

economic management.

Milanovic contrasts both models with social democratic capitalism, shaped by economist John Maynard Keynes among others, including politicians rebuilding national economies after the Second World War. He also sketches an alternative “people’s capitalism”, echoed in today’s European and US progressivism.

Milanovic was trained in the Marxist economics of the former Yugoslavia. This might explain why historical forces are so central to his analysis — and why he is not optimistic about the chances of alternative models. He lists policies that might favour progressivism, such as improving publicly funded education. In my view, these are wishful thinking without analysis of the political obstacles to sensible policies (sensible, at least, to those who prefer to avert revolution). Nor does the book explore other current varieties of capitalism, such as the more egalitarian, consensual systems of Scandinavia or Japan. It would have been salutary to know how these are responding to the forces of globalization, technological overreach, an ageing population and environmental stress.

These existential pressures explain why all three books conclude that ‘business as usual’ in thinking about how to run an economy cannot continue. It is right to measure what societies actually value, as Stiglitz and his co-authors (and I) argue. It is also right, as Soros asserts, that the intellectual framework of economics must adapt to a world ever more removed from a focus on individual choices. This trend is under way in economic research, but a radical rethink is unlikely there: the incentives of academia encourage conservatism and incremental progress.

Better metrics and theories will not be enough to create a sustainable economic and social model. Or, they could — but only if they convince policymakers and the public to act differently. The future of capitalism is out of the hands of those who spend their time thinking about it. ■

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EPIDEMIOLOGY

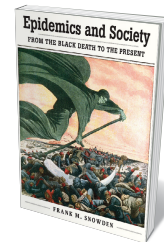
How pandemics shape social evolution

Laura Spinney weighs up Frank Snowden’s sweeping history of the impact of infectious diseases on society.

When will we learn never to declare the end of anything? Only 50 years ago, two prominent US universities closed their infectious-disease departments, sure that the problem they studied had been solved. Now, cases of measles and mumps are on the rise again in Europe and the United States, new infectious diseases are emerging at an unprecedented rate, and the threat of the next pandemic keeps philanthropist Bill Gates awake at night.

So it’s a shame that to make this point, *Epidemics and Society*, Frank Snowden’s wide-ranging study on this rolling human reality, repeats the urban myth that in 1969, US surgeon-general William Stewart said, “It is time to close the book on infectious diseases, and declare the war against pestilence won.” Even though Stewart never said this, it’s clear that there was a pervasive, dangerously complacent attitude in the late 1960s. International public-health authorities were predicting that pathogenic organisms, including the parasite that causes malaria, would be eliminated by the end of the twentieth century. Snowden’s broader thesis is that infectious diseases have shaped social evolution no less powerfully than have wars, revolutions and economic crises.

It’s not a new message, but it bears repeating. Snowden, a historian at Yale University in New Haven, Connecticut, has assembled a vast amount of evidence, some the fruit of his own research. His global history spans more than a millennium of outbreaks, covering diseases from bubonic plague to



Epidemics and Society: From the Black Death to the Present

FRANK M. SNOWDEN
Yale University Press
(2019)

smallpox, malaria, the respiratory illness SARS, Ebola and beyond. He rehashes the long history of scapegoating, violence, mass hysteria and religiosity that have accompanied epidemics, but only to speculate on their longer-term social, political and cultural consequences.

When cholera struck Paris in 1832 — in an epidemic that eventually killed nearly 19,000 Parisians — a conspiracy theory spread that the unpopular government under King Louis Philippe was poisoning wells with arsenic. The police and army were barely able to contain the violence that ensued. The institutional memory

of those events fuelled dread of the “dangerous classes”: poor people. That, Snowden argues, might help to explain why the two most egregious examples of class-based repression in the nineteenth century also took place in the French capital. These were the violent crushing of the 1848

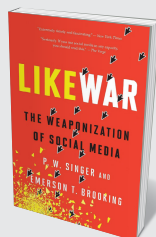
revolution and the bloody destruction of the Paris Commune, the revolutionary government that briefly ruled the city 23 years later.

