

Neeraja Sankaran, *A Tale of Two Viruses. Parallels in the Research Trajectories of Tumor and Bacterial Viruses*. Pittsburgh: University of Pittsburgh Press, 2021. xvi, 296 pp. 55\$. ISBN: 978-0822946304.

The word *virus* has become sadly popular in the last two years as a consequence of the ongoing global pandemic of coronavirus disease 2019. At the same time, the adjective *viral* (that we frequently use in a benign way to describe something that is quickly diffused by the internet) now gained new concrete significances that become real in our life in terms of transmissibility, severity and hospitalization indices.

The origin of this term is ancient since it was first used in medieval times for the discharge from an ulcer or wound, eventually shifting to substances within the body that cause infectious diseases. As a consequence, a virus was a sort of *poisonous secretion*, and early on it often kept to its original meaning of *venom*, either the literal or figurative kind. A first understanding of what a virus is in biological terms occurred at the beginning of the twentieth century when the word *virus* gained a more specific meaning corresponding to a tiny infectious agent, smaller than bacteria, that replicates in living cells. How quickly did the biological concept of virus spread in science?

A reply to this question can be found in the recently published book entitled *A Tale of Two Viruses. Parallels in the Research Trajectories of Tumor and Bacterial Viruses* (University of Pittsburgh Press, 2021), written by the historian of science and medicine Neeraja Sankaran.

At a first reading, this book looks like a comparative history of two viruses reporting the parallel discoveries of the Rous sarcoma virus and of bacteriophages. Actually, *A Tale of Two Viruses* is an intriguing historical reconstruction of the origin of virology as a mature scientific discipline, also allowing readers to understand the complexity of the different life forms that we call viruses and the difficulties that virologists have to daily face in the study of these infectious agents.

The comparison of two viruses that are actually different in their biology and structure could be unusual for several biologists. Actually, this choice is really effective from a historical perspective since it allows us to better understand the difficulties that the first virologists had to face for the acceptance of their work describing two viruses that were different from the concept of virus that was common during the Nineteenth Century. Indeed, these viruses are not typical infective agents since the Rous sarcoma virus is causative of tumors (called sarcomas) occurring in chickens, whereas bacteriophages infect (and kill) bacteria.

Using a biographical technique, Neeraja Sankaran moves from the detailed and rigorous reconstruction of Peyton Rous's work discovering the Rous sarcoma virus to Felix d'Herelle and Frederick William Twort, who independently assessed the existence of viruses capable of infecting bacterial cells. Following these independent research trajectories Sankaran reports "the evolving understanding of the nature of viruses in general, the various cycles of discovery, hypotheses and experimental testing through which they (viruses, *nda*) were defined, refined and redefined". Most people using the word virus probably know not more than a virus is a disease-causing agent spreading very rapidly and easily and the same has been true also for scientists for several decades.

In the central chapters of *A Tale of Two Viruses*, Sankaran analyses the technical improvements that favoured the study of viruses and the "molecularizing vision of viruses" is also discussed. As Sankaran states "I would add that virology has something of a special relationship with molecular biology because more than any other discipline it fed, as much as fed off, the newly burgeoning discipline." Molecular biology indeed provided technical tools that have been essential for conceptual advancements in virology. We can now suggest, as also Sankaran writes, that the modern concept of virus is the culmination of research in viral molecular biology that made it possible to understand the structure and functioning of viruses. Before the advent of molecular biology, "the concept of viruses varies with discipline of the investigators and the kind of virus they studied <writes Sankaran>. Some microbiologists believe that viruses are microorganisms, some chemists that they are molecules. Most geneticists tend to consider viruses as replicating agents of cellular origin. All of these views have merit and could conceivably be true. [...] Like the six blind men of an ancient Indian parable who described an elephant in six different ways according to the part that each could feel (the tusk, the trunk, ears and so on), each of the aforementioned discipline offered a partial description of what viruses are." The achievements of molecular virology favoured the integration of these different views in a coherent definition of virus.

At the same time, the advent of molecular biology favoured the proposal of hypotheses about virus origin and, as a consequence, about life origin. As argued by Sankaran, the concept of virus is inextricably interwoven with questions concerning the nature of life. Indeed, several scientists asked themselves for decades if viruses were alive and the answer to this question has been often negative. This situation rapidly changed during the golden age of virology (in the middle of the last century), as a consequence of several discoveries that modified our vision of viruses. Indeed, it emerged that viruses have played (and still play) a major innovative role in the evolution of life.

The study of virus origin and evolution is a timely topic to remind ourselves that the question about the origin of life is not only, strictly speaking, a scientific question since it is also an existential question, a challenge for the human conceptualization of the world, and it is therefore an historical and philosophical question. *A Tale of Two Viruses* is therefore a strong reaffirmation that numerous questions that pertain to the origin of life are topics of research also for the human sciences.

In the last two years several books about viruses have been published, but *A Tale of Two Viruses* is one of the few attempts to reconstruct the history of viruses through the lens of historians too, also focussing on the contributions of philosophers, sociologists and other humanists and social scientists. Interestingly (and actually unfortunately), the contributions of them has been scarcely appreciated also during the ongoing global pandemic so that *A Tale of Two Viruses* is a timely proposal to reaffirm the idea that the contributions of virologists and epidemiologists are not the only ones that should be view as valuable during a viral pandemic. If we want to really understand how science works and what, in the face of substantial adversity, has been achieved in the past decades, we have to face virology also from different points of view. Moreover, key questions in the medium and long term about how we can prepare for other pandemics, how human behaviour can adapt at times of uncertainty, how we understand risk, how we evaluate the cost of different approaches and how we deal with the mental health burden of Covid-19 could be properly faced only if we accept that these are questions for social sciences. *A Tale of Two Viruses* is therefore useful to reconstruct the parallel trajectories of the “two cultures” in the age of a viral pandemic with the hope that at the end of this emergency they could finally be reconciled.

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