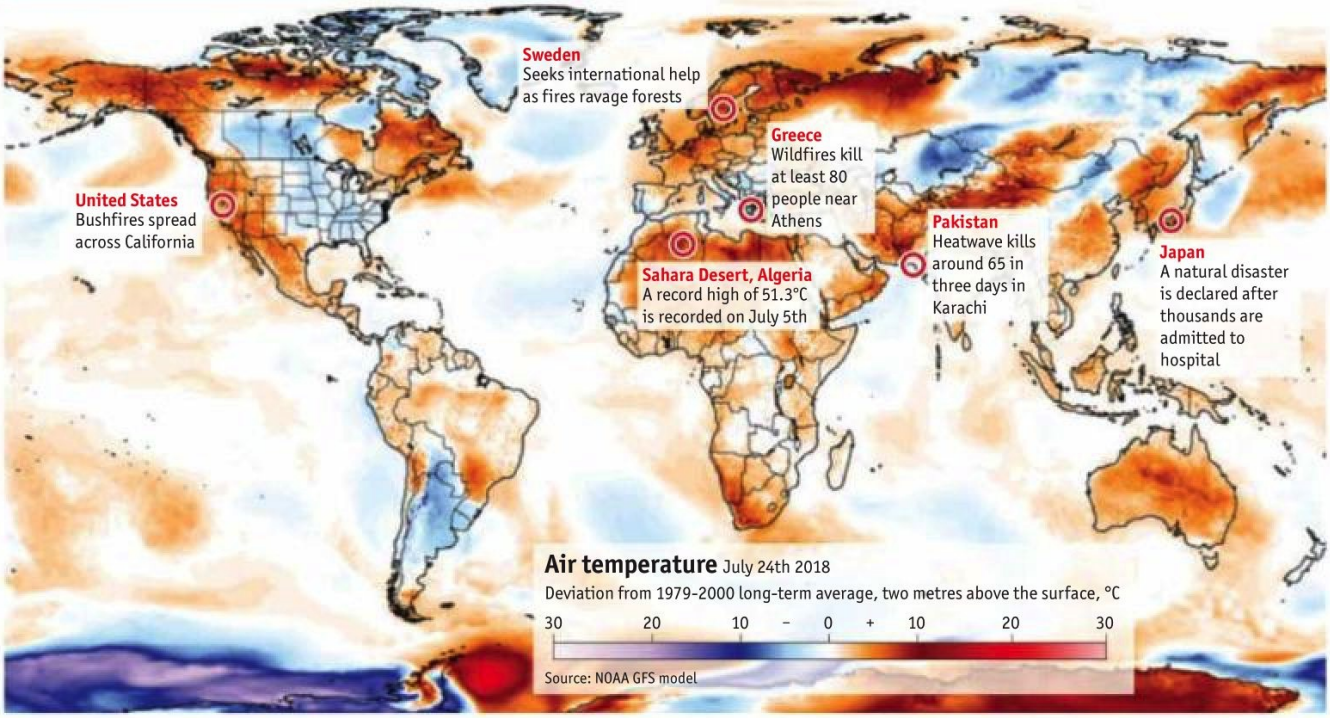

Climate change

The long hot summer

Greece is burning, Japan is in a state of emergency. Heat is causing problems across the world and, worryingly, such weather events may become more common

SODANKYLA, a town in Finnish Lapland just north of the Arctic Circle, boasts an average annual temperature a little below freezing. Residents eagerly await the brief spell in July when the region enjoys something akin to summer. This year they may have wished for a bit less of it. On July 18th thermometers showed 32.1°C (89.8°F), which is 12°C warmer than typical for the month and the highest since records began in 1908. But Sodankyla is not the only place that is sizzling.

Wildfires have killed at least 80 people near Athens. Sweden has suffered a rash of forest fires, sparked by unusually hot and dry weather. Britain and the Netherlands look more parched than they did in 1976, one of the driest summers on record. Some 80,000 hectares of forest are burning in Siberia. Japan has declared its heatwave to be a natural disaster. On the night of July 7th, the temperature in downtown Los Angeles did not drop below 26.1°C. That seems positively nippy compared with Quriyat in Oman, which recorded a 24-hour minimum temperature of 42.6°C a few days earlier.

Heatwaves bring problems, especially in the developing world. Crops are ravaged, food spoils and workers become less productive. Studies have linked rising temperatures to violent crime and civil strife. And heat can kill on its own. In 2003 more than 70,000 Europeans may have died as a direct result of an infernal summer.

That was seen as a once-a-millennium heatwave at the time. By comparison, notes Geert Jan van Oldenborgh of the Royal Netherlands Meteorological Institute, outside of northern Europe the summer of 2018 looks unremarkable, so far, in terms of temperature. The Netherlands, for instance, can expect scorchers every couple of years. Except, he adds, a century ago that might have been once every 20 years. A few years back, a team led by Peter Stott of Britain's Met Office calculated that, by 2012, summers like the one in 2003 would be expected to occur not every 1,000 years but every 127.

Hot times ahead

No consequence of global warming is as self-evident as higher temperatures. Earth is roughly 1°C hotter today than it was before humanity started belching greenhouse gases into the atmosphere during the Industrial Revolution. If this so-called thermodynamic effect were all there was to it, temperatures now considered unusually hot would become more typical and those regarded as uncommonly cold, uncommoner still. But climate being a complicated thing, there is more to it.

