Battlefields for research in Ukraine

To the Editor — The war that hit Ukraine on 24 February 2022 has profoundly affected scientific research across the whole country. Leading research institutes in Kyiv, Kharkiv, Chernihiv, Sumy, Zhytomyr, Mariupol, Kherson, Mykolaiv and Odesa, among other cities near the north, south and east borders, are located in areas of intense shelling — including a flagship of aging research, the Dmitry F. Chebotarev Institute of Gerontology of the National Academy of Medical Sciences in Kyiv. Compared to the east, the war has felt substantially less scary in the west, including in Ivano-Frankivsk, where I work on the biology of aging along with several other research groups at the Vasyl Stefanyk Precarpathian National University. Nevertheless, several missiles have hit Ivano-Frankivsk and air raid sirens are now part of our daily lives, as they are for many others across the country. The potential threat of Russian cruise missiles that can reach every corner of the country has brought research to a halt. This paralysis is in some ways similar to what we experienced at around the same time in 2020, after the COVID-19 pandemic started. However, it also feels strikingly different. In the very first days after the large-scale Russian invasion of Ukraine began, there was plenty of time for thinking — but in shelters during air raid warnings. Several of our colleagues have become volunteers and devoted their time to helping the army or people in shelled areas. The head of our department went to serve in the Territorial Defense Forces (the military reserve component of the Ukrainian army), and some students have left the country. The war is having a strong impact on aging and gerontological studies. Studying aging in animal models requires long-term care and investment. A lost experiment in fruit flies means about 2.5 months of work wasted; a lost experiment in a mouse model can set you back for 2 years. Studies on Ukrainian centenarian individuals may be lost forever. Looking to the future, the destruction of Ukrainian research infrastructure, and uncertainty about the availability of research funds, will have a long-lasting negative impact on research in Ukraine.

I remember the early 2000s, when our laboratory in the Department of Biochemistry at Vasyl Stefanyk Precarpathian National University had just been created. At that time, I was a PhD student working on the mechanisms of oxidative stress responses in the budding yeast. A few parallel groups worked in the goldfish model, *Carassius auratus*. Our resources were limited, and we had to squeeze the maximum out of our old devices. We had no liquid nitrogen to preserve yeast cells and fish tissues that should be used for numerous enzymatic assays. Therefore, we would run experiments around the clock. Our group was incredibly motivated, and we all believed in success. There were many moments when I caught myself thinking that scientists should not care about politics. I felt I did not have time to listen to political debates or take part in protests, and that I should focus on research. And yet, in 2004 I ended up serving as a member of the election commission during the Orange Revolution, when the people of Ukraine successfully contested the run-off vote for the presidential election. In 2014, many of my colleagues travelled to Maidan Square in Kyiv to participate in our second revolution, the Revolution of Dignity. Being inspired by the changes that happened after the revolution, our laboratory put substantial efforts into new projects. Many young Ukrainian scientists and science advocates sacrificed their time to fight for academic integrity and increasing funding for researchers in Ukraine. The National Research Foundation of Ukraine (NRFU), created in 2018, was one of the results of their efforts and perseverance. In 2020, our laboratory received funding from the NRFU. The funds allowed us to substantially improve our facilities and fueled our research. Funding was supposed to continue until the end of 2022, and just before 24 February we had prepared the budget for the next stage of our project. With few reagents left to perform experiments, it now feels like we are back to the early 2000s — except that our time in the laboratory is now more like time on a battlefield, punctuated by air raid warnings.

There has always been a lot of mutual respect between Ukrainian and Russian scientists, but very few of our Russian colleagues have raised their voices against the war and protested against the invasion; unfortunately, this might have been too little, too late. Several research institutions in other parts of the world have shown support and offered help to researchers in Ukraine, in particular by welcoming students to their laboratories and offering scholarships. On the one hand, this will help Ukrainian science as Ukrainian students will be able to study, acquire important skills and contribute to global science after graduation. However, on the other hand, it will potentially lead to a brain drain as many young Ukrainian researchers may not return to the country where research institutions need to be rebuilt, and where scientific equipment and opportunities will probably remain scarce for years to come.

Ukraine now faces the difficult task to not only fight for its democracy and freedom but also to rebuild its cities and infrastructure, and to mend the horrors of the war. Many scientists would wish to stand apart from politics, and feel that science is apolitical. But as history has repeatedly shown in Ukraine, politics often comes to scientists. As scientists, we have an important part to play in educating the public, in opposing untruths and in performing our duty to not stand apart from politics at critically important moments. ❐

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