The synergy between wars and epidemics in shaping history has long been recognized. Napoleon Bonaparte’s nineteenth-century

SCAPEGOATING AND VIOLENCE HAVE ACCOMPANIED EPIDEMICS.

NEW IN PAPERBACK

Highlights of this season’s releases.



LikeWar

P. W. Singer & Emerson T. Brooking HOUGHTON MIFFLIN HARCOURT (2019)

As reports on politics and war flood social media, the medium itself is becoming weaponized: virality is valued over veracity. If you’re online, you inadvertently become part of the war. Warning that ‘you are what you share’, defence specialists P. W. Singer and Emerson Brooking explore the real-world and online geopolitical impacts of this conflict, and how to prepare ourselves for the next unprecedented threat.



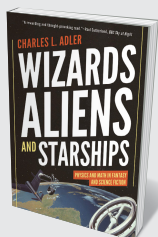
imperial expansion westwards across the Atlantic Ocean was halted by yellow fever, which his army encountered in France's Caribbean colony of Saint-Domingue (now Haiti). His eastern ambitions were thwarted by dysentery and typhus. (The typhus epidemic that ravaged the Grande Armée during its retreat from Moscow might have prompted an unparalleled die-off by some measurements, as Snowden claims. But it was surely not in terms of "deaths per capita".)

SECURITY THREAT

An odd omission from the book is the 1918 'Spanish' influenza pandemic, which overlapped with the First World War and is estimated to have killed between 50 million and 100 million people. Snowden might have felt that it garnered enough attention around its centenary. But a future flu pandemic is currently ranked among the leading threats to global security, and there has been surprisingly little research on the long-term consequences of the 1918 catastrophe. Furthermore, it might have been interesting to explore the possible links between that pandemic and the ongoing epidemic of AIDS in South Africa, which the book does cover.

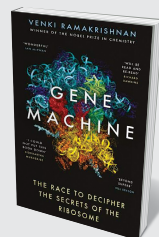
There is evidence that white scapegoating of black South Africans in 1918 precipitated the first legislative steps towards apartheid. As Snowden discusses, by restricting the land available to people of colour, apartheid accelerated the growth of a migrant labour system that divided black families. It also encouraged new forms of social and sexual behaviour. Both developments, in turn, hastened the spread of AIDS once it arrived. Young men growing up away from their families, for instance, often developed standards of masculinity that promoted sexual conquest and violence; South Africa now has one of the highest rates of rape in the world (K. Naidoo *S. Afr. Med. J.* **103**, 210–211; 2013). The crowning tragedy of these depressing events was President Thabo Mbeki's endorsement, from 1999, of a US AIDS denialist's theory that the disease is not caused by the HIV virus. That resulted in the avoidable deaths of an estimated half a million South Africans.

In the twenty-first century, we seem to be repeating many of the mistakes that triggered or exacerbated epidemics in the past. That is presumably why Snowden refers ominously to this century's first major epidemics, of



Wizards, Aliens and Starships

Charles L. Adler PRINCETON UNIV. PRESS (2019)
Physicist Charles Adler tracks his own field and maths through science-fiction tropes to separate the plausible from the impossible. The shape-shifting transfiguration spells in J. K. Rowling's Harry Potter series, for instance, pose problems related to conservation of mass.



Gene Machine

Venki Ramakrishnan ONEWORLD (2019)
This scientific memoir by UK Nobel laureate and Royal Society president Venki Ramakrishnan is invitingly witty. He gives a frank account of the race to demystify the ribosome (the cell's protein factory), and the highs and frustrations of scientific success (see G. Ferry *Nature* **561**, 32; 2018).

SARS and Ebola, as “dress rehearsals”. Although many people espouse health care for all, our globalized economic system militates against it — because profits are rarely invested where they were extracted — and we still seem to think that borders will keep disease out, even though they never have. Since Snowden completed his book, the administration of US President Donald Trump has announced that an immigrant’s chances of getting permanent residence will now be linked to the burden they put on the public purse — including health-care costs. That makes it more likely that recent arrivals will avoid doctors, and infectious diseases will go undetected.