Weather patterns can change because the colder poles warm faster than balmier lower latitudes. As the thermal difference between the two diminishes, so does the velocity of the jet stream, a westerly wind which blows at an altitude of around 10km. That means the weather it carries can stay in place for longer. Sometimes, it offsets the thermodynamic effects, leading to cooler temperatures than might be expected. Often, it amplifies them.

When and by how much is a matter of hot debate among climate scientists. It is hard to pin any particular heatwave, drought or flood on the effects of man-made pollution. Freak events happen; the highest temperature ever recorded on Earth was 56.7°C in Death Valley, California, but that was on July 10th 1913, when concentrations of carbon dioxide in the atmosphere were much lower.

By using clever statistics to compare the climate's actual behaviour with computer simulations of how it might have behaved in the absence of human activity, researchers can calculate how mankind has made a ▸▸

particular weather event more likely. The first such study, co-authored by Dr Stott in 2004, found that the likelihood of the 2003 European summer had doubled as a result of human activity. Since then similar "event attribution" research has burgeoned. A year ago Carbon Brief, a web portal, identified a total of 138 peer-reviewed papers in the field, covering 144 weather events. Of 48 heatwaves, 41 contained humankind's imprint in the data.

More studies have appeared since then. World Weather Attribution, a website run by Dr van Oldenborgh and Friederike Otto of Oxford University, posts a new one practically every month. Besides scrutinising past weather, many of the studies look ahead—in particular at how the likelihood of future extreme events changes depending on how seriously countries take their commitment in Paris in 2015 to limit global warming to "well below" 2°C relative to pre-industrial levels (and better yet, to no more than 1.5°C).

The picture that emerges is bleak. One study, published in June by Andrew King of the University of Melbourne and his colleagues, found that the number of Europeans who can expect to witness a temperature above the current record, wherever they happen to live, would double from 45m today to 90m if the planet warmed by another 0.5°C or so on top of the 1°C since the 1880s. If, instead of 0.5°C, it warmed by 1°C, the figure would rise to 163m.

This looks even more alarming if you factor in humidity. Human beings can tolerate heat with sweat, which evaporates and cools the skin. That is why a dry 50°C can feel less stifling than a muggy 30°C. If the wet-bulb temperature (equivalent to that recorded by a thermometer wrapped in a moist towel) exceeds 35°C, even a fit, healthy youngster lounging naked in the shade next to a fan could die in six hours.

Greece smoulders

At present, wet-bulb temperatures seldom exceed 31°C. In 2016 Jeremy Pal of Loyola Marymount University and Elfatih Eltahir of the Massachusetts Institute for Technology found that if carbon emissions continue unabated, several cities in the Persian Gulf, including Abu Dhabi and Dubai, could exceed wet-bulb levels of 35°C by the end of the century. A follow-up study reckoned that, by 2100, parts of South Asia, which is much more populous than the sheikhdoms and a lot poorer, could suffer a wet-bulb level of 34.2°C every 25 years.

The effects could be devastating. The World Bank has warned that rising temperatures and changing monsoons could cost India 2.8% of GDP per person by 2050 and affect the living standards of 600m Indians in areas identified as hot spots. The global cost of productivity lost to heat has been estimated at $2trn by 2030.

The toll on human lives is hard to imagine. But at least people can learn from past mistakes. Thanks to better government responses, particularly in care for the elderly, in 2012 Europe survived a summer hotter still than 2003 with fewer casualties. As Indians get richer more will be able to afford air-conditioning; even those in shantytowns can paint their corrugated-iron roofs white to reflect sunlight. If only the world could take in a similar lesson about the importance of stopping climate change in the first place. ■

AIDS

It ain't over till it's over

AMSTERDAM

A certain weariness is entering the war on AIDS. Wrongly so

"HOW much does the world want to eliminate AIDS?" That was the question hanging over the 22nd meeting of the International AIDS Society (IAS), which opened in Amsterdam this week. "How much" is a phrase with two possible interpretations: emotional desire and financial willingness.

The IAS meetings, which began in 1985 as workshops for scientists and clinicians, quickly attracted activists and celebrities. Bureaucracies followed. In 1996 UNAIDS, an agency dedicated to dealing with the illness, was set up. In 2002 the Global Fund, a public-private partnership, was created to raise and spend money on AIDS, and on tuberculosis and malaria. In 2003 America's PEPFAR, the President's Emergency Plan For AIDS Relief, got going. Combined with the efforts of health services, these organisations have helped turn things around. The annual death rate from an illness that has, so far, killed 35m people, has fallen from a peak of 1.9m to 900,000. New-infection rates have dropped from 3.4m to 1.8m. And 22m people are now on antiretroviral drugs (ARVs).

This is all cause for celebration. But there is also a sense that things are fraying at the edges. Targets are not being met. Money is not arriving as expected. A scandal at UNAIDS, involving allegations of sexual harassment by a former deputy director (who denies wrongdoing), is casting shadows. And scientific progress is patchy.

