BOOKS

Nature fights back

Adrian Woolfson explains the nature of pandemics – and how we can expect many more of them

The subjugation of nature has formed a cornerstone of the human agenda. How surprising and humbling, then, to find our way of life so rapidly and unexpectedly undermined by a biological force that transcends identity and culture. Still worse, when we discover that the source of this chaos is a sub-microscopic viral particle whose genetic code — simpler than a bacterium — is barely compatible with a living entity. Yet it has brought global civilisation to a standstill.

The stark and poetic prose of Paolo Giordano's essay *How Contagion Works* conveys the existential angst of an Italian intellectual as he comes to terms with quarantine: the vulnerabilities, missed opportunities, loneliness, fear of annihilation and the realisation that humanity's supporting structures are 'a house of cards'. Until now a determined individualist, Giordano is struck by the realisation that the infrastructure of our globalised era is a complex nexus of communication. 'If the interactions of human beings were drawn in pen,' he writes, 'the world would be a giant scribble.'

Our assailants have inverted the natural order and expropriated the trappings of civilisation. They have hitched lifts on aeroplanes, luxuriated in fancy cruise ship cabins, vacationed on doorknobs and travelled from Brooklyn to Beijing. Meanwhile we have been transmogrified into substrates that make possible their utopia. Regardless of race, creed or colour, we are reduced to pithy categories: susceptible, infected and recovered.

Every outbreak, as Meera Senthilingam notes in his compelling overview *Outbreaks and Epidemics*, has a unique source. The 2003 Severe Acute Respiratory Syndrome (Sars) outbreak index case was Dr Liu Jianlun. After checking into room 911 of the Metropole hotel in Kowloon, he died ten days later. By then the virus had disseminated its pathogenic cargo — cadging rides on bicycles, automobiles, trains and planes — to destinations as far flung as Singapore and Canada. Our current foe, Sars-CoV-2, is thought to have originated in a live animal and seafood market in Wuhan, China.

Smallpox was eradicated by 1980 through global vaccination, but it has been hard to repeat this success with other diseases. Vaccination strategies have been frustrated by anti-vaxxers, rejecters of modern medicine, fear of politically motivated interventions, religious beliefs and fake news. A 2018 report by the Royal Society of Public Health in the UK indicated that one in four individuals believed it was possible to be administered too many vaccines. Such sentiments are not new. The Vaccination Acts sparked mass resistance in Victorian England. In 1885 more than 20,000 gathered in Leicester to protest against vaccinations.

And old enemies can come back. As global warming takes effect, the exposure of human and animal corpses previously locked into the Siberian permafrost raises the possibility of the resurgence of deadly diseases such as anthrax and smallpox. An anthrax outbreak in 2016 in this region may have originated from reactivated frozen *Bacillus anthracis* spores.

In 1495, the Spaniards unkindly laced wine exported to France with the blood of leprosy patients

Global warming, overpopulation, urbanisation, deforestation and other violations of nature mean pandemics are likely to occur with increasing frequency. Since the Spanish flu pandemic of 1918 (death toll 100 million — twice that of the entire first world war) we've seen many other pandemics. H2N2 'Asian flu' killed 1.1 million worldwide in 1957. H3N2 dispatched a further one million in 1968. In 2009 H1N1 killed around 19,000.

In *Rethinking Readiness*, Jeff Schlegelmilch adds violent conflicts and mass population movements — including the four billion airline passengers who annually traverse the globe — to the list of risk factors. We need to 'understand what we could be facing in the years to come', he cautions. If humankind is to survive, we will must 'lean into the variability and complexity of the world' and stop 'downplaying the threats of pandemics'. But antibiotic-resistant bacteria, biological weapons, climate change, the collapse of infrastructure such as power grids and water, cyber threats and nuclear conflict also pose existential dangers.

Bioterrorism, such as the anthrax-laced letters posted after 9/11, is not a recent phenomenon. The Mongols catapulted the bodies of plague victims over the city walls in the 1346 siege of Caffa, in the Crimea, while the Spaniards in 1495 unkindly laced wine exported to France with the blood of leprosy patients. In the 1700s the British Army plotted to supply smallpox-laden blankets to Native Americans, and Napoleon flooded the outskirts of Mantua to encourage the spread of malaria. In Cold War Russia the Biopreparat programme accumulated stockpiles of plague and anthrax, the full extent of this enterprise becoming apparent only after a defection in the 1990s.

