcentral.com/articles/10.1186/s12915-021-01060-x>).

In the second study, we addressed differences in the behavior of fruit bats in rural and urban environments. One of the most commonly described changes in the behavioral characteristics of urban dwelling animals is an increased level of risk-taking. Animals in urban environments are exposed to numerous novel situations, such as foraging near humans. In this study, we aimed to reveal if urban fruit bats become risk-takers and how they differ behaviorally from rural bats, studying both innate and learned factors that might play a role in the process. We assessed the behavior of newborn pups from both rural and urban colonies before they acquired experience outdoors, examining risk-taking, exploration, and learning abilities. We found that urban pups exhibited significantly

higher risk-taking levels and that they learn faster, but are less exploratory than their rural counterparts. A cross-fostering experiment revealed that pups were more similar to their adopting mothers, thus suggesting a non-genetic mechanism and pointing towards a maternal effect. We moreover found that lactating urban mothers have higher cortisol levels in their milk, which could potentially explain the transmission of some behavioral traits from mother to pup. We thus offer a potential mechanism for how urban pups can acquire urban-suitable behavioral traits through hormonal transfer from their mothers.

Additional related projects that I have been involved in while at Wiko include examining a huge MRI database of brain images of fruit bats from rural and urban colonies and an SNP (single nucleotide polymorphism) mapping of bats from these two populations. The analyses of these two data sets will continue after my return home.

In summary, bats are unique among small mammals in their ability to rapidly move far. Our study is an excellent example of how animals adjust to environmental changes, and it shows how such mobile mammals can exploit the benefits offered by urban environments. My time at Wiko allowed me to focus on this fundamental question of how animals might exploit the new urban, fragmented environment that is taking over our landscape. Without my stay at Wiko, I could have not taken the time to integrate the results of the different experiments we have been running in the past decade.