The peak of AIDS hubris seemed to come at the IAS meeting in Melbourne in July 2014. Michel Sidibé, UNAIDS's director, announced the 90-90-90 aspiration—that by 2020, 90% of those infected will know they have the disease, 90% of those will be on ARVs, and 90% of them will have their virus levels suppressed to the point of clinical negligibility. This was ambitious enough. But in December of that year, the UN itself topped it by proposing an "end to AIDS" by 2030.

Neither of these things is going to happen. There was good news in Amsterdam, that Namibia has just reached its 90-90-90 targets. But in Africa this puts it alongside only Botswana and eSwatini (as Swaziland now wants to be known). In the world as a whole the numbers are 75-79-81, up from 67-73-78 in 2015, so there is a long way to go. As to ending AIDS, it is not even clear what that means—short of eradicating HIV from someone's body. The UN aspired to "ensure that HIV investments increase to $26bn by 2020, including a quarter for HIV prevention". That, too, looks unlikely. Since 2014, only in 2016-17 did expenditure on AIDS rise, by 8% to $21bn.

More please

To cry "more money" is the easiest thing in the world. But the AIDS campaign really does need more if it is to succeed. Each life saved by putting someone on ARVs is a charge on the future until that person dies, which will probably be in several decades' time. The fact that an untreated individual may go on to infect others means that a dollar spent now really is worth more than one spent in the future.

This is not necessarily a call for more foreign aid. As Mark Dybul, a former head of both PEPFAR and the Global Fund, told ▸▸

the meeting, though truly poor countries do depend on such aid for their AIDS programmes, somewhat richer ones could afford to fill the gap from the pockets of their own taxpayers, but choose not to do so.

As to what the money should be spent on, finding those infected and treating them remains top of the list. But increasing effort needs to be devoted to prevention. Here, PEPFAR is leading the way. As Deborah Birx, its head, observes, her organisation has supervised and paid for the circumcision of 15m African men. Circumcision is a cheap and effective way of reducing a man's risk of HIV infection (the foreskin of the penis is rich in the type of cells the virus breeds in). PEPFAR has also had measurable success with projects aimed at girls and young women, particularly by paying for them to stay in school longer than they otherwise would have. This improves both their confidence and their earning power. And that makes them less susceptible to the blandishments of "sugar daddies" who offer enhanced lifestyles in exchange for sex.

The wild card, however, is pre-exposure prophylaxis (PREP). This employs a combination of two well-established ARVs, tenofovir and emtricitabine. Ingested before intercourse, it stops HIV taking hold in the first place. Trials in rich countries have shown that it works extremely well. The question is how to deploy it in those parts of the world, particularly Africa, where the epidemic is rife.

Deciding who should get ARVs is easy. Anyone who is infected with, or has been exposed to, HIV is a candidate. Deciding who should be offered PREP is trickier. Obvious target groups include prostitutes, injecting drug users and the promiscuous.

Gratifyingly, as Peter Godfrey-Faussett, a scientific adviser to UNAIDS, observes, in trials in rich countries people identified as being in need of PREP tend to come forward willingly. Whether that will be true in Africa remains to be seen, though studies in South Africa suggest that, with a little bit of encouragement, many prostitutes quickly see the advantages. Although Truvada, the original, proprietary version of the combination, is expensive, generic equivalents are now available for about the same cost, a dollar or less a pill, as the ARVs used for treatment. According to Dr Godfrey-Faussett, mathematical modelling suggests that aiming PREP at the 3m people most in need of it should therefore be a cost-effective way of slowing the virus's spread.

That is just as well, for other hopes of yesteryear are proving slow to materialise. Cervical rings doped with dapivirine, which early trials suggested may be almost as effective for women as circumcision is for men, have yet to obtain regulatory approval. The idea of effecting a true cure by using a drug to activate HIV in those bodily tissues where it hides, and then priming the immune system to recognise and kill it, was knocked back by a study presented to the meeting by researchers from Imperial College London, which showed no effect. And, though large-scale trials of a vaccine developed by Johnson & Johnson, a drug company, are planned, the road to an effective vaccine is littered with the corpses of trials that have got so far and no further.

Back, then, to the tried and trusted: ARVs. Though 90-90-90 will not be achieved by 2020, this will not be the first time a target has slipped. But achieved eventually, and then o'erleaped, it must be. If the world really does want to eliminate AIDS, governments, both rich and middle-income, need to be cajoled into paying now. Paying later will be dearer. ■

Planetary science

Life in the freezer?

A large underground lake has been discovered on Mars

THERE is no shortage of water on Mars. Astronomers reckon that at least 5m cubic kilometres of ice is locked up beneath the planet's dusty regolith. Whether any of it is liquid is a trickier question.

In the 19th century Percival Lowell, an American astronomer, popularised the idea that there were canals criss-crossing the Martian surface, carrying water from the poles to feed a thirsty desert civilisation. Better telescopes, and the arrival of space probes in the 1960s, revealed the canals as a mirage. Mars's frigid temperatures, and the feeble pressure exerted by its wispy atmosphere, mean that no liquid water could survive on the surface for long. Nevertheless, in 2006 seasonal changes in a pair of Martian craters led astronomers to speculate that small amounts of liquid water might be bubbling briefly to the surface in the Martian summer. Over a decade later, though, the case remains unproven.

