

*Dear Friends,*

*This issue of our magazine commemorates the centennial of the discovery of bacteriophages. Bacteriophages are minuscule viruses, but their role in science can hardly be overestimated.*

*Viruses are known to be the smallest living organisms on Earth; there is even an opinion that calling them “alive” may be wrong as they have too simple a structure. In fact, a virus is a genetic program encoded in DNA or RNA strands packed in a protein shell. Viral genes can work only inside a living cell of another organism by embedding themselves into the host genome and forcing the cellular metabolic machine to produce new copies of viral particles. Like other viruses, bacteriophages (literally, «eaters of bacteria») are intracellular parasites, but they use bacteria and archaea, rather than animals and plants, as their hosts.*

*In recent years, we have learned that bacteriophages play a huge role in the biosphere: controlling the amount of microbial flora, they are a major factor hindering its unrestrained growth. No wonder that the quantity of bacteriophages is enormous: their total biomass may be as high as 109 tons whereas the total mass of all living organisms is only an estimated 2–3 orders of magnitude higher. Bacteriophages are not just the most common form of life on Earth: being an integral part of trophic cycles, they actively participate in the global cycle of matter and energy.*

*Since bacteriophages can target specific strains of bacteria, mankind has used them, albeit with varying success, as a very accurate and safe weapon against bacterial infections in humans and animals almost since the time they were discovered in the early twentieth century. The very history of this discovery reads like a fascinating novel, the main characters being two dramatic and tragic personalities—a brilliant self-educated Frenchman Félix d’Hérelle and his closest associate and friend, a Georgian microbiologist George Eliava.*

*The time when they lived and worked was an era of wars and revolutions, which shattered the very foundations of society, but these two men were not of the kind to hide from reality in the ivory tower. Félix d’Hérelle, the discoverer of bacteriophages, who spent, at the age of seventy, several years under house arrest for refusing to help the German invaders, had to witness at the end of his life how his beloved child was losing ground to the increasing spread of antibiotics. George Eliava, who declined an invitation of the famous Pasteur Institute in Paris with the words “I’m needed in Georgia” and founded the world’s first and only bacteriophage research center in Tbilisi, was shot in his home country as an “enemy of the people.”*



*However, the ingenious idea to fight bacteria with a living biological weapon has outlived its creators. For many years, the USSR had been the world center of bacteriophage research, and phage therapy passed its first major test during World War II. Suffice it to say that the cholera bacteriophage was one the fighters in the famous Battle of Stalingrad. Produced directly in the besieged city of Stalingrad, this virus helped localize a cholera epidemic that broke out on the territory occupied by German troops.*

*The subsequent history of phage therapy is an excellent illustration of the philosophical thesis that any development follows a spiral path. In the 1980s, it became clear that the effectiveness of antibiotic treatment decreased dramatically due to the increasing drug resistance to antibiotics. Scientists and physicians around the world turned their eyes, once again, to bacteriophages. After all, the unique advantage of phage drugs over antibiotics is their targeted action against a specific bacterial strain or species without damaging the normal microflora of the organism, which is why they can be used safely for prevention, as well as treatment, of infections.*

*Of course, no one today argues categorically that, at the present stage in the development of science, bacteriophages can completely replace other antibacterial preparations in medicine and agriculture, but all the articles in this issue clearly show that bacteriophages can be for mankind not only a neighbor with whom we share one biosphere but also a strong and loyal ally.*

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Editor-in-Chief