In these disparate times, our old normality has become a ghost world — an elusive fiction. The vacuum generated by quarantine and accompanying social isolation has propagated loneliness. In *Together*, the former US surgeon general Vivek Murthy provides a compassionate and thought-provoking exposition of the loneliness pandemic that runs 'like a dark thread', disguised as a host of other pathologies such as addiction, obesity, violence, anxiety and depression. The fractured structures of modern societies are fertile breeding grounds for this unforgiving malady.

Individuals with strong social relationships are 50 per cent less likely to suffer a premature death. Impoverished social interactions can affect a life span as much as smoking 15 cigarettes a day and influence longevity more than obesity, alcohol and lack of exercise. Loneliness is associated with an increased risk of coronary heart disease, high blood pressure, stroke, dementia, anxiety and depression. It can also kill us. Takotsubo syndrome, known as 'broken heart syndrome' or stress-induced cardiomyopathy, was first described in Japan in 1990.

The word 'loneliness' did not enter the English language until the late 16th century. It's possible that the stigma associat-

ARCHIVES CHARMET/BRIDGEMAN IMAGES

Personal protective equipment designed for doctors in Marseille in 1720 during the last major outbreak of bubonic plague in Western Europe, which killed 100,000 in the space of two years

ed with it originated with John Milton, who described Satan in *Paradise Lost* (1667) as taking 'lonely steps'. The contemporary focus on individuality and our prioritisation of romantic love over friendship has undermined communities and helped erode social networks.

Might kindness — a natural antidote to alienation — through gestures as inconsequential as a smile or encouragement transform into a beneficial contagion that minimises loneliness? In Okinawa, Japan, children are placed in groups of five at an early age. These *moai* are designed to function as second families. Loneliness may be hard to identify. It is a 'great masquerader' and adopts protean forms, including alienation, sadness and anger.

One of the challenges of pandemics, as we're discovering, is how to balance disease prevention with economic survival. In the US, 30 million have filed for unemployment in just a few months and the world is entering a catastrophic recession. To ration resources and seek to re-open businesses, accountants have to assign price tags to life.

In *Ultimate Price,* a detailed analysis of how government organisations and corporations define the monetary value of human life, Howard Friedman tours the uncomfortable architecture of this calculus. He also demonstrates how the movement from statistics to the details of actual lives leads to an increased perception of their value.

In the late 1960s, the Ford Motor Company rolled out a low-priced car, the Pinto. Road tests indicated the need for minor modifications, but after weighing the anticipated costs of death and injury-related lawsuits against the expense of making the modifications, Ford decided to ignore the flaws. Key considerations included delay to sales and the dollar value assigned to a human life. This monetisation of lives relegated their loss to the 'cost of doing business'. It would be almost a decade before the recall was implemented.

When we think about 'contagion' we think first of infectious diseases. Adam Kucharski's lively, intriguing and elegant *The Rules of Contagion* teaches us, however, that the mathematical rules governing the transmission of disease generalise to non-infectious networked transmissible entities — from the financial contagion that crashed the global financial markets in August 2007 to the propagation of computer viruses, violence, television sales, happiness, obesity, the transmission of ideas, advertisements, behaviours such as yawning and laughter, and cultural trends. Following the collapse of Lehman Brothers, the banking industry began to adopt the language of epidemics.

This 'Theory of Happenings', originally formulated by the Nobel Prizewinner Ronald Ross in 1916, best known for his work on mosquito dynamics and eradication, describes how the number of individuals affected by anything — be it a disease, piece of information or social contagion — evolves over time. Although the details may vary considerably, each is defined by this abstract 'outbreak science' comprising four key stages: spark, growth, peak and decline.

The prospect of such mathematical certainty, and the vanquishing of disorder, offers us some degree of solace in unfortunate times.

How Contagion Works: Science, Awareness and Community in Times of Global Crises by Paolo Giordano (Weidenfeld & Nicolson, £2.99, pp. 80)
Outbreaks and Epidemics: Battling Infection from Measles to Coronavirus by Meera Senthilingam (Icon Books, £8.99, pp. 196)
Rethinking Readiness: A Brief Guide to Twenty-first-Century Megadisasters by Jeff Schlegelmilch (Columbia University Press, £14.99, pp. 200)
Together: Loneliness, Health and What Happens When We Find Connection by Vivek Murthy (Profile Books, £20, pp. 352)
Ultimate Price: The Value We Place on Life by Howard Friedman (University of California Press, £23, pp. 232)
The Rules of Contagion: Why Things Spread — And Why Things Stop by Adam Kucharski (Profile Books, £16.99, pp. 352)