Now the question seems to have been settled in spectacular style. In a paper published in *Science* on July 25th, Roberto Orosei of the National Institute for Astrophysics in Italy, and his colleagues, report the discovery of a lake of liquid water 20km across, buried 1.5km beneath Mars's surface, close to its southern polar ice cap. The lake seems to be a Martian cousin of familiar Earthly features such as Lake Vostok, a subterranean lake in Antarctica.

The team used radar waves to peer beneath the planet's surface. Different materials reflect the radar waves with different intensities, allowing scientists to detect what is there. The team used a radar sensor on Mars Express, an orbiting probe, to survey a 200km-wide area of Planum Australe, the planet's southern polar plain. The sensor lacked the sensitivity of those used on Earth, but after more than three years of collecting data Dr Orosei felt confident enough to claim that water was the only explanation for the team's readings.

That the lake is underground is key to its survival, says Susanne Schwenzer, a planetary scientist at the Open University, in Britain, who was not involved with the work. As in Antarctica, the thickness of the ice sheet insulates the water from the subfreezing temperatures on the planet's surface. At the same time, the pressure exerted by the ice lowers the water's melting point below 0°C. And if the water is spiced with salts of sodium, magnesium and calcium—all of which have been found on Mars—its melting point could drop still further.

The discovery is exciting from a purely geological point of view. But the biggest question is whether anything might be alive down there. There is plenty of life in Lake Vostok, even though it has been cut off for tens of millions of years. Mars was much warmer and wetter in the past. Fossilised river deltas and lakebeds are visible on the planet's surface. If microbial life did arise on Mars in the distant past, it might be clinging on in just such an isolated pocket of water below the planet's surface.

Perhaps. Mars has been dry for around 3.8bn years. That is a long time for a life-preserving lake to have endured. Dr Schwenzer points out that Mars's axis has wobbled sufficiently over the planet's history that the polar caps have wandered widely over its surface. On the other hand, the existence of one such lake suggests there may be more. Alien hunters have, in recent years, been shifting their attentions to the icy moons of Jupiter and Saturn, which sport oceans beneath their surfaces. The discovery of liquid water on Mars will shift some of that attention back. ■

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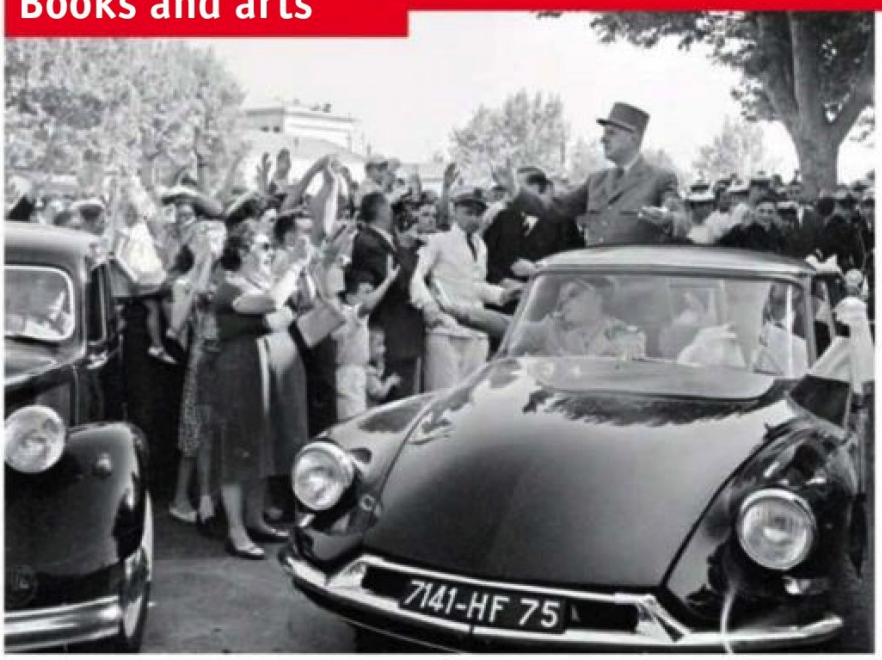

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De Gaulle

Jupiter's father

France's wartime leader laid the foundations for Emmanuel Macron's presidency

De Gaulle. By Julian Jackson. *Belknap Press; 928 pages; $39.95. Published in Britain as "A Certain Idea of France: The Life of Charles de Gaulle"; Allen Lane; £35*

WHEN Emmanuel Macron posed for his official presidential portrait last June, he placed on the desk beside him an open leather-bound volume of Charles de Gaulle's "Mémoires de Guerre". For a former Socialist minister, who had campaigned for office as "neither on the left nor the right", the symbolism was arresting. This was a 39-year-old president claiming to be, if not quite *le général*'s heir, then at least the modern advocate of the Gaullist vision which continues to animate the nation: the quest for greatness.

Fully 60 years after de Gaulle emerged from retirement to found the Fifth Republic, and nearly half a century after he quit the presidency following defeat in a referendum, he remains a towering figure in the French imagination, as Julian Jackson, a British historian, chronicles in his compelling and painstakingly documented biography. He has over 3,600 roads in France named after him, more than Louis Pasteur or Victor Hugo, as well as the main airport in Paris, an aircraft-carrier and the roundabout at the Arc de Triomphe.

