books and arts

From 1940, Blackett sat on the MAUD Committee, assessing the likelihood that research on nuclear chain reactions would lead to a practical atomic weapon within the timespan of the war. At first he was the lone British voice calling for the weapon to be developed only by the United States. After the war, and particularly after the 1946 McMahon Act broke with any pretence of joint UK–US responsibility for the bomb, Blackett argued vehemently against a British bomb project. He tried private routes of influence, but was rebuffed by the prime minister, Clement Attlee. So he went public, writing The Military and Political Consequences of Atomic Energy.

“Neither communist nor pacifist, Blackett had no argument with war,” writes Nye, “so why did Blackett take such “an outspoken and unpopular political position on matters of nuclear policy immediately following the Second World War?” Because his naval and operational-research experience taught him that policy decisions driven by inadequate knowledge were likely to be wrong. And because he was appalled by war-games theorizing, which he viewed as inhuman.

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Living with viruses

Viral Fitness: The Next SARS and West Nile in the Making by Jaap Goudsmit Oxford University Press: 2004. 202 pp. £18.50, $29.95

Steven Wolinsky

Breathing can kill you. So can eating and drinking. We live in a world where pathogenic microorganisms in air, food and water pose an omnipresent threat to human health and agriculture. Yet we continue to expand our global presence, engage in high-risk sexual behaviour, and produce more crops and domesticated animals bred for traits that restrict their diversity. As a result, we are exposing ourselves to dangerous viral pathogens that can cause epidemics on a scale seen only in apocalyptic novels. Viruses will inevitably help decimate our natural world and humans as well. So claims Jaap Goudsmit in his engaging new book, Viral Fitness.

Goudsmit, a professor of communicable diseases at the University of Amsterdam in the Netherlands, chooses several diseases of plants, animals and humans as case studies in the epidemiology and evolutionary biology of emerging viral pathogens. He highlights important ecological factors in the emergence of viruses, such as the role of waterfowl, in the rise of the H5N1 influenza virus, which led to an outbreak of avian flu in Asia; the part the bushmeat trade played in the appearance of HIV in Africa; and the role of the consumption of palm civet in the spread of the coronavirus that causes severe acute respiratory syndrome (SARS).

To become dangerous to humans, such viruses must cross the species barrier, which requires both genetic factors and incursions into new ecological niches. Antibodies against the SARS coronavirus from the Himalayan palm civet, the putative species of origin, have been found in other animals sold at local Chinese markets, implying that there are constraints to adaptation across species. Goudsmit points out that few transmission events are sustained. Monkeypox virus and the O and N groups of HIV type 1, for example, infected human hosts with limited subsequent transmission. This suggests that dead-end transfers of viruses with imperfect adaptation to the new host species may be common, and that transmission of a pathogen that spreads to epidemic proportions may be the exception rather than the rule.

Goudsmit deftly reconstructs epidemiological history and relates how climatic changes, population movements and trade have converged to help viruses emerge and spread. Many of these anecdotes are well known, but others are not. Goudsmit artfully unravels the threads that tie together the evolutionary selection processes working in the new host species. Because viruses have large population sizes, high mutation rates and short generation times, they are capable of rapid genetic evolution. Once inside the host, virus populations are shaped by forces of evolutionary change that include mutation, genetic recombination and natural selection. This complex interplay between the virus and its host — both in a single individual and in the population — can result in a variety of outcomes. For example, the introduction into Australia of a myxoma virus to reduce the rabbit population was highly successful, through an accidental experiment of nature. At first, rabbit numbers were drastically reduced. Over time, however, a milder strain emerged that was more effective at infecting rabbits. Through selection, the virus evolved to a less virulent form, illustrating the important difference between evolutionary fitness and virulence.

Despite the fascinating examples he cites, Goudsmit fails to address some critical topics, such as the contribution of host and virus genetic heterogeneity and coevolution, and the role of frequency-dependent selection in evolutionary change. Several of his suggestions are untenable, such as the idea that a new virus can emerge after an asexual ménage à trois among unrelated viruses in a single cell; not every virus can infect every cell. Viruses have anthropomorphic desires and a teleological end in view, according to Goudsmit. Other topics, such as the role of viruses in making possible our evolutionary development, and the use of phage therapy for clinical and agricultural applications, add another dimension to the host–pathogen relationship.

To bolster the claim that viruses are a threat to us now “more than ever before”, Goudsmit considers epidemiological and evolutionary dynamics alongside the course of human events, but neglects to mention many public-health successes. Health officials are scrambling, so far with relative success, to contain the SARS coronavirus and prevent the spread of the influenza H5N1 and H7N7 viruses from waterfowl to humans. No mention is made of the important change to seasonal outbreaks of influenza achieved by simply moving pigs away from ducks on Chinese farms.

How can we avoid the dangers that nature presents? Wash your hands. Cover your mouth when you sneeze. Refrain from transplanting animal organs, Goudsmit would also add, and don’t eat monkeys. Vaccines help to halt viruses that cause epidemics such as measles, which cause short infections
with strong cross-immunity, and influenza. For retroviruses such as HIV that lead to persisting infection, the prospects for a vaccine are dim; their diversity exists both in the individual and in the population as a whole. Until we have an effective AIDS vaccine, people will need the education and resources to modify their behaviour. Unless we change our way of life, Goudsmit warns, the emergence of viral threats to human health looms large.

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