The starkest reminder that the battle is not won, however, is that only one infectious disease has been eradicated globally: smallpox. Others that those optimists of the 1960s thought would have vanished by now have been hard to dislodge — and could easily flare up again. The strife-ridden Democratic Republic of the Congo is harbouring more than Ebola. There is also a measles outbreak, and a circulating strain of polio that mutated from the live, weakened one in the oral vaccine. There have been successful local disease eradications, but they often came at a price. A sustained campaign of DDT application helped eliminate malaria from the Italian island of Sardinia by 1952, for example, but in 2001, the pesticide was banned globally under the Stockholm Convention, after it was found to be dangerous to wildlife and the environment.

For Snowden, the lesson from more than 50 years of such experiments — successes and failures — is that eradication is most likely to work when doctors, politicians, drugmakers, the media and citizens work together. *Salus populi suprema lex*, he reminds us: public health must be the highest law. He has preached that message to generations of Yale undergraduates, and repeats it in this book. The risk is only that he is preaching to the converted. ■

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HISTORY OF TECHNOLOGY

Shadowed light

David E. Nye examines volumes on the complex history of lighting technologies and a great inventor.

Beyond steam engines and power blooms, the Industrial Revolution spawned innovation in artificial lighting — for city streets, lighthouses, railway carriages and mills. Incremental improvements, from whale oil to gas, kerosene and electric carbon-arc technology, culminated in 1879 in a practical incandescent light bulb created by prolific US inventor Thomas Edison. These advances were no straightforward march of progress, as two books — Jeremy Zallen’s *American Lucifers*, and *Edison* by the late Edmund Morris — reveal.

American Lucifers begins a century before Edison’s birth, in 1750. Zallen, a historian, explores the human costs of artificial lighting from then until 1890, concentrating on

American Lucifers: The Dark History of Artificial Light, 1750-1865

JEREMY ZALLEN

Univ. North Carolina Press (2019)

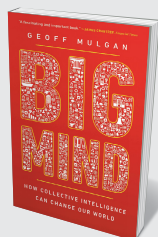
Edison

EDMUND MORRIS

Random House (2019)

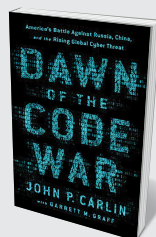
people producing and using fuel in the United States, and their links to South America, Britain and the Caribbean. Viewing energy in terms of class, he examines the fate of whalers, enslaved people distilling pine resin to make turpentine, children in match factories, petroleum refiners and miners of coal and copper.

The international networks he examines are convoluted. Jewish candle-makers in



Big Mind

Geoff Mulgan PRINCETON UNIV. PRESS (2019)
Innovation specialist Geoff Mulgan’s timely work draws on philosophy and computer science to explore collective intelligence: how combining human and technical abilities could help to tackle everyday problems, along with large-scale challenges in public health and climate change.



Dawn of The Code War

John P. Carlin & Garrett M. Graff PUBLICAFFAIRS (2019)
This cautionary insider story by security strategist John Carlin and journalist Garrett Graff examines targeting of US interests in cyberspace. From election hacking to terrorist recruitment, they provide legal insight into the risky situation facing the United States online.

Rhode Island, he argues, were culpable for the exploitation of workers who used their candles in Caribbean sugar plantations, New England cotton mills and Pennsylvania coal mines. Later, coal from those mines fed steam engines that powered electric lights. The candles themselves were made using either whale oil or tallow from livestock — cattle and hogs that “until the 1930s were mostly raised by farmers using kerosene lamps”. Zallen’s case studies also range over Argentinian slaughterhouses, phosphorus-match factories in Liverpool, UK, and a Montana copper mine.

The benefits of artificial light get short shrift. The “whole electric edifice”, Zallen argues, was predicated on “a century of steadily industrializing slave labor” along with the exploitation of women and children who, although not enslaved, worked at best for starvation wages. Yet such assertions oversimplify. In the nineteenth century, real wages in the United States increased. Factories demanded literacy and numeracy, which is one reason children were compelled to attend school. Nor is women’s history during this era one purely of exploitation and “rigid expectations”, as the spread of women’s colleges and the growing suffrage movement reveal.