The great myth-maker is still cited in polls as the nation's favourite political leader of all time. Proud, pesky and bloody-minded to his wartime allies, a visionary who failed in later years to read the shifting social mood of the 1960s, de Gaulle is remembered above all as a heroic figure: a leader who refused to admit defeat, and persuaded the French that their true spirit, uncrushed by submission to Nazi Germany, would ultimately prevail. He secured France a permanent seat at the UN Security Council, an independent nuclear deterrent, a pioneering role in the forging of post-war Europe and begrudging global respect.

De Gaulle's unwavering belief in his ability to embody the nation, and his modelling of a constitution topped with a near-monarchical presidency, also shaped the heavy expectations—and the disappointments—that have surrounded his successors ever since. Some of them explicitly embraced the Gaullist legacy, notably Jacques Chirac, who denounced the American "hyperpower", urged a counterbalancing multi-polar world, and relished the strong, centralised presidency. Others, or more accurately François Hollande, flinched at grandeur. After the whirlwind years under Nicolas Sarkozy in 2007-12, voters were at first drawn to the "normal" presidency that Mr Hollande sought to embody, as he headed off on holiday by train and adopted the forgettable posture of a middle manager. But the French soon realised that they like their head of state to look grand after all.

It was while he was working as an adviser to the normal President Hollande that Mr Macron began to develop his theory of a "Jupiterian" presidency. The loss of the king and the post-revolutionary Terror, he argued, had created an "emotional, imaginary collective void" at the centre of the French republic. This left the French feeling insecure, and in need of a leader who invested the presidency with a certain aura and mystique. If German political leadership is defined by the application of law, he contended, French society, historically structured around the Catholic church and the monarchy, needs clear vertical authority and a president who incarnates power.

The echoes of de Gaulle in all this are startling, and not only in terms of grandiose language and imperious style. The general devised a strong executive presidency in 1958, and introduced direct elections to it four years later, precisely in order to remove power from the hands of political parties and bring stability to French institutions. In 2016 Mr Macron created En Marche!, a centrist political movement, as a means of blowing up the traditional party system. He was able to defy the might of the two mainstream parties thanks to the original source of French presidential legitimacy: the direct mandate of the people, introduced by de Gaulle.

The pragmatic, well read, far-sighted, if self-important, statesman who emerges from Mr Jackson's broadly sympathetic biography comes across as a model for the current French president. De Gaulle cites Socrates, Goethe and Flaubert in his texts; Macron speaks of Hegel, Pericles and Malraux. De Gaulle, writes Mr Jackson, believed that "the leader also has to cultivate ▸▸

mystery and keep his distance while exercising a 'large dose of egoism, of pride, of hardness and of ruse'." For the general, leadership was about creating moments of national exaltation as well as exercising authority and imposing order on his country. He "exhorted the French to believe in themselves as a 'great' nation". Mr Macron seeks nothing less.

Mr Jackson is clear-eyed about his subject's flaws. Throughout the book, he carefully weighs competing views of de Gaulle's leadership, from his time as a young platoon commander during the first world war to his resignation from the presidency in 1969. De Gaulle anticipated tank warfare, was right in 1940 that the Axis powers would eventually be defeated, predicted the collapse of the Bretton Woods system and foresaw America's inability to win the Vietnam war. Yet he was wrong about much else, such as his belief in the imminence of world war in 1946-47, and his conviction that France could win its war in Indo-China. An authoritarian conservative, he was slow to see the end of empire and failed to understand the social changes sweeping through France during the 1960s. A very private man, de Gaulle was also cold, mostly humourless and prone to melancholy. He was accused variously of delusional ambition, extravagant showmanship, duplicity, pig-headedness and worse.

The great adaptor

Ultimately, though, Mr Jackson is an admirer. He sees de Gaulle's great quality as his ability to adapt to circumstance. The general left France in June 1940, his suitcases lashed to the top of a tiny plane, ultimately bound, he thought, for north Africa. But he stayed in London, where he first landed, and turned exile in suburban England into glorious resistance.

When his options narrowed, he adjusted policy, often ruthlessly. He was dubious about Algerian independence, but after an attempted coup by generals determined to cling on to the north African territory, he granted himself emergency powers and ceded it—a decision for which a swathe of the nationalist right never forgave him.

"Only during crises do nations throw up giants," de Gaulle once told a reporter. As immodest as he was frugal (he paid his own electricity bills in the presidential apartment), the wartime leader of the Free French had both the political stature and the unshakable self-belief necessary to rewrite the national narrative and secure France the respect he felt it was due. Mr Macron, who seeks to do the same, lacks the stature but has the self-belief in spades.

