

VIROLOGY

Pathogenic passengers

Edward C. Holmes welcomes a robust account of how viruses emerge and how pandemics can be prevented.

Pandemic disease is a world traveller. This simple fact underlies much of the work of the Global Viral Forecasting Initiative (GVFI), an organization established and run by microbiologist Nathan Wolfe, which aims to predict and prevent disease pandemics. So it is apt that I read Wolfe's *The Viral Storm* on a crowded airliner bound for Beijing, and fortunate that the book was sufficiently diverting to keep me awake for 13 hours. It is an excellent piece of scientific gothic, rich in descriptions of the threat we face from emerging viruses and how we might prevent them from becoming pandemic.

The book is part description of viruses and how they jump species to emerge in new hosts, part autobiography and part advertisement for the GVFI. Wolfe discusses viral natural history and the history of past pandemics, splicing in references to his

research trips to the developing world. His clear message is that humans are entering a new pandemic age, fuelled by such factors as the rise in global travel, urbanization, deforestation and changing agricultural practices, all of which increase the likelihood of human exposure to animal species that carry potentially deadly viral infections.

In this connected world, new viruses are able to spread quickly, perhaps with devastating effect. "A storm is brewing," says Wolfe, and science must retool to meet this pandemic threat. That will mean increased surveillance of potential reservoir species, the deployment of new technologies that can quickly identify the infectious agent responsible for a disease outbreak, and the use of social-networking media to track cases of human infection in real time.

Wolfe's arguments are generally

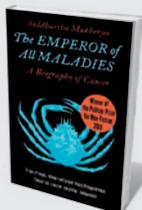
convincing, particularly on the science of viral surveillance and the part that social media might play in this; the next pandemic will doubtless be both televised and tweeted. Yet he overgeneralizes at times — for example, when stressing the role that hunting, by exposing humans to diverse animal species, has in viral emergence. Hunting may be responsible for the emergence of only a small number of human infections — although these include HIV, which ignited the current interest in emerging viruses and may have entered humans through the consumption of infected 'bush meat'. Some over-

exuberance should be forgiven, as Wolfe has a gift for conveying the thrill of scientific research, writing with both gusto and panache.

His most provocative claim is that it is possible to predict which diseases will emerge in the future. This has been called the holy grail of research into infectious disease, and has ▶

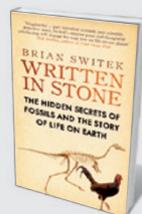


The Viral Storm: The Dawn of a New Pandemic Age
NATHAN WOLFE
Allen Lane/Times:
2011. 320 pp.
£14.99/£26



The Emperor of All Maladies

Siddhartha Mukherjee (*Fourth Estate*, 2011; £9.99) In his 'biography of cancer', physician Siddhartha Mukherjee provides a new perspective on the disease and the people affected by it. While showing how modern understanding of cancer is leading to new tactics to control it, he also explores how humans fought it in the past.



Written in Stone: Evolution, the Fossil Record, and Our Place in Nature

Brian Switek (*Icon Books*, 2011; £12.99) Fossil finds are revealing ever more about Earth and human history, explains Brian Switek in this accessible book. Reviewer Jan Zalasiewicz called it "a fine guide to the four-dimensional tapestry of life" (*Nature* **469**, 32–33; 2011).

► attracted considerable research funding. Although 'prediction' is an enticing word, how it will be done is vaguely described at best. In Wolfe's research programme, prediction seems to involve fine-scale surveillance — for instance, through increasingly high-tech surveys of viral biodiversity in potential reservoir species, the monitoring of unusual animal die-offs, and the minute-by-minute screening of Google trends, Twitter and mobile-phone data.

Gathering such data is laudable, but still more reactive than predictive. In reality, accurate prediction faces challenges that could prove insurmountable. A novel virus discovered in a potential reservoir species may not replicate in human cells; a virus that replicates in human cells may not transmit between humans; and a variety of epidemiological processes dictate that even if such a virus is able to transmit between hosts, it may not spread through a population. Predicting viral emergence therefore requires a difficult, and perhaps unattainable, synthesis of genetics and epidemiology.

I believe that this fad for prediction presents a greater danger: that we establish expectations so unrealistic that they are met with inevitable failure, in turn undermining public confidence. Another unwelcome consequence, in my view, is the diversion of research funds from basic biological studies of viral emergence — such as defining the relationship between a virus and its host-cell receptor — to more speculative programmes, such as predicting future viral evolution.

Wolfe has become the public face of emerging disease. This enjoyable, well researched and thought-provoking book shows that he has a clear vision of how pandemics occur in human populations and the part he might play in their prevention and control. Although it is not clear what the coming years will hold, one safe prediction is that Wolfe will have a lot more to say. On the evidence of this book, he is worth listening to. ■

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TECHNOLOGY

The inspiration exchange

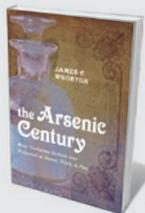
Chris Lintott assesses an idea that unites individual scientific expertise with collective intelligence.

I imagine sitting down at your computer each morning and choosing what to work on from a list of problems submitted by scientists from around the world. The requests cut across academic boundaries, yet have been selected with you in mind as the person best qualified to solve them. What would such a system achieve? What would your career be like as a consequence?

This scenario is the vision of writer and

quantum-computation expert Michael Nielsen. In 2007, he announced on his blog that he felt he could have more impact by developing new scientific tools than by pursuing his physics research. *Reinventing Discovery*, his thought-provoking call to arms, suggests he was right.

Nielsen is convinced that, as a result of our growing ability to share information and ideas, we are living through a revolution



The Arsenic Century: How Victorian Britain was Poisoned at Home, Work, and Play

James C. Whorton (Oxford Univ. Press, 2011; £9.99)
Arsenic in the nineteenth century was ubiquitous — stored in kitchens as a rat killer, or used to dye sweets, candles and gloves. Historian James Whorton shows how its deadly past resonates with the environmental poisonings of today.



Where Good Ideas Come from: The Seven Patterns of Innovation

Steven Johnson (Penguin, 2011; £9.99)
Good ideas, says writer Steven Johnson, are rarely produced by lone geniuses. Innovation more often grows out of a network of minds, he argues. Universities offer the best chance for breakthroughs as they lack market pressures.