In arguing that electrification was dangerous for miners, Zallen fails to acknowledge that, after around 1890, electric light proved safer in mines than candles. Electric-fan ventilation removed explosive gases, and alarms and telephones improved safety. But such technologies did not necessarily raise wages, and they did lead to redundancies.

Zallen is right to stress the human costs of resource extraction and to see technologies as ideological by implication and often oppressive in use. Energy historians need to integrate labour with invention and entrepreneurship, and *American Lucifers* contributes valuable perspectives. However, this well-written work comes close to reducing a complex transition between energy regimes into a simpler story of class struggle.

The packed narrative shows that the mid-nineteenth-century world into which Edison was born was not simply a prelude to electrification. But Zallen mistakenly dismisses the inventor as an “electric booster”, when he was actually well acquainted with the energy world of candles, coal and class conflict. Morris’s view of Edison is more nuanced. Known for his trilogy on US president

Theodore Roosevelt, Morris follows an unusual chronology, proceeding in reverse from Edison’s death in 1931. Thus, Edison’s final three decades, when important inventions tapered off, precede his spectacular triumphs.

Born in 1847 in rural Ohio, and moving to Michigan as a child, Edison had little schooling before he became a telegrapher at 15. He learnt how the telegraphy system worked, and became an inventor, ultimately based in New Jersey. At 30, he had improved telegraphy, the telephone and the microphone, and startled the world with the phonograph. By 1882, he and his collaborators had developed the electric bulb and the still-familiar electricity-distribution system of dynamos, wiring, fuses, sockets and wall switches.

Electric lighting outshone gas first in city

ELECTRIFICATION HAS PROVED A BOON BUT SPURRED RESOURCE EXTRACTION AND GLOBAL WARMING.

centres, stock exchanges, railway stations and prominent buildings; by 1910, it dominated street lighting. By 1940, it was on its way to today’s vast, energy-guzzling infrastructure. Morris, an engaging writer with an eye for details, explains the inventions clearly, including lesser-known technologies such as the 1877 translating embosser, which sped up telegraphic transmission. Perhaps Edison’s greatest invention was the first US industrial research lab, in West Orange, New Jersey. From 1886, this developed motion-picture equipment and a film studio; improved batteries, iron mining, cement production and phonograph recording; and found that a weed, goldenrod (*Solidago leavenworthii*), could be a domestic source of rubber.

Edison — twice married and a devoted father to six children — was more devoted to the lab than to domestic life. Invention was a collective process, as the thousands of

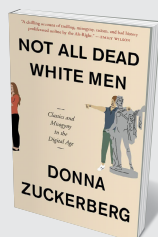
collaborative notebooks held at West Orange attest. His relationships with pioneering electrical engineer William Hammer, his chief experimental assistant Charles Batchelor, and others were essential to Edison’s success, but in later life he became more of a loner.

Like many inventors, he proved poor at business. Like many a self-made man, he had little sympathy for workers in the difficult 1890s. And like many founding entrepreneurs, he resisted delegation. At his death, his famous laboratory was left moribund and leaderless. Edison had long since lost control or even partial ownership of his electric-light interests, which financiers submerged in the General Electric company. He let major inventions, such as the phonograph and motion pictures, languish, but poured resources into quixotic projects — notably, a New Jersey iron mine, to the despair of family and associates. By telling Edison’s story in reverse, Morris downplays these accumulated failings, in a riches-to-rags narrative that explores how individual creativity emerges.

Morris’s treatment is detailed but flawed. Edison’s relationship with the US car magnate Henry Ford was more important than Morris credits: both grew up in the hinterlands of Detroit, Michigan, and they held similar convictions. Edison’s racism is only gingerly mentioned. Some fascinating letters to Edison, including several from the escape artist Harry Houdini, might have been included. But, faced with five million pages of documents, Morris had to omit much. The structure also inhibits retrospective summaries.