De Gaulle "saved the honour of France", says Mr Jackson at the end of this book. Perhaps; or maybe his real achievement was to persuade the French that they saved their own honour. ■

Adam Smith

An enlightened life

Rescuing the world's most famous economist from myth and misrepresentation

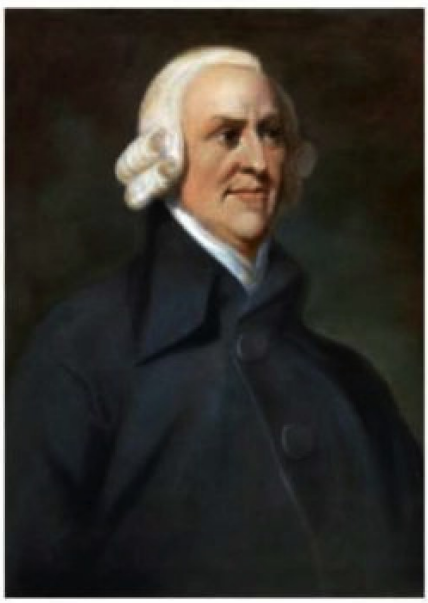
Adam Smith: Father of Economics. By Jesse Norman. *Basic Books; 416 pages; $30. Published in Britain as "Adam Smith: What He Thought and Why it Matters" by Allen Lane; £25*

MARGARET THATCHER is said to have carried a copy of the "Wealth of Nations", Adam Smith's most famous work, in her handbag. Britain's most famous economist appears on the back of £20 notes. Yet while a few stock ideas are associated with him—the "invisible hand", the division of labour, self-interest—what he actually wrote is often misinterpreted.

Jesse Norman, a British member of parliament who trained as a philosopher and is one of the Conservative Party's best brains, wants to put that right. Author of a celebrated biography of Edmund Burke, Mr Norman not only explains Smith's writings, which ranged from astronomy to colonialism, but also shows that they are still relevant today.

Smith lived at a time of great change, when the Industrial Revolution was getting going and more people were questioning the authority of religion. Scotland was in many ways a more progressive place than England, and, as a professor of moral philosophy at Glasgow University, Smith was right at the heart of it.

In the "Wealth of Nations" and his less famous work, "The Theory of Moral Sentiments", Smith expounded the benefits of these changes. His enthusiasm for free thinking set him on the path to atheism, though he did not travel as far down it as his friend David Hume did. He believed that free trade was a force for good. He applied economic concepts to new questions, such as slavery, arguing that slave labour was more expensive than waged labour, because slaves had no incentive to produce more than the bare minimum.



Smith myths dispelled

Though Mr Norman proceeds at a brisker pace, he covers much the same ground as Nicholas Phillipson did in his recent intellectual biography of Smith. And like Mr Phillipson, Mr Norman peppers his high-minded discussion of Smith's work with details about the economist's day-to-day life. Smith spent six miserable years as a student at Oxford University, where he thought the teaching far inferior to what he could get in Scotland.

Some readers will find Mr Norman's busting of Smith-related myths to be the book's most satisfying theme. Contrary to what is often assumed, the Scot did not advocate ruthless self-interest. The very first sentence of "The Theory of Moral Sentiments" reads: "How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it except the pleasure of seeing it."

Smith's notion of the "invisible hand" is also misunderstood. The term is often taken to mean that the market will always produce the best outcome. The reality is more complex. True, Smith believed in markets—and to a radical extent. But he saw many instances where markets needed to be curbed. Smith was even sympathetic to limits on interest rates charged on loans, a policy that few modern economists would support.

Mr Norman gets all this right, but he is not the first to do so. Robert Heilbroner's "The Worldly Philosophers", published in 1953, offered a fairly nuanced understanding of what Smith stood for. More recently Emma Rothschild, one of the world's best historians of economic thought, and Amartya Sen have written widely on the "uses and abuses" of Smith. Yet the book cites few of their contributions—not even a fascinating paper Ms Rothschild wrote in 1994 which explores Smith's use of the

phrase "invisible hand".

The book also does an unsatisfactory job of dealing with Smith's critics. Writers from Murray Rothbard to Joseph Schumpeter to Salim Rashid have argued that Smith's ideas are poorly thought through, even plagiarised. Mr Norman accepts that Smith's discussion of what constitutes value is confused, but he has too little time for the naysayers. He dismisses Rothbard's critique in a footnote as "manifestly unfair and inaccurate" without explaining why; Schumpeter's objections are batted aside; Mr Rashid's work is not mentioned at all. As a result the book's big claims about Smith, including that the "Wealth of Nations" is "the greatest work of social science ever written", are not convincing.

The author is on safer ground when he explains the relevance of Smith's ideas today. Economists, especially in America, increasingly worry that capitalism has become too cosy—or "rigged", as President Donald Trump puts it. Smith got there first. He fretted that the capitalists would always try to exploit ordinary people, whether by shaping regulation to their advantage or by fixing prices. "The rate of profit...is always highest in the countries which are going fastest to ruin," he argued. America's corporate-profit rate is currently at historical highs. Had regulators read more Smith, the American economy might be in better shape. ■

