

programme soaked up staggering amounts of money, expertise, resources and time.

Second, it proves that it is technically very difficult to genetically engineer pathogens to meet all 12 of the criteria for military usefulness, such as being suitable for aerosol delivery and able to survive in stable form in the air. Pleiotropy — the fact that a single gene may affect more than one feature in an organism — often means that efforts to enhance one ‘desirable’ property reduce others. However, advances in genomics may eventually overcome this obstacle.

Third, it shows that there was no national strategy for the programme. As Leitenberg and Zilinskas note, it did not benefit the Soviet Union’s ability to wage war, but it did severely impair economic development in biotechnology by diverting scientific talent. Indeed, there was no stated doctrine of use laying out in what circumstances or how the Soviet armed forces would use bioweapons on the battlefield.

Finally, the book illustrates the impracticality of applying a single-use/dual-use approach to biology. Rather, we should talk of use and misuse. Even the most apparently ‘single-use’ aspect of the Soviet offensive research — the development of antibiotic-resistant pathogens — has potentially large-scale health applications. An attenuated, antibiotic-resistant live vaccine could be injected into patients with a disease and under antibiotic treatment. The antibiotics would attack the disease, but not the vaccine. We should seek not to ring-fence ‘dual-use’ technologies — impossible, in any case — but to discover how to prevent the misuse of biology.

Biopreparat, the ostensibly civilian part of the programme, came about because Soviet military bioweapons experts wanted parity with nuclear experts; at the same time, civilian scientists realized that their research would be funded only if it had weapons applications. As the programme’s scientific champion Yury Ovchinnikov is reported to have said: “Nobody would give us money for medicine. But offer one weapon and you’ll get full support.”

In other words, because Soviet biologists were underfunded and under-respected, they distorted what they offered to fit military funders’ misinformed biases. Behavioural economists tell us how decisions that are logical at the individual level can result in outcomes that are, at the aggregate level, wildly illogical. Perhaps the Soviet programme, a clear example of this, tells us that behavioural economists should have a role in analysing how to prevent proliferation or create environments conducive to disarmament. ■

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Books in brief



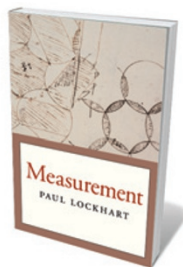
Corporation 2020: Transforming Business for Tomorrow's World
Pavan Sukhdev ISLAND 320 pp. £18.99 (2012)

Business isn't working — so say a rising number of pundits witnessing cyclical patterns of boom and bust. Green economist and former banker Pavan Sukhdev argues that the corporate model needs an overhaul if profits are to be generated in socially equitable, environmentally benign ways. In his nuanced analysis, corporations need to align their aims with society, becoming viable communities, institutes and financial, human and natural capital ‘factories’. His plan for reform focuses on resource taxation, limited leverage, ethical advertising and disclosure of externalities such as pollution.



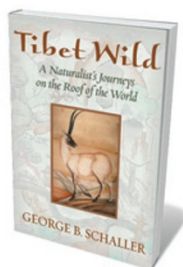
Hyperactive: The Controversial History of ADHD
Matthew Smith REAKTION BOOKS 208 pp. £25 (2012)

Mild brain damage, sugar, evolutionary hangovers, genes — answers to the question ‘What causes ADHD?’ are mind-bogglingly diverse. But, argues Matthew Smith in the first medical history of attention-deficit hyperactivity disorder, we may need to accept that explanations will be pluralistic and relativistic. Smith addresses biological, social and psychological issues, from an eighteenth-century description of the fidgets to the first cases, the drugs and the diets. With powerful pharmaceuticals involved and US diagnoses running at 9% a year in 5- to 17-year-olds, this is a timely chronicle.



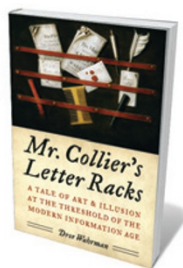
Measurement

Paul Lockhart HARVARD UNIVERSITY PRESS 416 pp. £20 (2012)
This invitation to tackle mathematical questions is infused with the joys of the rarefied reality of maths. Paul Lockhart largely avoids complex formulae and the wilder shores of jargon, opting instead for simple geometric drawings, lucid instructions and honest warnings about the hurdles. Covering size, shape, space and time, Lockhart, a maths teacher, gets through scores of problems, from showing that a cone in a hemisphere occupies half the volume to determining the size of the largest circle that can sit at the bottom of a parabola. Elegant, amusing and challenging.



Tibet Wild: A Naturalist's Journeys on the Roof of the World
George B. Schaller ISLAND 412 pp. £18.99 (2012)

After 50 years of research on endangered species, field biologist George Schaller is still swimming against the tide of change in the wild. This highly personal compilation, part memoir and part research record, celebrates that “raw terrain where lakes are the colour of molten turquoise” — the Tibetan Plateau, particularly the northern plain of the Chang Tang. Woven into vivid accounts of tracking mammals such as snow leopards and chiru, or Tibetan antelope, are Schaller’s tracings of the impacts of climate change and population growth on one of the last animal strongholds.



Mr. Collier's Letter Racks: A Tale of Art and Illusion at the Threshold of the Modern Information Age

Dror Wahrman OXFORD UNIVERSITY PRESS 352 pp. £22.95 (2012)
The technology-driven explosion in cheap print 300 years ago spawned the first information age. As historical sleuth Dror Wahrman relates, a little-known Dutchman commented covertly on the metamorphosis — in *trompe l'oeil* paintings. Edward Collier created ‘snapshots’ of letter racks stuffed with printed speeches and pamphlets — riddled with visual jokes and puzzles that were coded criticisms of the limitations of print and the politics of the day.