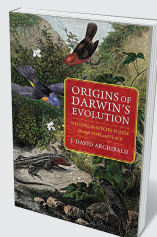
Electrification has proved a boon — but spurred resource extraction, light pollution and global warming. As we face another great transition, from fossil fuels to alternative energies, Zallen’s narrative is timely — echoing in the high human and environmental costs of dramas playing out in Nigerian oilfields and the smog of Indian cities. Meanwhile, Morris’s portrait of an energy revolution that was eagerly embraced, yet took more than half a century, leaves us hoping that rendering Edison’s system sustainable will not take as long. ■

David E. Nye is professor of US history at the University of Southern Denmark in Odense. His publications include *Electrifying America*, *When the Lights Went Out* and *American Illuminations*. e-mail: nye@sdu.dk



Not All Dead White Men

Donna Zuckerberg HARVARD UNIV. PRESS (2019)
With the proliferation of anti-feminist rhetoric online, the extreme right is using ancient philosophy to boost its credibility. As Stoic ethics moves from lecture halls to Reddit, classicist Donna Zuckerberg exposes this misappropriation, meant to enforce the concept of male superiority.



Origins of Darwin's Evolution

J. David Archibald COLUMBIA UNIV. PRESS (2019)
Biologist David Archibald examines an unsung hero of Charles Darwin’s evolutionary theory: historical biogeography, the natural history of species in time and place. Archibald invites us to enrich our understanding through Darwin’s ideas on species evolution in different regions.

The ocean re-imagined

Two books offer urgent takes on the state of the seas. Boris Worm lauds both.

On a calm day, the ocean can resemble a vast mirror. Peering over the side of a boat, we might see ourselves reflected; what lies beneath is hidden.

In *Neptune's Laboratory*, environmental historian Antony Adler takes this observation as a leitmotif. The ocean, he writes, is “an ideal screen for human projections of fear and hope”. In his entertaining, readable history of marine science, the author shows how humanity’s fundamental ignorance about the sea has often fed fantastical ideas of it as saviour, battlefield, playground, storehouse, angry beast or hapless victim. Throughout, he reminds us, we have struggled to see Earth’s oceanic reaches for what they truly are: the face of our changing planet.

That recognition of a rapidly, irreversibly altering ocean permeates every page of Callum Roberts’s scientific memoir, *Reef Life*. He takes a deep dive into his own four-decade career as a marine ecologist, chronicling the splendour, complexity and vulnerability of coral reefs. Both books left me with a sense of urgency about the ocean’s perilous state, but also with renewed hope that we have reached a turning point in our collective relationship with it.

Through his eventful tale, Adler recounts how scientific inquiry into the ocean began in earnest less than 200 years ago, and how the findings of myriad individuals gradually coalesced into an interdisciplinary field: oceanography. Adler discusses many colourful personalities. For instance, the “Prince of Ocean Science” — Albert I of Monaco — funded the early expansion of oceanography in Europe in the late nineteenth and early twentieth centuries. And French under-sea explorer Jacques Cousteau popularized the ocean through film and television.

Two opposing trends feature in *Neptune's Laboratory*. On the one hand, marine scientists such as Albert I have often worked hard to forge international collaborations, recognizing the ocean as a common good

Neptune's Laboratory: Fantasy, Fear, and Science at Sea

ANTHONY ADLER
Harvard University Press (2019)

Reef Life: An underwater memoir

CALLUM ROBERTS
Profile (2019)

without clear boundaries, too large for any one nation to grasp. Others have tended towards nationalism and parochialism, seeking to carve up the ocean for political, economic or military gain. One such was US mechanical engineer Carroll Livingston Riker. In 1912, he unsuccessfully lobbied the US Congress to spend US\$190 million on a 320-kilometre jetty, intended to redirect the Labrador Current and Gulf Stream, warming the Arctic to produce ice-free harbours.

A RICHER CONTEXT

Personally, I found Adler’s study enlightening. I have rarely seen the history of oceanography taught in any comprehensive way in marine-science classes, either ones I have taken or those I have given. Reading the book, I came to see my own journey as a marine scientist in a much richer context, tightly interwoven with the personalities, philosophies and storylines that dominate the field’s history.

Of particular resonance, for example, is the transformation in our understanding of oceanic limits over the past 150 years. All too recently seen as an inexhaustible, boundless resource — bolted to the hubristic sense that the ‘seven seas’ could be controlled and conquered — Earth’s ocean ecosystems are now being recognized as fragile and in decline. More than 90% of fish stocks are fully or overexploited, and climate change is compromising the ocean’s oxygen supply and productivity. Adler quotes oceanographer Sylvia Earle: “nothing else will matter if we fail to protect the ocean. Our fate and the ocean’s are one.”