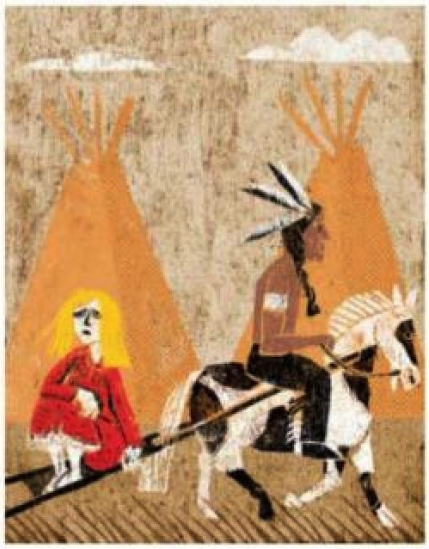
American fiction

Tragedy of the Greasy Grass

The Removes. By Tatjana Soli. *Sarah Crichton Books, 384 pages; $27*

THE United States was days from its centennial when the Battle of the Little Bighorn was fought. In June 1876 the Seventh Cavalry, led by the flamboyant General George Armstrong Custer, was vastly outnumbered in what was then Montana Territory by warriors of the Lakota and Cheyenne people; the soldiers were slaughtered to a man. The bloodbath was nicknamed Custer's Last Stand, but in truth it was the last stand for the people of the great plains of North America. Custer's death made the American government more determined to drive the country's indigenous population from their lands, and to destroy their ancient cultures.

The story of the Greasy Grass (as the battle was known by its short-term victors) and its aftermath has been told so often that it has become myth: tricky territory for a novelist. But this is not Tatjana Soli's first foray into painful history. "The Lotus Eaters", her debut novel, was set in Vietnam



during the war; "The Removes", her fourth novel, focuses not only on Custer but also on his striking wife, Libbie, and Anne, a young woman abducted by the Cheyenne as a girl of 15.

The novel switches back and forth between these three perspectives, taking its title from Anne's constant uprooting with the nomadic Cheyenne as they move camp through the seasons, European settlers at their backs; it also alludes to the eventual removal of the native people from their land. Ms Soli's Custer arrives out west in the summer of 1874, fully aware of the nature of the bargains being struck. The sacred Black Hills have been "promised to the Sioux in perpetuity, in this case defined as until the government had other ideas for its use". Ms Soli never minimises the genocide, but all the characters emerge as victims of the notion of progress.

That the conclusion of the novel is foreordained does nothing to diminish its tension. Plot depends on character: the author brings to life both Custer and Libbie—who travelled with him almost everywhere after their marriage during the American civil war. Anne's story is wholly fictional, but influenced by "captivity" narratives published in America from the 17th century onwards. Perhaps because Ms Soli has most licence with Anne, it is her tale that stays with the reader most keenly; it is through her that the author is able to explore most fully European and native American identity.

Ms Soli honours the history she uses to tell her tale by the care she takes with her storytelling, and by the way she laces through the book documents and photographs from the era. She does not shy away from violence, but nor does she revel in it; most notably, the climactic battle is barely described. But by that point the reader's imagination has been well-schooled by the author's art: the horror is more vivid for being created in the mind's eye. ■

Ecology

The rise and fall of bees

Buzz: The Nature and Necessity of Bees. By Thor Hanson. *Basic Books; 304 pages; $27. Icon Books; £16.99*

BEES are wasps that went vegetarian. This was a brilliant evolutionary move: they now outnumber wasps by around three to one. Instead of hunting creatures that would rather not be eaten, they turned to living things that offered themselves on a plate. Bees and flowers evolved together in a gorgeous spiral of mutual dependence. Nectar and pollen feed the bees; in return, the plants get to procreate.

Humans are beneficiaries, too. These days honey is seen as a minor treat, but for hunter-gatherers it was essential: members of the Hadza, a tribe in Tanzania, get as much as 15% of their calories from honey, not including nutrition from the larvae and pollen they also consume. Of all the foods in nature, honey is the richest in energy. "The need to feed our big, hungry brains may help explain why we crave it," Thor Hanson explains in "Buzz", a book of popular science at its intelligent best.

The 20,000 species of wild bees are even more important than the domesticated kind, through their role in pollinating crops. That is why the problems afflicting both domestic and wild bees represent a danger for people, too.

A decade ago, stories of "colony collapse disorder" and crashing bee populations led to predictions of imminent ecological disaster. When the "beepocalypse" failed to materialise, humanity lost interest, but the insects' problems persist. Mr Hanson cites an authoritative survey showing that around 40% of bee species globally are in decline or threatened with extinction. Beekeepers in North America and Europe are losing hives at an abnormally high rate.

Why? Diana Cox-Foster, an entomologist, offers Mr Hanson the theory of the four Ps: parasites, poor nutrition, pesticides and pathogens. Widespread culling of flowers is a particular problem. "People look across a park or a golf course and think it's green and lush, but to a bee it's like a desert or a petrified forest—there's nothing to survive on," she says.

The remedies are clear, according to Mr Hanson: "providing landscapes with more flowers and nesting habitat, reducing pesticide use, and stopping the long-distance movement of domestic bees (and the pathogens that travel with them)." Fewer bees will mean fewer plants and therefore less to eat and less oxygen to breathe. Time to take their problems seriously. ■

Chinese fiction

A dark light on modern China

The Day the Sun Died. By Yan Lianke. *Translated by Carlos Rojas. Chatto & Windus; 352 pages; £14.99. To be published in America by Grove Press in December; $22*

THE humdrum town of Gaotian lies, with symbolic neatness, in "the centre of China". After the sun sets on a torrid session of wheat-harvesting during "the dog days of summer", its citizens begin to sleepwalk—or "dreamwalk", to translate the Chinese term literally. Through the ensuing night, all hell breaks loose. On this witches' sabbath, "somnambulistic hysteria" triggers a wave of looting and murder. Everyone sheds conscience and inhibition to fulfil desires and avenge injuries. All dare to "put their thoughts into practice". Dawn fails to arrive: night stretches out like "an endless ball of black thread". Yet, after an act of sacrifice calls time on this provincial apocalypse, the town gets back to work "as if nothing had happened".