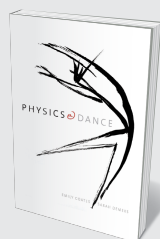
That final narrative and call to action largely dominates Roberts’s *Reef Life*. This is a deeply personal journey of a marine scientist and conservationist whose working life takes place in the oceans of the Anthropocene — the geological epoch proposed to mark humanity’s dominant impact on planet Earth. Throughout his travels, from the Red Sea and the Gulf to remote atolls in the Pacific, Roberts witnesses the slow disintegration of coral reefs from the combined impacts of land-based pollution, habitat destruction, overfishing and ocean warming.

Casting coral reefs as a canary in the coal mine, Roberts warns of the transformative effects of climate change and other human stressors on oceans. Part odyssey, part ‘Reef Ecology 101’, Robert’s witty and vivid descriptions of the underwater world are meshed with the most up-to-date findings, which suggest that “reefs cannot be climate-proofed and they can’t hide from climate change”. Without drastic emissions reductions, we are indeed facing a world without coral.

BATTERED REEFS

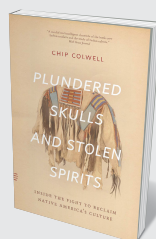
Some of his imagery is haunting. He compares the battered and bleached reefs he has witnessed through his career to ailing parents gradually robbed “of mobility, independence and even dignity”. I can relate to Roberts’s painful transition from bright-eyed student fascinated by marine biodiversity to chronicler of decline and advocate for a saner relationship with the sea. Many in our field have watched what we love disappear before our eyes, but few have recounted it in such a public way.

Both books reveal geographical limitations. *Neptune's Laboratory* is almost exclusively set in Britain, France and the United States. Yet Adler points out that Russia’s marine-science history is understudied and underappreciated, partly because much of it happened under a veil of secrecy



Physics and Dance

Emily Coates & Sarah Demers YALE UNIV. PRESS (2019)
New York City Ballet dancer Emily Coates and CERN physicist Sarah Demers interweave science and choreographic research in this unique study. That fusion, they show, can enrich understanding of both fields. An insightful *pas de deux* between physics and ballet.



Plundered Skulls and Stolen Spirits

Chip Colwell UNIV. CHICAGO PRESS (2019)
The fight to reclaim Native American culture goes on. Here, curator Chip Colwell sensitively explores repatriation of human remains held in museum collections, including the scalp of a Native American murdered by the US Army in Colorado’s 1864 Sand Creek massacre.



during the cold war. Likewise, members of non-European maritime cultures including Polynesians and Inuit people have long built a deep understanding of the ocean, and framed their relationship to it in different, and possibly more holistic ways, but these are not mentioned here.

And in *Reef Life*, Roberts's global travels are viewed very much through his own cultural lens. There is little perspective on the lives and views of the local people who are most affected by the changes he chronicles.

Yet these books both offer a valuable reminder that we are at a crossroads in our collective relationship to world oceans. Humanity now has an unprecedented awareness of what the ocean does for us, such as regulating Earth's climate through heat

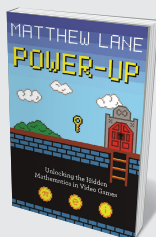
NOTHING ELSE WILL MATTER IF WE FAIL TO PROTECT THE OCEAN.

absorption and carbon sequestration. At the same time, we increasingly understand how human impact is disrupting ocean systems and threatening the abundance of ocean life. With that understanding comes the

opportunity to allow marine ecosystems to recover, as detailed, for example, in the 14th United Nations Sustainable Development Goal, 'Life Below Water'.

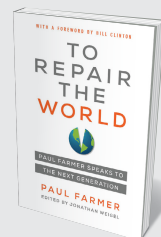
I wondered, after reading *Neptune's Laboratory* and *Reef Life*, whether we are on the cusp of re-imagining the ocean once more when we dive through that mirroring surface to comprehend its depths. As marine scientists Jane Lubchenco and Steven Gaines (*Science* **364**, 911–912; 2019) have put it: "The ocean is not too big to fail, nor is it too big to fix. It is too big to ignore." ■

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Power Up

Matthew Lane PRINCETON UNIV. PRESS (2019)
Passionately nerdy mathematician Matthew Lane reveals how video games could be useful teaching aids. He explores the not-so-hidden maths in the classics — for example, using *Mario Kart* turtle shells to elucidate the study of pursuit and evasion trajectories. Enlightening.



To Repair The World

Paul Farmer UNIV. CALIFORNIA PRESS (2019)
This heartfelt manifesto calls for the next generation to tackle challenges ranging from climate change and health-care access to essential human rights. With humour and passion, medical anthropologist Paul Farmer advocates a cure for society and the planet.



The Crowd and the Cosmos: Adventures in the Zooniverse
CHRIS LINTOTT
Oxford University Press
(2019)

century, the US-based National Audubon Society has relied on an army of volunteers to count birds across North America each December. And since 1911, the American Association of Variable Star Observers in Cambridge, Massachusetts, has enlisted a network of predominantly amateur astronomers to collect nearly 40 million observa-

tions of stars that have fluctuating brightness. That endeavour has provided valuable insights into stellar lifecycles and distances to galaxies. SETI@home, launched in 1999, meanwhile uses the idle time on millions of home computers to search for radio signals from extraterrestrial civilizations.

In recent years we've seen an explosion in new opportunities, in fields such as cetology, linguistics and space archaeology. The SciStarter website (<https://scistarter.org>), for example, currently aggregates thousands of citizen-science projects and events from around the world.

One researcher who has been at the forefront of the phenomenon for more than a decade is Chris Lintott, professor of astrophysics at the University of Oxford, UK, and a presenter of *The Sky at Night*, the BBC's monthly astronomy television show. In his new book, *The Crowd and the Cosmos*, Lintott tells the story of the most ambitious, successful citizen-scientist initiative so far: Zooniverse, which boasts 1.6 million registered users. Through its platform, people can, in effect, become research assistants to scientists working on projects in a profusion of fields. What these have in common are large quantities of data and a need for human eyes, ears and brains to help make sense of them.

Zooniverse emerged from the success of Galaxy Zoo, Lintott's first citizen-science venture. In 2007, faced with the daunting task of classifying millions of galaxies imaged by the Sloan Digital Sky Survey telescope in New Mexico, Lintott and colleagues solicited help through a brief slot on BBC Radio's morning

ASTRONOMY

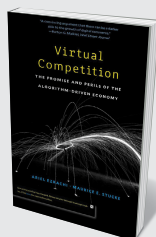
Putting the 'I' in science

Chris Lintott's chronicle of the booming citizen-science project Zooniverse is inspirational, finds **Michael West**.

Citizen science is booming. Today, anyone with a computer or a smartphone can participate in research in astronomy, oceanography, medicine, zoology and beyond. With such studies no longer the exclusive realm of an elite few, communities of amateur and professional scientists have joined together to

democratize the discipline, harnessing mutual enthusiasm and collective wisdom to gather and analyse data.

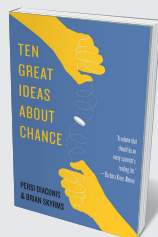
As a research tool, crowdsourcing is nothing new. Charles Darwin maintained a voluminous correspondence with fellow naturalists and lay enthusiasts in the Victorian era. For more than a



Virtual Competition

Ariel Ezrachi & Maurice E. Stucke HARVARD UNIV. PRESS (2019)

From price-comparison algorithms to phone operating systems, technology has altered competitive commerce. Lawyers Ariel Ezrachi and Maurice E. Stucke question the democratic consequences of this dual-edged power.



Ten Great Ideas About Chance

Persi Diaconis & Brian Skyrms PRINCETON UNIV. PRESS (2019)

Philosopher Brian Skyrms and mathematician Persi Diaconis weave the foundations of probability with economics and history in this engrossing discourse. A must-read for anyone interested in the dissection of probability. **Mary Craig**