First published in Taiwan in 2015, this exuberant but sinister fable confirms its author as one of China's most audacious and enigmatic novelists. Once a propagandist for the army, Yan Lianke has since the early 1990s written a series of novels and stories that alchemise China's boom into fantastical—yet thoroughly topical—fiction. Although banned on the mainland, Mr Yan still lives in Beijing. He dubs his style, which blends satire, folk-tale, epic, chronicle and even science fiction into a head-spinning mix, "mythorealism". Only such a delirious mash-up, he argues, can capture the "hidden internal logic" of China's breakneck growth. His novels encompass the visionary intensity of "The Four Books", and the transgressive farce of "The Explosion Chronicles".

With its yarn of a single night of mayhem, and its naive but perceptive narrator—a 14-year-old boy named Li Niannian—"The Day the Sun Died" achieves a focus and momentum not always found in Mr Yan's work. His writing—resourcefully translated by Carlos Rojas—feels both ancient and modern, folkloric and avant-garde. He honours the modern Chinese experience of living in two worlds, two epochs, at once. Niannian's parents run a shop that sells funeral ornaments; his rich uncle manages the crematorium, and processes its waste into a grisly brew, "corpse oil". The dreamwalkers of the "great somnambulism" shun the here-and-now. "No one wanted the present. This was a war over the past and the future."

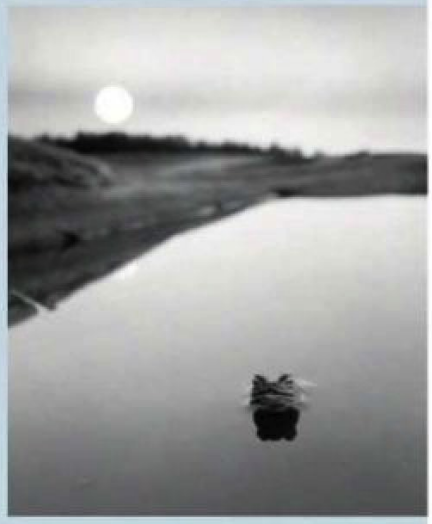
Mr Yan wrote "The Day the Sun Died" soon after China's leader Xi Jinping had sloganised the idea of the "Chinese Dream". But his satirical *danse macabre* has more than one target. Gaotian's night of chaos and carnage recalls both the Cultural Revolution and some dystopian "Black Friday" shopping spree. Fanciful nostalgia, as well as crass materialism, drives the slaughter. The "dreamwalking" town council tries to revive the "Taiping Heavenly Kingdom", a millenarian cult that convulsed 19th-century China. This pantomime ends in more bloodshed.

Slyly, Mr Yan writes himself into this book, as a dried-up hack whose arid and baffling novels resemble "rotten fruit" or "deserted graves". On the contrary. He seeds his reader's imagination, and his outlandish fantasia germinates many varieties of interpretation. "When sleep is deep," he writes, "the crops become ripe." ■

Photography

Top dog

A remarkable photographer with an unusual approach to the art market



UNDER a low sun, a frog with a thuggish expression swims alone in a pond, its black reflection a crisply outlined mirror image on the still water. It stares straight ahead; an eye-to-eye confrontation seems imminent. This sinister yet amusing picture was taken by Pentti Sammallahti, a 68-year-old Finnish photographer with an unusual status: he is at once feted and deliberately low-profile.

His modest prices—prints start at €600 ($702)—are part of the explanation. Peter Fetterman, who exhibited Mr Sammallahti's work at the Masterpiece fair in London this month, says he "is the best photographer whose work you can afford." But price tags that make his work accessible put off some collectors and galleries, who see price as a measure of quality. "Peter keeps telling me to charge more," says Mr Sammallahti.

He chooses not to raise prices, nor to limit editions of his prints. "I have the negative," he says, "why not print from it?" For him, making prints is part of his art. The frog peers from a silver-gelatine image taken from a black-and-white negative, one of his preferred techniques, but he experiments ceaselessly.

Mr Sammallahti is not a recluse, nor lacking in ambition. He travels the world taking photographs; a book, "Here Far Away", was published in 2012; another, of bird pictures, comes out later this year. But he shuns the art scene, believing that commercial pressures undermine quality. He does not lecture and rarely gives interviews. In 1991 he received an unprecedented 20-year grant from the Finnish government. Its sole condition was that he should concentrate on photography, so he gave up teaching. "I want to work in peace," he explains, "to be free to fail."

Failure has eluded him. In 2003 Henri Cartier-Bresson chose a photo by Mr Sammallahti—one of 100 images that the French master found most "stimulating, joyful and moving"—for his foundation's inaugural exhibition in Paris. A big dog sits high up on a Russian snowmobile, its ears pricked, king of all it surveys.